ARTÍCULO ORIGINAL

Gac Méd Caracas 2024;132(4):1037-1050
DOI: 10.47307/GMC.2024.132.4.15

Education and Health. Learning healthy habits among Colombian students: A study on attitudes towards food

Educación y Salud. Aprendizaje de hábitos saludables entre estudiantes colombianos: un estudio sobre actitudes hacia la comida

María Teresa Durango Oquendo[1], María Natividad Elvira-Zorzo[2*], María Laura Vergara Álvarez[3], Kelly Márquez Toscano[4]

SUMMARY

This study employs an attitude change approach to examine the effectiveness of diverse pedagogical strategies in conveying human nutrition concepts. The objective was to evaluate the impact of these strategies on knowledge and attitudes towards food. It was employed the DIAC method, which combines qualitative and quantitative approaches, and included 100 secondary school students and 129 families from a public educational institution in Colombia. A learning unit on human nutrition was implemented for the students, while the families completed a survey to assess their perceptions of family nutrition. The study yielded several key outcomes, including changes in attitudes toward food, knowledge acquisition, behavioral modification, and the consolidation of students' cognitive structures. The results demonstrated a favorable alteration in attitudes towards food, promoting knowledge acquisition, behavioral modification, and cognitive consolidation. However, a worrying trend of excessive consumption of sugary drinks, fried foods, sweets, biscuits, and industrial products was identified. The findings underscore the necessity for integrating nutritional health education into public policy, with the urgent need to implement effective educational strategies to promote healthy eating habits early on. The study's implications for public policy and the need for effective educational strategies are clear, underlining the urgency and importance of the study's findings. Furthermore, the significant influence of parental behavior on children's dietary patterns is highlighted. This study contributes to the fields of education and public health by providing empirical evidence on the effectiveness of targeted strategies to improve nutrition and health in school settings, underscoring the importance of integrative interventions involving both students and their families.

Keywords: *Attitudes, education, meaningful learning, eating habits, psychosocial factors.*

DOI: https://doi.org/10.47307/GMC.2024.132.4.15

ORCID: https://orcid.org/0009-0009-9870-6768[1]
ORCID: https://orcid.org/0000- 0003-1070-6093[2]
ORCID: https://orcid.org/0000-0001-9600-2956[3]
ORCID: https://orcid.org/0009-0009-1410-8948[4]

[1] American University of Europe, Quintana Roo, Mexico. E-mail: mariat.durango@gmail.com

[2*] Autor de correspondencia: Department of Social Psychology and Anthropology, University of Salamanca, Campus Ciudad Jardín, 37005 Salamanca, Spain, and Department of Education and Humanities, Universidad Americana de Europa, Cancún 77500, Mexico.
E-mail: maria_elvirazorzo@usal.es

[3]Universidad Nacional Abierta y a Distancia, School of Social Sciences, Arts and Humanities, Corozal, Sucre. E-mail: maria.vergara@unad.edu.co

[4]Universidad Nacional Abierta y a Distancia, INVIL, Corozal, Sucre. E-mail: kelly.marquez@unad.edu.co.

Recibido: 5 de julio 2024
Recibido-2: 31 de julio 2024
Aceptado: 21 de octubre 2024

RESUMEN

Este estudio analiza la eficacia de estrategias pedagógicas en la enseñanza de conceptos de nutrición humana, enfocándose en el cambio de actitudes. El objetivo fue evaluar el impacto de estas estrategias en los conocimientos y actitudes hacia la alimentación. Se utilizó el método DIAC, que combina enfoques cualitativos y cuantitativos, e incluyó a 100 estudiantes de secundaria y 129 familias de una institución pública en Colombia. A los estudiantes se les impartió una unidad de aprendizaje sobre nutrición, mientras que las familias completaron una encuesta sobre sus percepciones de la alimentación familiar. Los resultados mostraron cambios positivos en las actitudes hacia la alimentación, promoviendo la adquisición de conocimientos, la modificación de comportamientos y la consolidación cognitiva. Sin embargo, se observó un preocupante consumo excesivo de bebidas azucaradas, frituras y productos industriales. Estos hallazgos subrayan la necesidad de integrar la educación nutricional en las políticas públicas mediante estrategias que fomenten hábitos saludables desde edades tempranas. Además, se destacó la influencia del comportamiento parental en los patrones alimentarios de los niños. El estudio aporta evidencia empírica sobre la efectividad de estas estrategias educativas en el entorno escolar, resaltando la importancia de intervenciones que involucren tanto a estudiantes como a sus familias para mejorar la nutrición y la salud.

Palabras clave: *Actitudes, educación, aprendizaje significativo, hábitos alimenticios, factores psicosociales.*

INTRODUCTION

Healthy eating throughout life prevents malnutrition and non-communicable diseases. However, the increase in processed foods and lifestyle changes have altered eating habits. According to the World Health Organization (WHO) (1), increased consumption of high-calorie foods, saturated fats, trans fats, salt and sugar negatively affects health.

Healthy eating must be adapted to individual, contextual, and economic needs. Although the basic principles are consistent, improving these habits is a social challenge. Strategies are needed to change attitudes and prioritize appropriate food choices, especially through family and school education. Echandi (2) stresses the importance of understanding the nutritional benefits of food.

In Colombia, unhealthy habits in children and youth, such as consuming innutritious foods and resistance to school feeding programs, affect food security. The 2015 National Nutritional Situation Survey (ENSIN) reveals an alarming increase in overweight and obesity, with 56.4 % of the population being overweight. In children aged 5 to 12 years, obesity and overweight increased from 18.8 % to 24.4 %, and in adolescents up to 17 years of age, 17.9 % are overweight (3). It is crucial to reflect on nutrition teaching in schools and whether the knowledge imparted by the Ministry of National Education is adequate. To promote healthy eating habits, it is proposed that this educational work be improved by incorporating learning units designed with Soussan's learning cycle (4).

