

**THE TEACHING OF SCIENCE AND THE TEACHING OF  
PORTUGUESE: A STUDY WITH A PRIMARY EDUCATION CLASS**

**ENSINO DAS CIÊNCIAS E ENSINO DO PORTUGUÊS: UM ESTUDO  
NUMA TURMA DO 1.º CICLO**

**ENSEÑANZA DE LAS CIENCIAS Y ENSEÑANZA DEL PORTUGUÉS:  
UN ESTUDIO EN UN CURSO DE EDUCACIÓN PRIMARIA**

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**SUMMARY:** The teaching of science and the teaching of Portuguese can be articulated, especially as to what regards the first years of schooling, where mono-teaching prevails. This study was carried out with a primary education class and the objective was to combine the teaching of science and the teaching of Portuguese through a children's book that pointed to the topic of food education. The methodology used was case study. Given the intervention performed, however, features of the action research methodology were also included. The results point to a very positive work in the articulation between the teaching of science and the teaching of Portuguese, as it enabled students to mobilise knowledge and languages from both fields simultaneously.

**Key-words:** Teaching of science. Teaching of Portuguese. Curriculum articulation. Food education. Children's literature.

**RESUMO:** O ensino das ciências e o ensino do português podem ser articulados sobretudo quando falamos dos primeiros anos de escolaridade, onde encontramos o regime de monodocência. Este estudo foi realizado numa turma do 1.º ciclo e o objetivo foi aliar o ensino das ciências e o ensino do português através de uma obra de literatura infantil que apontava para a temática da educação alimentar. A metodologia utilizada foi o estudo de caso, mas dada a intervenção efetuada partilhou características de uma investigação-ação. Os resultados apontam para um trabalho muito positivo na articulação entre o ensino das ciências e o ensino do português, pois possibilitou aos alunos a mobilização de conhecimentos e linguagens destas áreas em simultâneo.

**Palavras-chave:** Ensino das ciências. Ensino do português. Articulação curricular. Educação alimentar. Literatura infantil.

**RESUMEN:** La enseñanza de las ciencias y la enseñanza del portugués pueden ser enseñando conjuntamente cuando hablamos de los primeros años de escolaridad, donde encontramos un régimen de monodocencia. Este estudio fue realizado en un curso de educación primaria y el objetivo fue aunar la enseñanza de las ciencias y la enseñanza del portugués a partir de una obra de literatura infantil, cuya temática estaba relacionada con la educación alimentaria. La metodología utilizada fue el estudio de caso, si bien la intervención efectuada está relacionada con características propias de una investigación-acción. Los resultados apuntan a que se trató de un trabajo positivo en relación a la enseñanza de las ciencias y la enseñanza del portugués, ya que permitió a los estudiantes movilizar conocimientos y lenguajes de estas áreas de forma simultánea.

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**Palabras clave:** Enseñanza de las ciências;. Enseñanza del português. Articulación curricular. Educación alimentaria. Literatura infantil.

## Introduction

Although the teaching of science and the teaching of Portuguese are seemingly distant, there are certainly moments in which they can meet. Physically, these moments are determined, at the starting stages of education at least, by the mono-teaching scheme; conceptually, we can find circumstances in which concepts, content, methodologies and pedagogical resources can coexist from a holistic point of view. Galvão (2006) states that

Science and literature have specific languages and methods, but they both benefit from mutual interaction, and people benefit when they understand the different readings both approaches allow them to make (GALVÃO, 2006, p. 36).

Galvão (2006) also points out that there are well-defined barriers in Portugal between the teaching of science and the teaching of Humanities. These barriers continue to be perpetuated to this day by a mono-disciplinary teacher training. Although the training of nursery school teachers and primary school teachers favours mono-teaching, Portuguese Decree-Law 79/2014, of May 14, which outlines this training and provides its regulatory framework, continues to show this logic of compartmentalisation between science and Humanities. It greatly privileges the area of teaching, dividing it in the following domains, isolated from each other: Portuguese, Mathematics, Natural Sciences and History and Geography of Portugal.

