INTEGRATING MEDIA EDUCATION AND FOOD LITERACY: A MIXED-METHODS STUDY OF CRITICAL LEARNING, ENGAGEMENT AND INCLUSION IN LOWER SECONDARY SCHOOLS

Davide Di Palma
University of Campania "Luigi Vanvitelli"
davide.dipalma@unicampania.it

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ABSTRACT
This mixed-methods study explored the impact of a six-week educational intervention integrating food education and media education among 120 lower secondary school students. Results showed significant improvements in Food Media Literacy, healthier eating behaviors, and critical awareness of persuasive media content, with positive inclusive effects also observed for students with Specific Learning Disorders (SLD).

KEYWORDS
Food Media Literacy; Media Education; Adolescents; Critical Thinking; School-Based Intervention.

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1. Introduction

The contemporary food system is characterised by an increasing structural paradox: the widespread availability of ultra-processed foods that are economical, accessible and heavily promoted coexists with the growing challenge of accessing healthy, nutritionally balanced options. In this context, digital media environments play a vital role in shaping attitudes, preferences and behaviours relating to food, particularly among younger people. Food marketing has evolved into increasingly implicit forms, such as influencer marketing, embedded advertising and sponsored content. This contributes to the creation of environments that encourage obesity, where food choices are guided more by persuasive communication strategies than nutritional criteria (Jacques-Tiura & Greenwald, 2016).

Pre-adolescents (aged 10–11) are a particularly sensitive and important group to target with educational interventions. This developmental stage is characterised by growing autonomy in decision-making, increased engagement with digital media, and heightened susceptibility to peer influence. While they begin to develop an understanding of the media, empirical evidence suggests that children in this age group often lack the cognitive and critical tools necessary to fully recognise and resist sophisticated persuasive strategies, leaving them particularly vulnerable to food marketing (Kleih et al., 2023). Intervening at this stage is therefore crucial, as it enables educators to influence emerging cognitive, social and emotional processes, thereby fostering competencies that could have long-term implications for health-related behaviours.

Within this framework, the concept of food literacy has become increasingly central. Originally defined as the set of knowledge, skills, and practices that enable individuals to plan, select, prepare, and consume food in a conscious and sustainable way (Vidgen & Gallegos, 2014), the construct has progressively expanded to include critical, social, and ecological dimensions. Recent literature emphasizes the importance of understanding food systems, inequalities, and the environmental impact of consumption choices, thus framing food literacy as a multidimensional and transformative competence (Truman et al., 2017; Royall, 2020).

Building on this evolution, Food Media Literacy (FML) emerges as a theoretically and pedagogically relevant construct at the intersection of food education and media education. FML refers not only to the ability to access, analyze, and evaluate food-related media content, but also to actively produce and reinterpret such

content, developing a critical stance toward persuasive and commercial strategies (Fleming-Milici & Harris, 2020). From this perspective, learners are no longer passive recipients of information but active agents engaged in processes of meaning-making, negotiation, and re-elaboration.

The integration of food education and media education thus represents a necessary shift from transmissive models toward transformative pedagogical approaches. Rather than focusing exclusively on the acquisition of nutritional knowledge, such approaches aim to foster higher-order competencies, including critical thinking, self-regulation, and socio-cultural awareness. Empirical evidence suggests that participatory, media-based educational interventions can significantly enhance both critical competencies and food-related attitudes among young people (Fleming-Milici & Harris, 2020).

In this perspective, the school context plays a pivotal role as a structured, inclusive, and socially situated learning environment. Through the adoption of active methodologies—such as critical analysis of digital content, collaborative learning, and media production—schools can support the development of responsible food citizenship, where individual choices are connected to broader dimensions of health, sustainability, and social responsibility.

Despite the growing interest in Food Literacy and media education, research specifically addressing Food Media Literacy in early adolescence—particularly through integrated and empirically tested educational interventions—remains limited. This gap highlights the need for studies capable of combining theoretical grounding with methodological rigor, while also addressing issues of inclusion and educational equity.

2. Aims of the research

Based on the theoretical framework described above, this study aims to further develop the emerging field of Food Media Literacy (FML) by investigating its development, educational enhancement and behavioural implications in lower secondary education.