Eating habits reflect food choices and consumption influenced by social and cultural factors. Biologically, eating habits involve obtaining nutrients necessary for the body's balance. Carbohydrates, vitamins, minerals, lipids, and proteins are essential for health. According to Ingelmo et al. (5), adequate and varied consumption of nutrients promotes nutritional balance.

An imbalance in nutrient intake can cause health problems such as obesity, diabetes, hypertension and hormonal imbalances. These diseases can be prevented with proper nutrition. Family, environment and education influence eating habits. Adolescents, especially, may face nutritional risks by having autonomy in their choices without proper education. Excess weight in children is a public health problem that requires urgent preventive intervention. The National Survey of the Nutritional Situation (ENSIN) in Colombia provides essential data for formulating public policies and evaluating progress in food security. According to the ENSIN 2015, critical needs were identified in adolescents aged 13 to 17 years, where underweight can compromise immunity and cause difficulties, while obesity can lead to emotional problems and chronic diseases such as type 2 diabetes and cardiovascular disease (3).

Despite the goals established in the National Development Plan (NDP) 2014-2018 to reduce overweight and obesity in Colombia's population aged 5 to 17 years, the prevalence increased to 22 %, exceeding the reduction expectations by 0.5 percentage points. This situation is aggravated by the particular nutritional requirements of adolescents, whose growth and development are at their peak, and nutritional deficiencies can negatively impact both these processes and cognitive response (3).

Acosta et al. (6) highlight the crucial role of health education in promoting proper eating habits, as well as the fundamental role of the family as the first learning environment where values and habits are formed. However, whether the family adequately fulfills this role in the current demands for healthy nutrition practices is questioned. Quevedo (7) argues that, from birth, social norms and guidelines influence individuals, and that the family, through diet and established food routines, should guide behavior in relation to food. This underlines the importance of the family as the first school where values and norms are learned and as a place where healthy eating habits are acquired.

Social networks have become a massive tool for connection, but they also expose children and adolescents to advertising that promotes unhealthy eating styles. In addition, the need to remain interconnected through mobile applications can have risks, such as disseminating misleading information and promoting unhealthy habits, negatively affecting the well-being of minors (8). As a place of education, the school plays a crucial role in promoting socially accepted behaviors and values. Several authors highlight the importance of developing programs to strengthen appropriate behaviors and promote healthy habits, taking advantage of children's time at school to implement motivating and sustainable didactic proposals (9,10).

This study aims to evaluate the impact of different educational strategies, based on the attitude change approach, on the knowledge and attitudes towards food of secondary school students and their families in Colombia.

METHOD

The research adopted a mixed exploratory and interpretative approach, integrating qualitative and quantitative evidence to study two realities in their natural context. The qualitative evidence focused on developing a didactic tool to assess attitudes toward eating habits. In contrast, the quantitative evidence was obtained through a questionnaire applied to parents to assess knowledge, attitudes, and family eating practices. According to Sampieri and Mendoza (11), this type of research combines qualitative and quantitative data analysis to provide a comprehensive perspective. The method used allowed the use of various analytical tools adapted to the context, facilitating a deep understanding of the problem and enriching the interpretations.

The study was based on a mixed sequential design with qualitative predominance, using the Nested or Dominant Model Concurrent Embedding (DIAC) method. This approach is crucial for exploring phenomena in depth and understanding experiences, behaviors and perspectives within specific contexts (12).

Procedure

Qualitative data collection began with obtaining informed consent from students, ensuring anonymous participation and confidentiality in accordance with the ethical principles of the Declaration of Helsinki (13). Qualitative data included interviews and focus groups with parents and students, exploring perceptions and eating behaviors.

Quantitative data collection involved 129 parents through a structured questionnaire on knowledge and food practices at home. A sample of 100 8th and 9th-grade students was randomly selected based on criteria of interest in natural sciences and time availability. IBM SPSS 29.0.0 software was used for statistical analysis, including ANOVA, to detect significant differences between groups.

Qualitative and quantitative results were integrated to provide an in-depth understanding of eating behavior, validated through data triangulation. This mixed approach allowed a comprehensive exploration of eating attitudes and practices, highlighting the importance of education and social context in forming healthy habits.

Sample

The information was analyzed and interpreted based on a sample of 100 students in the 8th and 9th grades and 129 parents (Figure 1) and the analysis of the statistics of the sample of students.

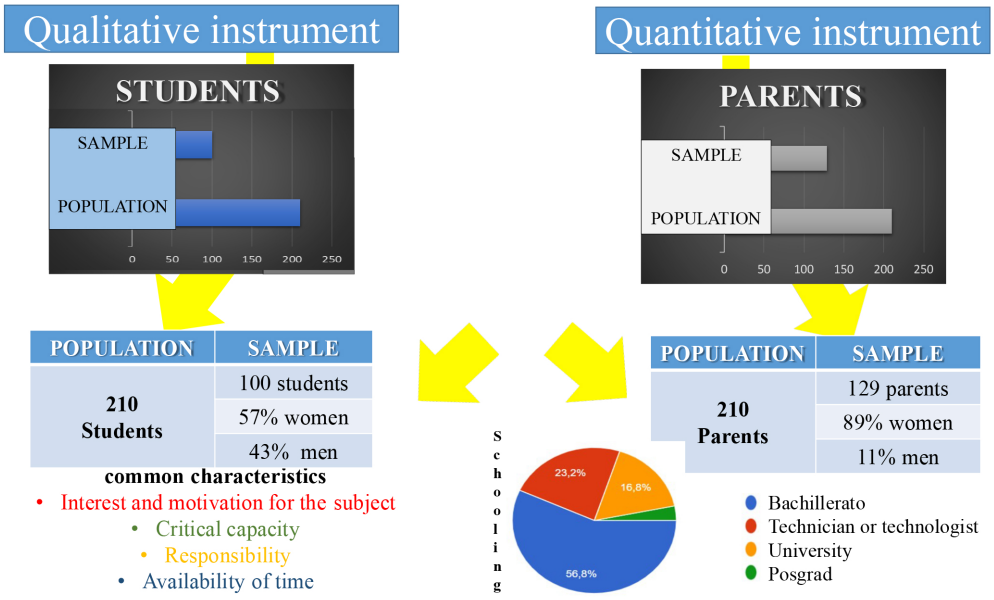


Figure 1. Characterization of the Population and Sample in the Qualitative and Quantitative Instruments. Note: own elaboration.