On the other hand, society tends to devalue humanities, and a certain stereotype prevails regarding this area of knowledge. Amaral (2014) declares the uncertainty, today, surrounding "Humanities and the role we assign them in a technocratic society, in which everything seems to be required to have practical utility, that is, to serve to something" (AMARAL, 2014, p.2), making it certainly more difficult to establish bridges, alliances with apparently more useful areas, such as science.

Despite these findings and reflections, we find studies and pedagogical experiences that seek to make the curriculum more flexible, articulating, in this case, the experimental teaching of science with the teaching of the mother tongue (AUTHOR; AUTHOR, 2008; AUTHOR; AUTHOR, 2009; EUGENIO; SUÁREZ, 2018). In the

studies mentioned above, the objective of this curriculum articulation is to “work with students [...] the story as a resource to teach natural sciences” (EUGENIO; SUÁREZ, 2018, p. 4), never forgetting the competences to be developed in connection with the teaching of the mother-tongue.

The study we present here was carried out with a 2nd-year class of primary school and focused on the topic of food education. Besides other several specific objectives (to be discussed later in this article), the main goal of this study was to combine the teaching of science and the teaching of the Portuguese language using a children's literature book.

This article is divided into different parts. In the first one, we take stock of the possibility of articulating the teaching of science and the teaching of the Portuguese language, at school and in the classroom, having as focal point the issue of food education. In the second part, we present the study carried out, the supporting methodology, and the instruments used for data collection, together with an analysis and a discussion of the data collected. We finish with the conclusion and the bibliographical references.

### **Teaching Science and Teaching Portuguese - the connection is possible**

#### ***Continuing Training Programmes - Experimental Teaching of Sciences and Teaching of Portuguese***

This reflection is based first and foremost on the implementation of continuing training programmes in primary education - more specifically in the field of experimental science teaching and Portuguese language teaching - an initiative of the then Directorate-General for Innovation and Curriculum Development (DGIDC) of the Portuguese Ministry of Education, in partnership with several Portuguese higher education institutions. These continuing training programmes took place between 2006 and 2010 and left an interesting mark on the Portuguese educational system, which translates not only in a large set of brochures for teachers, still used in schools today, but also in teachers' pedagogical practices. At higher education level, these brochures remain as an active bibliographical reference in the training of teachers, and academics/researchers continue to introduce theories and to conduct research as a result

of these ongoing training programmes (SILVEIRA, 2011; PINTO; REIS, 2012; PEREIRA; BRAGA; GONZÁLEZ, 2015; GONÇALVES, 2016; GANDUM, 2017).

The goal of the *Programa de Formação Contínua do Ensino Experimental das Ciências* [Continuing Training Programme for Experimental Science Teaching] was to improve teachers' methods in this field. The programme was geared to developing classroom activities, based on a theoretical framework in line with the research carried out in the Science Education area. Accordingly, the purpose was to bring about an improvement in students' training and its impact on their scientific literacy, so that, as future citizens, they could better understand socio-scientific issues or even opt for scientific areas based on informed decisions.

The programme's organising principles suggested an understanding of training as a process of teacher development, within a framework of appreciation and understanding of the processes of change aiming improvement, involving a dialectic between research and educational action. This resulted in objectives aimed at the innovative intervention of teachers in the teaching of science; the construction of pedagogical knowledge; the connection with the curriculum of the subsequent learning levels; the exploration of didactic situations with an experimental basis; the promotion, production, implementation, and evaluation of this type of activities; and the development of attitudes of interest and appreciation for science and its teaching (MARTINS; VEIGA; TEIXEIRA; VIEIRA; VIEIRA; RODRIGUES; COUCEIRO, 2006).

In this continuing training programme, teachers could cover a total of six basic subjects in the field of experimental science teaching in a two-year cycle or they could choose to attend only one subject. Each topic was approached according to a script, which was provided to the trainee, and the six subjects were evenly distributed between the two years of the programme.