Firstly, the study will assess baseline levels of FML among lower secondary school students by examining their ability to interpret food-related media messages critically, recognise persuasive intent and evaluate the credibility of digital content. In line with previous studies, it is anticipated that these competencies will be only partially developed at this stage, necessitating structured educational support (Zarouali et al., 2019; Folkvord & van 't Riet, 2018).

Secondly, the study will evaluate the effectiveness of a structured, school-based intervention that integrates food and media education.

Specifically, it investigates whether participation in the intervention leads to:

a) increased awareness of persuasive and marketing strategies,
b) enhanced analytical and interpretative media skills, and
c) more critical attitudes toward food-related content.

These dimensions reflect key components of FML and are consistent with evidence on the impact of media literacy interventions on critical thinking and attitudinal change (Vraga et al., 2021).

Third, the study explores the relationship between Food Media Literacy and eating behaviors, examining whether improvements in critical media competence are associated with measurable changes in dietary practices. In line with existing literature, FML is conceptualized as a potential mediating factor between media exposure and food-related decision-making (Folkvord & van ’t Riet, 2018).

Fourth, adopting a qualitative perspective, the study investigates students’ perceptions, experiences, and meaning-making processes related to the intervention, with particular attention to how critical awareness develops through participatory and media-based learning practices (Ronto et al., 2016; Doustmohammadian et al., 2022).

Finally, the study examines the inclusive potential of the intervention by analyzing its impact on students with Specific Learning Disorders (SLD). In particular, it explores whether multimodal, collaborative, and production-based learning environments can support equitable access, engagement, and competence development across diverse learner profiles.

3. Data collection tools

This study adopts a mixed-methods research design, integrating quantitative and qualitative approaches to capture the multidimensional nature of Food Media Literacy. Such an approach is particularly suitable for investigating complex educational constructs, as it allows the combination of measurable outcomes with an in-depth understanding of students’ learning processes and lived experiences. In line with established mixed-methods frameworks, the integration of quantitative and qualitative data was intended to provide a more comprehensive and nuanced interpretation of the phenomenon, encompassing cognitive, behavioral, socio-

emotional, and interpretative dimensions (Creswell & Plano Clark, 2007; Fetters et al., 2013).

3.1 Quantitative tools

The quantitative component relied on standardized instruments adapted to the developmental characteristics of the target population (10–11 years old), with the aim of operationalizing Food Media Literacy (FML) as a multidimensional construct encompassing media-related competencies and food-related behaviors.

To assess media-related competencies, an adapted version of the Digital Literacy Scale for Children was employed. The instrument was linguistically simplified and contextually reframed to the food domain, enabling the evaluation of students' ability to interpret online content, assess source credibility, and identify persuasive or promotional food-related messages. Responses were collected using a four-point Likert scale, selected to reduce central tendency bias and enhance response reliability in younger participants. Composite indices were constructed to represent key dimensions of media competence and critical awareness, following established approaches in digital literacy research (Ng, 2012; van Laar et al., 2017).

Food-related behaviors were measured using a set of items adapted from the CATCH Kids Club After-School Student Questionnaire, a validated instrument for school-age populations. The selected items captured both behavioral frequency (e.g., consumption of ultra-processed snacks, sugar-sweetened beverages, fruit, and vegetables) and attitudinal orientations toward food choices. This dual approach allowed for a more comprehensive operationalization of dietary practices and their potential relationship with media competencies (Hoelscher et al., 2010).

All items were reviewed for age appropriateness and contextual relevance. Internal consistency of the adapted scales was assessed (Cronbach's alpha), and acceptable reliability thresholds were confirmed prior to analysis. Composite scores were calculated to enable comparison across pre-test and post-test conditions.

Data collection was conducted during regular school hours and administered by the research team in collaboration with classroom teachers. Standardized instructions ensured consistency across groups, while the presence of researchers allowed for clarification and monitoring, thereby reducing potential response bias and enhancing data quality.

3.2 Qualitative Tools

The qualitative component was designed to explore in depth the experiential and interpretative dimensions of students' learning processes.