Initially, all 210 students from the selected grades were included. Then, 100 students were randomly selected (57 females and 43 males) who showed a high interest and motivation for the subject of natural sciences, in addition to meeting parameters such as critical capacity, responsibility, availability of time to participate in activities proposed inside and outside the institution, and sensitivity to the problems of their context.

As shown in Table 1, students were classified according to age from 14 to 16 (M= 15.2900, SD=0.82014).

As for the families, parents of students of the same grade and the same institution were openly and formally invited to participate in the survey, obtaining a total of 129 responses. Their participation made it possible to measure knowledge, attitudes, and eating habits in the home, providing information for analysis, exploration, representation, and prediction of certain characteristics for the generalization of results.

Table 1. Descriptive statistics of the age of 8th and 9th grade students.

		Frequency	Percentage	AGE Valid percentage	Cumulative percentage	Media	Standard deviation
Valid	14.00	23	23.0	23.0	23.0	15.29	0.82
	15.00	25	25.0	25.0	48.0		
	16.00	52	52.0	52.0	100.0		
	Total	100	100.0	100.0			

Note: Own elaboration based on SPSS results.

Instruments

Qualitative Instrument: Learning Units

A qualitative instrument was used in the form of learning units designed for 8th and 9th-grade students, focused on changing attitudes towards healthy eating habits. These units included metacognitive activities are structured in phases: approach, preconceptions, search, mobilization, structuring and reinforcement, and transfer. Metacognitive assessments were implemented to measure students' motivation and attitude changes (4).

Quantitative Instrument: Parent Survey

A quantitative survey was developed for parents of students of the same educational institution. The questionnaire entitled "Knowledge, Attitudes, and Family Eating Practices for Parents of School Children" consisted of 22 questions distributed in five sections: family environment, feeding practices, frequency of food consumption, school feeding, and parents' educational level. This instrument was validated and adapted regionally to ensure its comprehension and cultural appropriateness (14).

Result Analysis

Units of analysis were constructed for the qualitative instrument, allowing the qualitative data to be arranged and analyzed. Based on the students' responses, systemic networks were elaborated to model reality through data analysis.

The statistical treatment of the quantitative instrument was performed using IBM SPSS version 29.0.0 for Windows. For the descriptive analysis, categorical variables were presented as frequencies (n and %) and continuous variables with standard deviations (SD). The ANOVA analysis was used to assess the variance of the Body Mass Index (BMI) proposed by the students and to observe the nutritional status, allowing them to contrast different approaches and interactions between factors.

RESULTS

Students were assigned a code (E1-E100) for the learning units to specify their participation and facilitate the information analysis. Below are the categories that emerged from the elaboration of systemic networks based on the development of the phases of the learning unit, where feelings, concepts, and attitudes of the students were collected, thus supporting the processes of analysis and reflection of the proposed instrument. These categories, structured in the form of sentences, allowed triangulation between different instruments to validate the information:

1. Analysis and interpretation of the data from the approach phases and previous ideas

- Category: The student's cognitive structure as a vehicle for meaningful learning.
- Systemic network: Approach to disciplinary knowledge: nutritional table.

2. Analysis and interpretation of the data from the search phase:

- Category: The approach to disciplinary knowledge as a starting point for reflecting and recognizing new ideas.
- Systemic network: Exploration of new concepts: nutritional traffic light.

3. Analysis and interpretation of the data from the Mobilization phase:

- Category: Socio-cognitive conflict as a trigger for metacognition and attitude change.
- Systemic network: Confrontation of ideas: sugar.

4. Analysis and interpretation of the data from the Structuring and Reinforcement phase:

- Category: The consolidation of new mental structures acquired for the construction of learning.
- Systemic network: Relation of conceptual and methodological aspects of healthy eating: the heuristic use.

5. Analysis and interpretation of the data from the Transfer phase:

- Category: The acquisition of meaningful learning evidenced in the change of attitudes.
- Systemic networks: feeding habits: children's feeding behavior and knowledge projection: recent mental acquisitions.

The initial data collection during the learning unit allowed the creation of a systemic network to explore previous ideas, highlighting their relevance in the construction of new knowledge (Figure 2). Students' responses revealed diverse approaches toward the proposed activities, from external stimuli to reflections indicating a change in their thinking. Preconceptions about the nutritional table reflected the influence of the context and the educational process on their understanding. Subsequent analysis revealed a growing awareness of the quality of their food and the importance of nutritional information, suggesting a willingness to change behavior. However, it highlights the need for motivation and continuing education to generate a significant impact. The students' experience analyzing nutritional information led them to make comparisons and reflections based on their new knowledge, demonstrating metacognitive processes and autonomy in their learning.