The subjects were first introduced to the teachers in small groups and were then followed up in class. The different subjects were related to the curriculum of the *Programa de Estudo do Meio no 1.º Ciclo* [Social and Environmental Studies Area in primary education], but they were presented as external modules that were included both in the global context of the *primary education curriculum* and in the broader *primary education natural sciences curriculum*.

The intended goal was that teachers would thus learn about the national curriculum's guiding lines, which resulted from research in the Science Education field,

and appropriate their main sociocultural and methodological frameworks to transplant them into the classroom (MARTINS; VEIGA; TEIXEIRA; VIEIRA; VIEIRA; RODRIGUES; COUCEIRO, 2006).

What was, therefore, at stake was the valorisation of science teaching and learning in this first phase of schooling, due to the importance it has always had in society, so influenced by science and technology.

Regarding the teaching of Portuguese, and also as an initiative of DGIDC, the National Portuguese Teaching Programme (PNEP) emerged as part of the continuing training of teachers in this area of primary education. This programme was created by Order No. 546/2007 as a response to priority objectives of the 17th Constitutional Government's educational policy. These objectives included improving the conditions for the teaching and learning of the Portuguese language and enhancing the skills of teachers in this subject area.

The goals of this national programme were to improve the levels of reading comprehension, as well as oral and written expression in primary education, in an estimated period of time of 4 to 8 years, through the alteration of teaching practices.

It should be noted that this Ministerial Order established that the PNEP should also cover preschool education, through the association of preschool education professionals with the activities to be developed within the programme. This revealed not only a true articulation between the different learning stages, but also affirmed the vital importance of fostering literacy practices for the learning of reading and writing.

In this programme, teacher training was centred around inter-school groupings, aiming at the use of methodologies and strategies for Portuguese teaching focusing in the classroom.

There was close collaboration between the PNEP and the National Reading Plan (PNL). Not only did the choice of resident PNEP trainers focus on groups that were already part of PNL (through established protocols between municipalities and the PNL), but the training actions promoted were also supposed to address the eventual connections and articulations between the PNL and the teaching and learning of the written language, in particular.

This intended strong articulation between the PNL and the PNEP fostered a more systematic view of children's literature by teachers. Thus, as an indication of PNL reinforced by PNEP trainers, teachers were supposed to promote one hour per day of reading and book-centred activities in the classroom. From the many classes we

observed, we were able to infer these books were overwhelmingly children's literature's works.

This continuing training programme aimed at enhancing the teaching and learning of Portuguese in its multiple competences, given the importance, for the academic and personal success of students, of a thorough and complete mastery of their native language.

### ***Food Education and Children's Literature in Interface***

Having as backdrop the continuing education programmes mentioned earlier, the choice of the topic to be developed in this empirical study - food education - originated from the fact that food and nutritional issues are present in the curriculum of the different parts of our education system, starting in pre-school education. For that matter, the document concerning the *Aprendizagens Essenciais para o Estudo do Meio*["Essential Learning for Social and Environmental Studies"] (2018a), in the first year of schooling, states the following orientation in the field of Nature:

The student should acquire the capacity to: Identify the factors that contribute to the individual and collective well-being, both physically and psychologically, developing daily personal hygiene routines and hygiene routines concerning food, clothing and the usage of collective spaces. (PORTUGAL, 2018a, p. 6).

According to Oliveira, Netto-Oliveira, Rosaneli, Manfrinato, Nakashima and Auler (2008), adequate dietary decision-making is one of the main ways to promote health, and habits that develop during childhood will influence preferences, consumption and choices throughout life.

Health education understood as such implies the preservation of individual and collective health. It consists in the promotion of knowledge, attitudes and values that help children and young people make choices and decisions that promote their health and well-being at a physical, social and mental level, as advocated by the Portuguese Ministry of Education, based on the notion of health put forth by the World Health Organisation (WHO, 1946).