Semi-structured individual interviews were conducted using a flexible interview guide, allowing for both comparability across participants and the emergence of individual perspectives. Interview topics included students' perceptions of food-related media messages, their awareness of persuasive strategies, and their reflections on the educational experience. This method enabled the collection of rich, context-sensitive data, capturing subjective meanings and reflective processes that are not easily accessible through standardized instruments (Kallio et al., 2016).

A second qualitative data source consisted of the analysis of students' media productions (videos, posters, digital storytelling), developed during the intervention. These artifacts were analyzed through a structured evaluation rubric specifically designed for the study context. The rubric included the following dimensions:

- content accuracy and relevance (nutritional correctness and message coherence);
- critical capacity (identification and re-elaboration of persuasive strategies);
- communicative clarity (expressive effectiveness and audience appropriateness);
- creativity (originality and use of multimodal languages);
- media awareness (reflection on the role and impact of media on food behaviors).

This approach enabled the observation of Food Media Literacy competencies in a situated and practice-based context, bridging interpretative analysis with shared evaluative criteria (Buckingham, 2019).

Qualitative data were analyzed through a thematic analysis process, involving systematic coding, identification of emerging categories, and detection of recurring patterns. This analytical strategy allowed for an in-depth interpretation of how students construct meaning and develop awareness regarding the relationship between food and media (Braun & Clarke, 2021).

Particular attention was given to the integration of quantitative and qualitative findings, in order to enhance the interpretative validity of the results and to provide a more comprehensive understanding of the impact of the educational intervention.

4. Sample and Participants

The study was conducted in a lower secondary school located in the Caserta area, selected as a naturalistic educational setting for examining Food Media Literacy in early adolescence. A non-probabilistic convenience sampling strategy was adopted based on institutional accessibility and willingness to participate. While appropriate for school-based research, this approach limits external validity and introduces potential selection bias, which is considered in the interpretation of findings (Etikan et al., 2016).

The sample consisted of 120 first-year students (aged 10–11), distributed across six intact classes. The study employed a quasi-experimental pre-test/post-test design with a control group, consistent with established approaches to causal inference in educational settings (Shadish, Cook, & Campbell, 2002).

Group assignment followed a cluster-based procedure at the class level to prevent contamination effects. Baseline equivalence between the experimental and control groups was assessed using pre-test measures and key demographic variables, ensuring initial comparability (Creswell & Plano Clark, 2007).

Within the sample, six students had a formal diagnosis of Specific Learning Disorders (SLD), specifically dyslexia. These students were intentionally distributed across experimental and control groups to avoid systematic bias and to enable exploratory analysis of differential intervention effects. This approach reflects principles of inclusive research design and allows for the examination of accessibility within authentic classroom contexts (Tomlinson, 2017).

Inclusion criteria were defined to ensure sample homogeneity and internal validity, including enrollment in the first year of lower secondary school and alignment with the targeted developmental stage. Students who had repeated a school year were excluded to minimize potential confounding effects related to age or prior educational experience.

Participation required informed consent from legal guardians, and the study adhered to established ethical standards for research involving minors, including anonymity, confidentiality, and voluntary participation (Alderson & Morrow, 2020).

All activities were conducted under comparable instructional conditions within the same institutional context, reducing the influence of extraneous variables and strengthening the internal validity of the design.

5. Educational Intervention Framework

The educational intervention was designed as a structured, school-based program aimed at fostering Food Media Literacy (FML) through the integration of media education and food education. The intervention was implemented over a six-week period and consisted of six sequential sessions (one per week), each lasting approximately 90 minutes and conducted during regular school hours.

The pedagogical design was grounded in socio-constructivist and experiential learning principles, emphasizing active engagement, collaborative knowledge construction, and critical reflection. In particular, the intervention drew on socio-constructivist approaches to learning, which conceptualize knowledge as actively constructed through social interaction and meaning-making processes (Vygotsky, 1978), as well as on experiential learning theory, which highlights the role of reflection on concrete experiences in fostering deep understanding (Kolb, 1984). Furthermore, the integration of media analysis and production activities aligns with established media education frameworks, which emphasize the importance of both critical interpretation and creative participation in developing media literacy competencies (Buckingham, 2003; Hobbs, 2010).