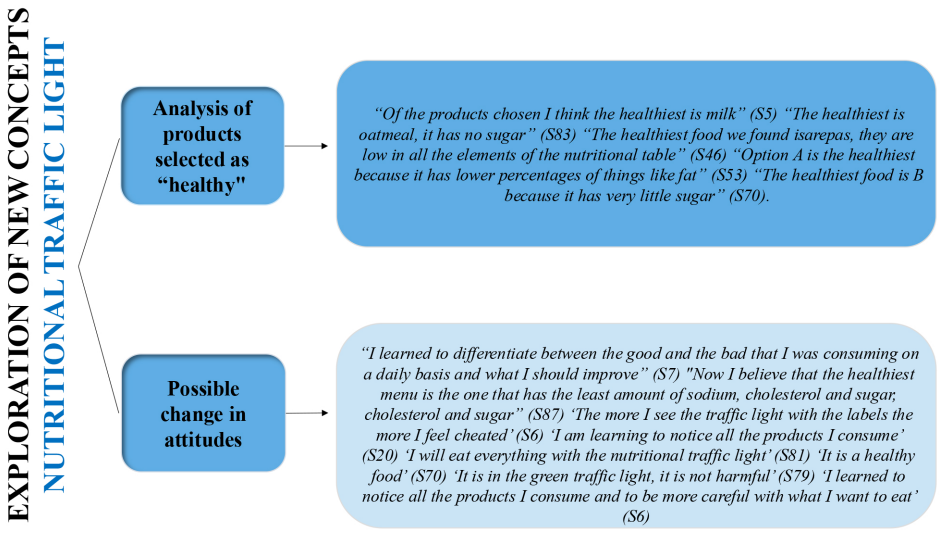


Figure 2. Approaching Disciplinary Knowledge as a Starting Point for Reflection and Recognition of New Ideas. Note: Systemic network extracted from the search phase according to the learning cycle. Own elaboration.

The heuristic Uve (Figure 3), designed for the structuring and reinforcement stage, was based on students' responses after understanding the functions of nutrients in the daily diet. These approaches demonstrate complex thinking by recognizing the importance of a healthy diet to prevent disease. The tool facilitates the understanding and structuring of knowledge about food, validating learning through testimonials highlighting awareness about the food consumed and the need to improve the diet to maintain health.

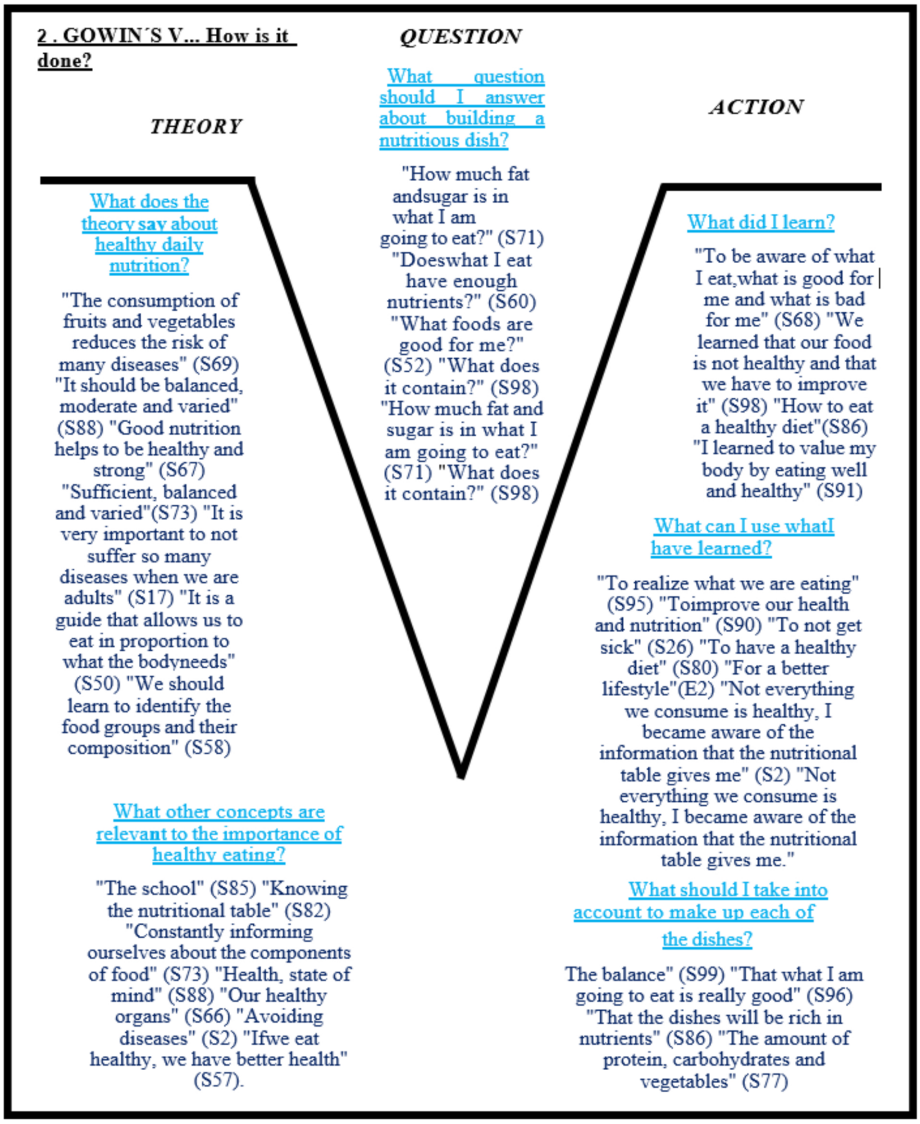


Figure 3. The consolidation of newly acquired mental structures for the construction of learning. Note: own elaboration.

The students highlighted the importance of balance, food quality, and consideration of nutrients when constructing a healthy dish, indicating a change in attitudes toward their own eating. The heuristic Uve, by promoting self-assessment and recognition of concepts related

to healthy eating, demonstrates its effectiveness in validating the learning acquired. The students' testimonies reflect a conscious understanding of the importance of a balanced diet to improve health and lifestyle, evidencing the metacognitive process of reflection and understanding of their own knowledge.