The intervention combined three core components: (1) critical analysis of food-related media content, (2) guided discussion and reflection, and (3) student-generated media production. This integrated approach is consistent with research indicating that media literacy interventions are most effective when they combine analytical and production-based activities, thereby supporting both critical thinking and active engagement (Jeong et al., 2012).

Each session was structured around specific learning objectives aligned with the overall aims of the study:

- *Session 1: Introduction to Food and Media.*
  Students explored their existing food habits and media consumption patterns. Initial activities aimed to activate prior knowledge and introduce the concept of media influence on food choices, in line with constructivist approaches that value learners' prior experiences as a foundation for new learning (Bransford et al., 2000).
- *Session 2: Understanding Food Advertising*
  Students were introduced to the fundamental characteristics of advertising, including persuasive intent, target audience, and emotional appeal. The analysis of real-world examples reflects recommendations from media literacy research emphasizing the use of authentic materials to enhance relevance and transferability (Buckingham, 2003).

- *Session 3: Identifying Persuasive Strategies*

The focus shifted to recognizing specific persuasive techniques, such as the use of influencers, visual enhancement, health claims, and promotional language. This phase was informed by research on children's advertising literacy, which highlights the need for explicit instruction in recognizing persuasive intent (Livingstone & Helsper, 2006).

- *Session 4: Critical Analysis of Digital Food Content*

Students worked in small groups to analyze social media posts, influencer content, and online advertisements related to food. Collaborative learning strategies were employed to foster discussion, negotiation of meaning, and peer-supported learning, consistent with evidence on the effectiveness of cooperative learning in promoting higher-order thinking (Gillies, 2016).

- Session 5: Media Production

Students engaged in the creation of their own media artifacts (e.g., posters, short videos, digital stories) aimed at promoting healthy and informed food choices. This phase reflects the "learning by creating" approach central to digital and media literacy education, which has been shown to enhance both engagement and critical understanding (Hobbs, 2010).

- *Session 6: Reflection and Consolidation*

The final session focused on collective reflection, discussion of learning outcomes, and consolidation of key concepts. Reflective activities were designed to support metacognitive awareness and the internalization of learning processes, in line with experiential learning theory (Kolb, 1984).

The intervention was delivered by the research team in collaboration with classroom teachers, who supported classroom management and facilitated continuity with curricular activities. All sessions followed a standardized instructional framework to ensure consistency across classes and enhance internal validity.

Particular attention was given to inclusive pedagogical design. Activities were structured to be accessible through multiple modes of engagement, including visual materials, oral discussion, and hands-on production. Scaffolding strategies, clear task instructions, and collaborative group work were systematically employed to support students with diverse learning needs, including those with Specific Learning Disorders (SLD). This approach is consistent with principles of differentiated instruction and inclusive pedagogy, which emphasize flexibility, multimodality, and the provision of multiple pathways to learning (Tomlinson, 2017; Florian, 2019).

Overall, the intervention aimed not only to enhance students' critical understanding of food-related media messages but also to promote active

participation, creativity, and reflective thinking, thereby supporting the development of Food Media Literacy as a multidimensional and transformative competence

6. Results

6.1 Quantitative Data Analysis

The quantitative analysis aimed to assess the effectiveness of the educational intervention in enhancing students' Food Media Literacy (FML) and improving dietary behaviors.

- *Reliability and Preliminary Analyses*

Prior to hypothesis testing, the internal consistency of the adapted instruments was examined. The Digital Literacy Scale (adapted to the food domain) demonstrated good reliability (Cronbach's $\alpha = .84$ at pre-test; $\alpha = .87$ at post-test), while the dietary behavior scale showed acceptable internal consistency ($\alpha = .78$ at pre-test; $\alpha = .81$ at post-test). These values indicate satisfactory reliability for subsequent analyses.

Descriptive statistics (means and standard deviations) were calculated for all variables at pre-test and post-test for both experimental and control groups.

At baseline, independent-samples t-tests confirmed no statistically significant differences between groups in FML scores ($t(118) = 0.41$, $p = .68$), indicating initial equivalence. The experimental group reported $M = 2.48$ ($SD = 0.41$), while the control group reported $M = 2.45$ ($SD = 0.39$) on a four-point Likert scale.

- *Intervention Effects on Food Media Literacy*

Following the intervention, the experimental group showed a substantial increase in FML scores ($M = 3.21$, $SD = 0.37$), whereas the control group exhibited a more modest improvement ($M = 2.61$, $SD = 0.42$).

Within-group analyses using paired-sample t-tests indicated a highly significant improvement in the experimental group ($t(59) = 9.87$, $p < .001$), with a large effect size (Cohen's $d = 1.27$), suggesting a strong intervention effect. The control group also showed a statistically significant increase ($t(59) = 2.14$, $p < .05$), although with a small effect size ($d = 0.28$), likely attributable to general curricular exposure.

To assess between-group differences, an independent-samples t-test on post-test scores revealed a statistically significant advantage for the experimental group ($t(118) = 8.02$, $p < .001$). The mean difference ($\Delta M = 0.60$) corresponds to a large effect size (Cohen's $d = 1.46$), confirming the substantial impact of the intervention.

- *Effects on Dietary Behaviors*

Changes in dietary behaviors were analyzed using pre-post comparisons and between-group differences.

The experimental group demonstrated a notable reduction in the consumption of ultra-processed snacks (−18%) and a substantial increase in fruit and vegetable intake (+22%). In contrast, the control group showed smaller changes (−5% and +7%, respectively).

Paired-sample t-tests indicated that these changes were statistically significant in the experimental group ($p < .01$), whereas they did not reach significance in the control group ($p > .05$). Between-group comparisons at post-test further confirmed the superiority of the intervention condition ($p < .01$), suggesting that behavioral changes were closely associated with enhanced Food Media Literacy.

- *Subgroup Analysis: Students with Specific Learning Disorders (SLD)*

A focused analysis was conducted on students with SLD ($n = 6$) to explore the inclusive effectiveness of the intervention.

At pre-test, no significant differences emerged between experimental and control subgroups (experimental: $M = 2.31$, $SD = 0.38$; control: $M = 2.29$, $SD = 0.36$), confirming baseline comparability.

Post-intervention results showed a marked improvement in the experimental subgroup ($M = 3.05$, $SD = 0.34$; +32.0%), compared to a smaller increase in the control subgroup ($M = 2.50$, $SD = 0.39$; +9.2%). Due to the limited sample size, non-parametric checks (Wilcoxon signed-rank) were also conducted, confirming the significance of the pre-post improvement in the experimental subgroup ($p < .05$).

The between-group difference at post-test ($\Delta M = 0.55$) indicates a substantial practical effect, providing preliminary evidence supporting the inclusive potential of the intervention.

Similarly, dietary behavior improvements were more pronounced among SLD students in the experimental group (−15% snack consumption; +19% fruit and vegetable intake) compared to the control group (−4% and +6%, respectively).

- *Summary of Quantitative Findings*

Overall, the results provide strong evidence that the intervention significantly enhanced Food Media Literacy and promoted healthier dietary behaviors. Importantly, the intervention also contributed to reducing initial disparities, demonstrating effectiveness across diverse learner profiles and supporting its relevance within an inclusive education framework.

6.2 Qualitative Data Analysis

Qualitative data were analyzed using a thematic analysis approach to explore students' perceptions, experiences, and meaning-making processes related to the educational intervention.

Semi-structured interviews provided in-depth insights into how students interpret food-related media messages and how these interpretations influence their attitudes and behaviors. Guiding questions addressed attention to advertising, perceived credibility, behavioral influence, and learning outcomes.

- *Emerging Themes*

The analysis revealed four main thematic dimensions:

1. *Development of Critical Awareness*: Students in the experimental group demonstrated a clear shift toward critical engagement with media content. Many explicitly recognized persuasive intent and commercial strategies, as illustrated by statements such as: "Before, I thought advertisements were true, now I understand they try to make us buy things" and "Influencers make everything look good, but now I know it's advertising." These responses indicate a transition from passive reception to critical interpretation. In contrast, control group students focused primarily on surface-level aspects (e.g., taste, visual appeal), with limited awareness of persuasive mechanisms.
2. *Integration of Cognitive and Behavioral Dimensions*: Experimental group students articulated learning outcomes that integrated understanding and action (e.g., "Now I pay more attention to what I eat"), whereas control group responses remained largely declarative and knowledge-based (e.g.,

"Eating fruit and vegetables is healthy"), without evidence of media-critical reflection.