In the last phase of the learning cycle (Figure 4), students observed and described the eating habits of elementary school children, applying the concepts learned. Their estimates reflect an ability to transfer the knowledge acquired to new situations, by identifying harmful eating practices and their possible consequences. This change in attitudes toward food evidences significant learning, according to Ortiz et al. (15), which is achieved by linking new knowledge with what was previously learned, which implies processing recent information and adjusting perceptions and behaviors.

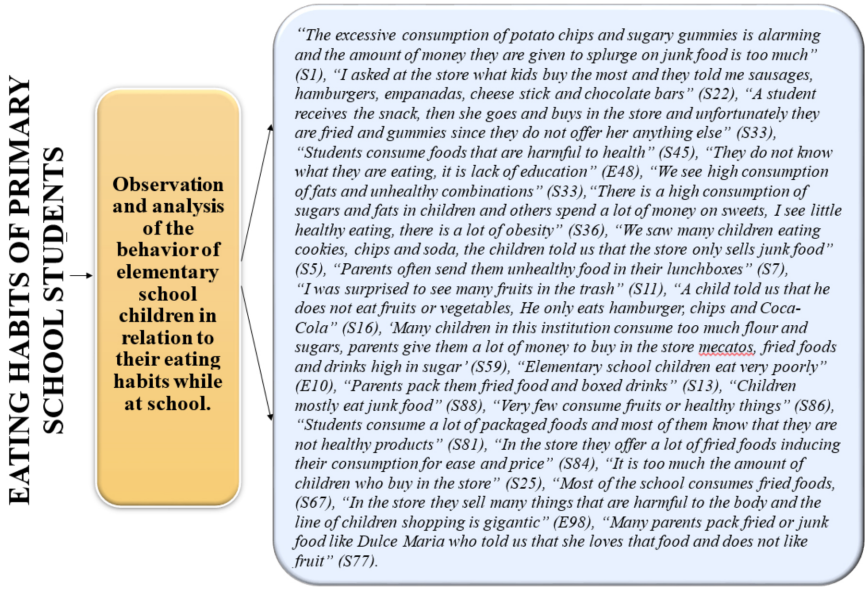


Figure 4. The Acquisition of Meaningful Learning Evidenced in Attitude Change. *Note:* Systemic network N. 1 extracted from the *transfer* phase according to the learning cycle. Own elaboration.

Using the qualitative instrument with metacognitive activities focused on nutrition proved to be a revealing and meaningful strategy for student learning (Figure 5). Activities such as the observation run, recognition of prior knowledge, analysis of the nutritional table, interpretation of graphs, and creation of healthy dishes, among others, clearly led to meaningful learning acquisition. Students took control of their learning through formative assessment tools at the end of each phase of the learning cycle.

From a constructivist perspective, the development of this didactic tool not only oriented the problems of the environment but also facilitated strategies to acquire knowledge in a comprehensive manner. A significant impact on learning was observed, where students managed and applied the knowledge acquired to benefit other members of the educational community, especially in the diagnosis and intervention proposals on eating habits in elementary school.

Transfer of recent mental acquisitions	**What were the most relevant aspects of the observation carried out in the primary school?**	*"It was weird because none of them ate healthy, in the lunch box they bring very bad things to eat" (S1)* *"That the elementary school children ate in a very bad way" (S37)* *"That they consume high fats and sugars increasing the rate of diabetes or death" (S22)* *"Most of the children prefer to eat things that are not so healthy" (S88)* *"Bad, some children throw away the food they don't like" (E89)* *"That many foods we eat have things that are harmful to our health" (S31)* *"Most foods are bad for our health" (S51)* *"The truth is that everyone eats junk food that mom packs" (S83)* *"The lack of knowledge of children about what they eat" (S69)* *"In the store they only sell to drink malt" (S8)*
	How did you feel in the role of observer?	*"I felt good because I could see the children's behavior" (S38)* *"I feel a duty to make the children aware" (S2)* *"Good, we interact with the children and teach them a little bit of what we know" (S67)* *"We feel concerned about the poor nutrition they have" (S50)* *"Puzzled to see that very few children are well encouraged" (S8)* *"I felt horrible, these children will die faster" (S91).*
	Do you consider it important to apply didactic strategies to improve children's eating habits?	*"Yes because through activities they can learn more and have more fun" (S98)* *"Yes because the didactic strategies allow greater participation and interest in the subject" (S43)* *"Yes because children prefer to do interactive activities because in this way they learn more easily" (S87)* *"Yes because children and most young people are interested in the didactic activity" (S81)* *"Yes, because children learn more easily with different playful activities that attract their attention" (S80)* *"Yes, because with didactic strategies they would learn about nutrition" (S61)* *"Yes, so that they do not suffer from diseases" (S7)* *"Yes, because this is the best way for children to learn and understand about their nutrition" (S73)*
	What activities would you propose for elementary school students to learn more about the importance of healthy eating?	*"Playful games or create an app about food" (S40)* *"We would make a fruit game for children to learn more" (E19)* *"Didactic talks, create healthy food businesses" (S24)* *"Show them in a fun way the large amounts of sugar they consume' (S11)* *"A food health brigade' (S27), "Talks for parents' (S52)* *"Make a fair to give them a taste of healthy food dishes' (S72)* *"Summon parents to healthy parenting schools' (S99)* *"I would implement healthy breakfasts, (S1), "I would give a talk to the children and also to the parents, to help them become aware of what children really need to eat well" (S28)*

Figure 5. Metacognitive Processes from Observation. Note: Systemic network N. 2 extracted from the transfer phase according to the learning cycle. Own elaboration.