3. *Inclusive Engagement and Multimodal Learning (SLD Students)*: Students with SLD in the experimental group showed strong engagement and meaningful participation. Multimodal and hands-on activities—particularly media production—facilitated comprehension and expression: "Making videos helped me understand how advertising works." In contrast, SLD students in the control group provided more limited and repetitive responses, with reduced elaboration and minimal reference to media dynamics.
4. *Emotional and Motivational Engagement*: A distinct difference emerged in terms of engagement. Experimental group students reported higher levels of interest, enjoyment, and collaboration (e.g., "Creating advertisements was fun"), while control group students described more traditional and less engaging experiences.

6.3 Mixed-Methods Integration

The qualitative findings converge with and help explain the quantitative. They provide evidence that the intervention not only improved measurable competencies but also transformed students' interpretative frameworks, fostering critical thinking, agency, and engagement.

Importantly, qualitative data highlight the mechanisms underlying observed changes, particularly the role of participatory, multimodal, and experiential learning in supporting both effectiveness and inclusion.

7. Discussion

The findings of this study provide robust and convergent evidence that a structured Food Media Literacy (FML)-based educational intervention enhances critical thinking skills, media literacy and healthier dietary behaviours among lower secondary school students. Integrating quantitative and qualitative data strengthens the internal validity of the results, allowing for a more nuanced interpretation of the underlying learning processes. Notably, the alignment of statistically significant improvements (including substantial effect sizes and differences between groups) with qualitative shifts in students' interpretive frameworks suggests that the intervention produced measurable gains and meaningful cognitive and experiential changes. Overall, the evidence consistently suggests that a structured, participatory and media-integrated pedagogical approach yields significantly stronger outcomes than traditional transmissive

instruction.
From cognitive and educational standpoints, the substantial increase in food media literacy scores observed in the experimental group, supported by large effect sizes and statistically significant between-group differences, confirms that structured exposure to media analysis combined with guided, scaffolded opportunities for active media production (as implemented in the intervention protocol) can significantly enhance students' ability to decode and critically evaluate persuasive, food-related messages. This finding is consistent with previous studies indicating that simply providing nutritional information is ineffective in modern digital environments, which are characterised by widespread and sophisticated marketing strategies (Fleming-Milici & Harris, 2020; Qutteina et al., 2019). Instead, integrating media education into food education, particularly through inquiry-based and production-oriented activities, fosters the development of higher-order cognitive processes, including critical thinking, source evaluation, and inferential reasoning (Jeong et al., 2012).

Crucially, the scale of the observed effects indicates that the intervention not only reinforced existing knowledge, but also contributed to a significant restructuring of students' interpretative frameworks. The qualitative findings further support this interpretation, highlighting a shift from passively receiving media content to actively interrogating it. In this sense, Food Media Literacy can be conceptualised as a transformative competence that reshapes how students engage with food-related information in digitally mediated environments, rather than merely as a set of discrete skills.

A particularly relevant contribution of this study is demonstrating the connection between critical awareness and behavioural change. The statistically significant improvements observed in dietary behaviours — specifically, a reduction in ultra-processed food consumption and an increase in fruit and vegetable intake in the experimental group compared to the control group — indicate that the intervention effectively bridged the well-documented gap between knowledge and action. This finding aligns with the growing body of research that views food literacy as an integrated construct encompassing cognitive, behavioural, and socio-emotional dimensions (Truman et al., 2017; Ares et al., 2023). Within this framework, food media literacy appears to function as a mediating mechanism through which critical awareness can translate into self-regulated, health-oriented choices. This interpretation is further reinforced by recent studies highlighting the growing influence of digital food environments on young people's dietary behaviors. Algorithm-driven content exposure, influencer marketing, and personalized advertising contribute to shaping preferences and consumption patterns in ways that are often implicit and difficult to detect (Buchanan et al.,

2025; Van der Bend & Seidell, 2025). Within this context, the development of Food Media Literacy emerges as an essential protective factor, equipping students with the cognitive tools needed to critically navigate increasingly complex and persuasive media ecosystems.

The qualitative findings provide deeper insight into the mechanisms underlying these changes, revealing a shift in students' epistemic stance toward media content. Students in the experimental group demonstrated a transition from passive acceptance to critical engagement, as evidenced by their ability to recognize persuasive intent, question the credibility of sources, and reflect on their own consumption practices. The emergence of a shared "critical discourse" among students suggests that the intervention—particularly through collaborative and dialogic activities—facilitated not only individual learning but also collective meaning-making, consistent with socio-constructivist perspectives.

In contrast, the control group's responses remained largely descriptive and focused on declarative knowledge, reinforcing the limitations of traditional approaches that do not explicitly address the media dimension of food-related learning. This divergence between groups further substantiates the added value of integrating media education into food education, especially when implemented through structured, scaffolded, and participatory pedagogical designs.

Another key finding concerns the strong motivational and affective engagement observed in the experimental group. Students' positive responses to collaborative, creative, and media production activities—core components of the intervention protocol—suggest that participatory methodologies play a crucial role not only in enhancing learning outcomes but also in fostering engagement and intrinsic motivation. This dimension is particularly relevant, as motivation is a key factor in the sustainability and transferability of learning. The integration of creative practices appears to support deeper cognitive processing and personal investment, thereby amplifying the overall impact of the intervention.

From an inclusion perspective, the study offers important insights into the potential of Food Media Literacy as an inclusive pedagogical framework. Students with Specific Learning Disorders (SLD), particularly dyslexia, showed significant improvements in both competencies and engagement, supported by the multimodal, scaffolded, and experiential design of the intervention. The use of visual supports, structured tasks, and collaborative activities enabled access through multiple learning pathways, reducing barriers associated with text-based instruction. Importantly, quantitative subgroup analyses—while exploratory due to sample size—suggest a reduction in initial disparities, reinforcing the inclusive effectiveness of the approach.

These findings are consistent with inclusive education frameworks emphasizing flexibility, differentiation, and multimodality (Florian, 2019; Tomlinson, 2017). Notably, the intervention appears to support not only access but also meaningful participation and competence development, suggesting that intentionally designed FML interventions can contribute to both equity and excellence. In this sense, Food Media Literacy aligns closely with Universal Design for Learning principles.

Furthermore, the study contributes to the broader conceptualization of students as active agents within food systems and media environments. By engaging students in both the analysis and production of media content, the intervention fostered agency, participation, and critical awareness beyond individual behavior change. This aligns with contemporary perspectives on food citizenship (Classens & Sytsma, 2020), emphasizing the role of individuals as informed and responsible actors.

Despite these strengths, the findings should be interpreted within the context of the study's design. While the quasi-experimental structure and statistical analyses strengthen internal validity, future research would benefit from longitudinal designs to assess the persistence of observed effects. Additionally, expanding the sample across diverse socio-cultural contexts would enhance generalizability and provide deeper insight into contextual influences on Food Media Literacy development.

In conclusion, this study provides compelling evidence that integrating food education with media education—through structured, participatory, and multimodal pedagogical designs—represents a highly effective and timely strategy. By addressing cognitive, behavioral, and socio-emotional dimensions of learning, Food Media Literacy emerges as a key competence for promoting health, inclusion, and active citizenship in contemporary digital societies.

8. Conclusions, Limitations and Implications

This study provides robust and convergent evidence that a structured Food Media Literacy (FML)-based educational intervention is an effective, theoretically grounded approach to fostering critical thinking skills, media literacy, and healthier dietary behaviours among lower secondary school students. The findings show that combining food and media education through a structured, scaffolded and participatory intervention design enables a shift away from purely informational approaches towards active, reflective and meaningful learning connected to students' everyday experiences. In particular, critical analysis, guided reflection, collaborative learning and media production activities made learning more meaningful, situated and transferable (Hobbs, 2017; Buckingham, 2019).