The increase in students' motivation and interest prompted a positive change in their attitudes, improving their performance and promoting objective postures towards the activities and proposals of the learning unit. This theory is reinforced by the liking and fascination shown by the students towards the activities performed and the successful application of what they learned in different daily contexts.

These results show how the metacognitive and participatory approach to teaching can improve individual learning and positively impact the educational community, highlighting the effectiveness of pedagogical strategies focused on nutrition and attitude change.

As for the survey with families, 129 parents participated, who answered a survey divided into 22 questions grouped into 5 categories related to family eating habits:

1. Knowledge about food (questions 1-8).
2. Eating habits at home (questions 9-13), key to recognizing healthy eating.
3. Frequency of consumption of certain products (question 14), as a trigger for eating habits.
4. Feeding children and/or adolescents from home (questions 15-21), determinant for food security.
5. Parents' level of schooling (question 22).

These categories were analyzed using SPSS software, version 29.0.0 for Windows, using analysis of variance (ANOVA), which allowed us to identify the most important results and better understand the information obtained.

First category: Knowledge about food

Regarding the first category, only 13 of the 129 respondents were unaware of the properties of some food groups. More than 50 % of respondents strongly agree that fruits and vegetables contain fiber and antioxidants that benefit health. 89.4 % agree and strongly agree that the properties of

dairy products are beneficial for teeth and bone health. Interestingly, 21.7 % of parents believe saturated fats are good and should be consumed. These results indicate a positive trend in parental recognition of certain food groups, although some erroneous beliefs about other food components persist.

Second Category: Eating habits at home

In the second category, 89.2 % of respondents share mealtimes as a family, 69 % report having food standards at home, and 45 % prepare the three main meals of the day at home. This suggests that food is still prepared at home, which could decrease the risk of excessive consumption of sugars, sodium, and saturated fats, evidencing the existence of traditional behaviors within the home.

Third category: Frequency of consumption of certain products

For the third category, the survey reveals that families maintain a balance in their consumption of proteins (chicken and meat) and fiber, vitamins, and minerals (fruits and vegetables). However, products such as white bread, whole milk, and industrial beverages with high sugar levels also have a high frequency of consumption, which could represent a risk of altering normal sugar levels.

Fourth category: Feeding children and/or adolescents from home

The fourth category, focusing on children's home food security, observes significant accompaniment. A high percentage of households (81.4 %) report that the mother prepares the food, which suggests better food handling, greater balance between food groups, and better cooking practices. In addition, 86.8 % of students receive breakfast at home, 89.9 % lunch, 94.6 % dinner, and 45.7 % snack. These percentages reflect that students eat at home and have adequate accompaniment.

Fifth category: Parents' level of schooling

Regarding the parents' level of schooling, it was found that more than 70 % have only basic education. This could be of concern when analyzing whether mothers, recognized as the main generators of eating habits, have sufficient knowledge to promote a healthy and balanced diet.

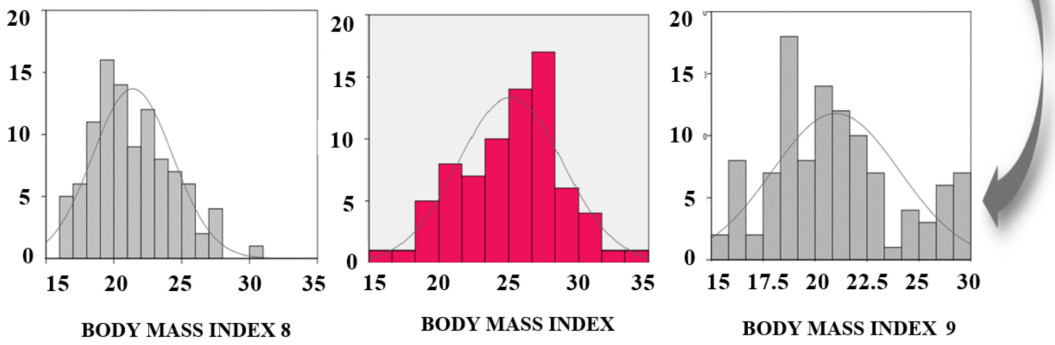
In addition, in the quantitative part, the ANOVA statistical analysis was used to compare and determine significant differences in the Body Mass Index (BMI) of students in grade 3 of primary school and grades 8 and 9 of secondary school (Figure 6), following the protocol of the World Health Organization (16). Assessing nutritional status allows for measuring the quality of life of populations, drawing a nutritional profile, and taking necessary actions to improve health, as suggested by Da Silva (17).

In the 8th grade, the ANOVA analysis showed that the variance within groups was 684.308, while the variance between groups was 1.71, with a significance value ($p = 0.358$). This indicates that most values are concentrated in a high peak, with a BMI between 18 and 22, corresponding to normal weight, showing a leptokurtic kurtosis distribution, that is a distribution when the degree of pawedness is greater than 3. There was only one case of Type I obesity, which suggests that the differences observed are not statistically significant and could be random.

In the 9th grade, the variance within groups was 548.057 and the variance between groups was 124.154, with a significant value ($p = 0.049$). Although a mesocurtic kurtosis was observed (mesokurtic when the degree of peakedness is equal to 3), identifying a normal concentration of values around its measurement, the data are more dispersed in a smaller range between underweight and overweight. There were no cases of obesity, but there were more cases of underweight, which could be related to a tendency to eating disorders due to the age of the students, as indicated by Behar and Marín (18) and Fernández et al. (19).

In the 3rd grade, the variance between groups was 865.819, greater than the variance

ANOVA						
		Sum of squares	Gl	Quadratic mean	F	Sig.
BMI Grade 8	Between groups	1.705	3	.568	.059	.981
	Within groups	684.308	71	9.638		
	Total	686.013	74			
BMI Grade 9	Between groups	124.154	3	41.385	5.361	.002
	Within groups	548.047	71	7.719		
	Total	672.201	74			
BMI Grade 3	Between groups	865.819	3	288.606	118.226	.000
	Within groups	173.320	71	2.441		
	Total	1039.139	74			



Note: Graphical information extracted from the SPS program. Body Mass Index of the students.

Figure 6. Body Mass Index of the students participating in the study.

within groups, which was 173.320, with a significance value (p = 0.002). This indicates a marked difference between the measures, with a leptokurtic kurtosis showing a large concentration of students with a BMI greater than 25, corresponding to being overweight and obese. Cases of Type II and Type III obesity were observed, as well as some instances of underweight.

These results are consistent with the observations of high school students on elementary school children, indicating that the nutritional situation could be worsening. The influence of advertising media and social networks seems to shape eating behavior patterns, especially among children and adolescents. In addition, parents' low level of education could significantly affect the eating behavior of children and adolescents, highlighting the need for educational and public health interventions to improve child nutrition.

DISCUSSION AND CONCLUSIONS

The present study explored the integration of nutrition-focused teaching strategies and their effects on parents' and students' attitudes toward food.

The results indicate that the didactic strategies focused on metacognitive nutrition-related activities effectively guided meaningful learning. The incorporation of elements such as observing prior knowledge, analyzing nutritional tables, and creating healthy dishes facilitated students' not only acquisition of knowledge but also application of it in a practical way (20). This constructivist approach, supported by the literature (21), stresses the importance of a holistic education that allows students to manage their own learning process and apply knowledge in real situations (22).

The study revealed an urgent need for intervention due to the unhealthy eating patterns observed among students, including elevated consumption of sugary drinks and processed foods. This finding reflects similar concerns in the National Survey of Nutritional Status in Colombia (3), highlighting the increasing prevalence of childhood obesity and its implications for public health. Educational and public health policies must be adapted to include more robust guidelines that promote healthy eating habits from an early age, involving both educational institutions and parents (23,24).

Implementing a learning unit focused on motivation and metacognition effectively generated interest and motivation among students. They actively participated in hands-on activities that allowed them to understand complex nutritional concepts and reflect on their own eating habits. This approach facilitated contextualized and meaningful learning aligned with students' interests and needs, which is crucial for the long-term success of any educational intervention, as other work has previously indicated (25-27).

Finally, the learning unit positively modifies students' attitudes toward healthy eating. Through structured activities encouraging reflection and critical thinking, students adopted more proactive and conscious stances regarding their food choices. This change in attitudes not only promotes healthy habits at the individual level but also strengthens the cognitive foundation for ongoing, adaptive learning. Educational interventions can positively influence attitudes and behaviors related to healthy eating, highlighting the importance of structured activities that encourage reflection and critical thinking. Furthermore, they provide evidence on how these changes can strengthen students' cognitive base for continuous and adaptive learning in the nutritional health domain (28-30).

Therefore, this study provides substantial evidence of the effectiveness of specific educational strategies in promoting healthy eating habits among students. However, it also highlights the need for continued commitment on the part of educational and health policies to maximize the impact of these interventions on the nutritional well-being of the youth population.

This type of discussion not only reflects the study's key findings but also places these results in the broader context of educational and nutrition research, emphasizing the importance of integrating theory with practice to achieve significant changes in eating behavior.

Despite the positive results obtained, this study has several limitations that should be considered. First, the sample was limited to a single educational institution in an urban setting, which could limit the generalizability of the findings to other populations and contexts. It would be advisable to replicate the study in different geographic regions and types of educational institutions to assess the applicability of the strategies in diverse cultural and socioeconomic contexts. In addition, the eating attitudes and behaviors assessment was mainly based on self-reports and perceptions, which may introduce biases such as overestimating adherence to healthy habits. Future research could benefit from mixed methods that combine self-reported data with objective measures of dietary intake to gain a more complete and accurate understanding of students' dietary patterns. In addition, further research could explore the long-term impact of educational interventions on other aspects of student well-being, such as academic performance and emotional health, as well as investigate how to engage parents in nutrition education programs more effectively. These areas represent important lines of future research that could further strengthen the effectiveness of educational interventions in promoting healthy eating habits and overall student well-being.

It is crucial to highlight the fundamental connection between education and health as a catalyst to promote healthy habits from an early age. This study has delved into analyzing students' attitudes towards food, highlighting the importance of understanding how educational environments influence dietary decisions and, therefore, health in general (22,31). Detailed investigation of these attitudes provides fundamental data that can guide the design of effective educational interventions that promote balanced eating and contribute to the well-being of students and their families.

Understanding attitudes towards food not only identifies areas for improvement in eating

habits but also facilitates the implementation of tailored pedagogical strategies that promote positive and sustainable changes in eating behavior. Integrating these initiatives within the educational context strengthens students' ability to make informed and healthy choices, thus creating a long-term positive impact on their health and quality of life.

Consequently, collaboration between the educational and public health spheres is essential to develop policies and programs that educate and empower future generations with the skills and knowledge necessary to maintain a balanced and healthy diet. This comprehensive approach benefits the individuals directly involved and contributes to society's collective well-being and prevention of diet-related diseases.

To explicitly address the practical translation of the study findings from a holistic approach, it is necessary to propose strategies to promote healthy eating in different key contexts, such as the family, school, and public health. In the family context, it is recommended that workshops and activities be conducted that encourage the active participation of parents, educating them about the importance of a balanced diet and their direct influence on their children's eating habits. In the school context, it is essential to integrate cross-curricular education programs that include healthy eating content in different subjects, thus facilitating continuous learning that applies to students' daily lives. Finally, from a public health perspective, it is crucial to develop awareness-raising campaigns and public policies that involve the whole community in promoting healthy eating habits, focusing on reducing the consumption of ultra-processed foods and sugary drinks. These strategies need to be aligned and coordinated to have a positive and sustainable impact, ensuring that students, families, and the wider community adopt healthy eating habits.