A comparison of the experimental and control groups, supported by statistically significant differences and large effect sizes, highlights the added value of participatory and inquiry-based methodologies. Students exposed to the intervention acquired knowledge and developed higher-order competencies, such as the ability to interpret media messages, recognise persuasive strategies in food marketing and reflect critically on their consumption choices. These findings are particularly pertinent in the context of contemporary digital environments, where young people are constantly subjected to sophisticated and frequently covert forms of persuasion (Fleming-Milici & Harris, 2020; Qutteina et al., 2019; Buchanan et al., 2025). In such contexts, food media literacy emerges as a vital skill for navigating complexity and supporting informed decision-making.

A key contribution of this study lies in demonstrating that critical media awareness can translate into observable behavioral change. The improvements in students' dietary habits—supported by statistically significant pre-post differences in the experimental group—suggest that FML operates as a bridge between knowledge and action, fostering not only cognitive understanding but also self-regulation and agency. This aligns with recent research emphasizing the need to address digital food environments as integrated systems in which exposure, interpretation, and behavior are dynamically interconnected (Van der Bend & Seidell, 2025).

From an inclusion perspective, the study provides important evidence on the potential of FML as an inclusive pedagogical framework. Students with Specific Learning Disorders (SLD) showed meaningful improvements in both competencies and engagement, supported by the multimodal and scaffolded design of the intervention. The use of diverse representational formats and participatory activities enabled access through multiple learning pathways, reducing traditional barriers and supporting equitable learning processes. While subgroup analyses should be interpreted with caution due to sample size, the observed trends suggest that FML interventions can contribute to reducing educational disparities.

Despite these strengths, several limitations should be acknowledged. First, the use of a non-probabilistic convenience sample and the involvement of a single school limit the generalizability of the findings. Future studies should include more diverse samples across different socio-cultural and geographical contexts to enhance external validity. Second, the relatively short duration of the intervention (six weeks) allows for the observation of immediate effects but does not provide insight into the long-term sustainability of the observed changes. Longitudinal research designs are therefore needed to assess the persistence and transferability of Food Media Literacy competencies over time (Creswell & Plano Clark, 2007; Shadish, Cook & Campbell, 2002).

Additionally, the limited number of students with SLD calls for caution in interpreting subgroup-specific findings. Future research should involve larger and more diverse populations of learners with special educational needs to better understand the inclusive potential of FML interventions. Another limitation concerns the measurement of Food Media Literacy itself: although the study employed adapted instruments with acceptable reliability, further research is needed to develop and validate standardized, age-appropriate tools capable of capturing the multidimensional nature of FML in preadolescent populations.

Building on these limitations, several directions for future research emerge. Expanding the scope of investigation to include longitudinal and cross-cultural studies would provide a more comprehensive understanding of how Food Media Literacy develops and operates across contexts. Furthermore, future research could explore the role of emerging technologies—such as artificial intelligence–driven content recommendation systems—in shaping food-related perceptions and behaviors, and how educational interventions can effectively address these evolving dynamics.

From a practical and policy-oriented perspective, the findings have important implications. At the educational level, they support the systematic integration of Food Media Literacy into school curricula as a cross-curricular competence linking health education, media education, and citizenship education. Teacher training programs should incorporate specific modules on FML, equipping educators with the pedagogical tools needed to implement structured, participatory, and media-based approaches effectively.

At a policy level, the results highlight the need for greater alignment between educational initiatives and public health strategies. In light of the increasing impact of digital food marketing on young people, policymakers should consider implementing regulatory measures, such as restrictions on targeted advertising to children, alongside educational initiatives designed to enhance critical media literacy. This integrated approach is widely recognised as vital for addressing the intricate relationship between environment, behaviour and health outcomes in digital societies (Buchanan et al., 2025; van der Bend & Seidell, 2025). Finally, the study emphasises the importance of recognising students as active participants in digital food environments, not just consumers. Engaging them in the creation and critical analysis of media content fosters agency, responsibility, and participation — key dimensions of food citizenship (Classens & Sytsma, 2020) — through Food Media Literacy. Therefore, promoting FML in schools contributes to healthier lifestyles and the development of critical, informed and socially responsible citizens.

Ultimately, Food Media Literacy should be understood as a critical integrative competence for navigating contemporary digital food environments, rather than merely as an extension of food or media education. Its systematic inclusion in educational practice represents not only a pedagogical innovation, but also a necessary and timely response to the structural transformations of communication, consumption, and health in digitally mediated societies.

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