REFERENCES

1. World Health Organization. Healthy eating throughout life prevents malnutrition and non-communicable diseases. Geneva: World Health Organization; 2017. Disponible en: https://www.who.int/tools/elena/interventions/fruit-vegetables-ncds
2. Echandi MD. Food and nutritional security: beyond the economic, a pillar of human and local development. Ambientico. 2021;(277):15-23.
3. National Planning Department. National Development Plan 2014-2018: All for a new country. Bogotá: National Planning Department; 2015. https://www.dnp.gov.co/PND/PND2014-2018.aspx
4. Soussan G. Teaching experimental sciences: didactics and training. OREALC/UNESCO; 2003.
5. Ingelmo RMG, Litago JDU, Alonso FG. Promoting healthy eating in childhood and adolescence to fulfill children's rights. South Fla J Dev. 2021;2(2):2229-2240.
6. Acosta J, Gómez M, Pérez L. The family as the first school of formation [Thesis, Universidad Católica de Oriente, Colombia]. Repositorio Institucional Universidad Católica de Oriente. 2019. https://hdl.handle.net/20.500.13064/183
7. Quevedo Bolívar PA. A má nutrição: mais além das deficiências nutricionais. Trabajo Social. 2019;21(1):219-239.
8. Díaz-Plaza MDD, Novalbos-Ruiz JP, Rodríguez-Martín A, Santi-Cano MJ, Belmonte-Cortés S. Social networks and cyberbullying in eating disorders. Nutrición Hospitalaria. 2022;39(spe2):62-67.
9. Ensaff H, Altieri E. "Little pushes" to promote healthy eating in schools: guidance document. J Nutr. 2022; 35(2).
10. González Céspedes L, Fretes G, Ríos P, Estigarribia G, Viveros G, Aguilar G, et al. Design of a multi-component randomized controlled community-based study for obesity prevention in school children: Research protocol. Span J Hum Nutr Diet. 2020;24(4):389-397.
11. Sampieri RH, Mendoza IG. Research methods. 7th edition. McGraw-Hill Education; 2018.
12. Hernández R, Fernández C, Baptista P, Baptista M. Research methodology. 6th edition. New York: McGraw-Hill Education; 2014.
13. World Medical Association. World Medical Association Declaration of Helsinki: Ethical principles for medical research involving human subjects. JAMA. 2013;310(20):2191-2194.
14. Lera R, Fernández M, García J, López P. Knowledge, attitudes and family eating practices for parents of school children. 22-item questionnaire. [Unpublished instrument]; 2018.
15. Contento IR. Nutrition education: linking research, theory, and practice. Asia Pac J Clin Nutr. 2008;17(Suppl 1):176-179.
16. Corvalán C, Garmendia ML, Jones-Smith J, Lutter CK, Miranda JJ, Pedraza LS, et al. Nutrition status of children in Latin America. Obes Rev. 2017;18(Suppl 2):7-18.

17. Da Silva LS, Franco DS, Linhares AO, Gigante DP. Nutritional status classification of preschoolers enrolled in a public and private school in the city of Pelotas- RS. RBONE. 2021;15(95):608-617.
18. Deci EL, Ryan RM. The "what" and "why" of goal pursuits: Human needs and the self-determination of behavior. Psychol Inq. 2000;11(4):227-268.
19. National Planning Department. National Development Plan 2014-2018: All for a new country. Bogotá: National Planning Department; 2015. https://www.dnp.gov.co/PND/PND2014-2018.aspx
20. Dweck CS. Mindset: The new psychology of success. New York: Random House; 2006.
21. Díaz Amador Y, Da Costa Leites Da Silva L. Characterization of eating habits and nutritional status of preschoolers. Cuban J Nurs. 2019; 35(2).
22. Diaz Centeno G. Maternal knowledge about healthy eating habits and excess malnutrition in preschoolers of an Educational Institution of Surco - 2017. San Ignacio de Loyola University. 2019.
23. Hall KD, Ayuketah A, Brychta R, Cai H, Cassimatis T, Chen KY, et al. Ultra-Processed Diets Cause Excess Calorie Intake and Weight Gain: An Inpatient Randomized Controlled Trial of Ad Libitum Food Intake. Cell Metab. 2019; 30(1):67-77.e3.
24. Hattie J, Timperley H. The power of feedback. Rev Educ Res. 2007; 77(1):81-112.
25. Colombian Institute of Family Welfare (ICBF). National Survey of the Nutritional Situation (ENSIN) 2015. Bogotá, Colombia; 2015.
26. World Health Organization [WHO]. Obesity and overweight. Fact sheet N.311. 2015.
27. Perry CL, Williams CL, Komro KA, Veblen-Mortenson S, Stigler MH, Munson KA, et al. Project Northland: long-term outcomes of community action to reduce adolescent alcohol use. Health Educ Res. 2002; 17(1):117-132.
28. Rosenkranz RR, Dzewaltowski DA. Model of the home food environment pertaining to childhood obesity. Nutr Rev. 2008; 66(3):123-140.
29. Sampieri RH, Mendoza M. Research methods. 7th ed. New York: McGraw-Hill Education; 2018.
30. Tuero CC, Zagalaz JC, Sánchez MLZ, de Mesa CGG. Knowledge and interests about healthy eating habits and physical activity practice. A study with adolescent population. Aula Abierta. 2018; 47(2):211-220.
31. World Health Organization. Growth reference data for 5-19 years. World Health Organization; 2015.