The concern of the Portuguese government with this issue is evident in the initiatives that have been taken regarding public school, of which we will highlight just a few. The *Programa Nacional de Combate à Obesidade*[National Obesity Prevention

Programme] has been in operation since 2005. It is an initiative of the Ministry of Health in articulation with the Ministry of Education, which in 2006 issued and sent to schools a reference brochure (BAPTISTA, 2006). This document clarifies, for example, which foods should or should not be provided to students in school cafeterias. It is worth noting that the *School Fruit Scheme Programme*, established in the framework of the European Union and implemented under Ordinance no. 1242/2009, of October 12, aimed at the distribution of fruit to primary education students. Its objectives were to contribute to the promotion of consumption habits regarding foods beneficial to the health of younger populations” (PORTUGAL, 2009, p. 7479). In the school year 2011-2012, the project *A Minha Lancheira* [My Lunch Box] was launched within the framework of the *Programa Regional do Alentejo para a Promoção da Alimentação Saudável* [Alentejo's Regional Programme for the Promotion of Healthy Food]. Its objective was to raise awareness among primary education students and their parents to healthy school snacks, promoting foods like bread, milk, yoghurt, and fruit, while discouraging sweets, salty snacks, and soft drinks. In 2012, the Ministry of Health launched the *National Programme for the Promotion of Healthy Eating*, aiming at improving the nutritional state of the Portuguese by promoting adequate daily food consumption. Although all these programmes promoting food education are still in force, not all is done. It was necessary to wait until 2019 for the *National Programme for Healthy Eating* to reach pre-school education, promoting the distribution of fruit and vegetables in children's snacks at this initial stage of education.

The change in dietary habits, resulting from the major socio-economic, technological, biotechnological, population and family changes that modern societies have undergone, has favoured an "obesogenic environment" (TOJO; LEIS, 2003, p.172), with a large-scale offer of foods of low nutritional value and high energy density, which enjoy great social acceptance. This, coupled with the decline in the use of more traditional styles of food preparation and the sedentary trend among the population, has contributed to the increase in obesity rates in Portugal and other Western countries. The obesity epidemic, which has been recognised since 1998 by the World Health Organisation (WHO, 1998), leads to an increase in the morbidity and mortality rate of the population, especially when it begins in childhood and extends through adulthood.

Here, prevention appears as the major tool to try to reverse the situation, acting early and consistently, trying to ensure the curriculum, the school's food supply and the

children's reference adults are all aligned. A balanced diet, however, can differ greatly depending on the social and cultural context, and it can be made up of very different foods, as long as it contains the adequate amount of nutrients, in the adequate proportion. But nutrients are more than biochemistry: they're are also expressions of our social and cultural identity. Following in this line, the *Mediterranean Diet* has been promoted in recent years in Portugal. It was raised to *Intangible Heritage of Humanity* in 2010 and it is characterised by a high consumption of fruits, vegetables and fish and a particular way to prepare food, using olive oil and favouring spices and herbs over salt. In this way, the social and cultural identity of a region is associated with a diet which, in the case of the *Mediterranean Diet*, has been shown to have enormous health benefits.

The system of mono-teaching, in force in primary education in Portugal, facilitates the systemic approach of these issues. During this teaching stage, the same teacher, in the same class, addresses science and Portuguese language subjects that do not necessarily have to exclude one another, if we understand that science and the mother tongue can be the object of a globalising perspective. Here we have built the bridge between science and Humanities, a field where children's literature can allow the students' contact with the world, with their culture and other cultures, and with problems, discovering new meanings and interacting with scientific content in a playful way.

As to what regards the *Aprendizagens Essenciais para o Português* [Essential Learning for Portuguese](2018b), the fields of reading and literary education point to story-reading and to the importance of "students becoming familiar and contacting with reference literature on a daily basis" (PORTUGAL, 2018b, p. 3). We believe that children's literature is another pedagogical resource available to primary education teachers. This literary genre has not only a playful function and an aesthetic function, but also a formative function. In fact, in these age groups, children's literature allows children to be in touch with humour, a world of wonder, and the playful uses of language, which enable linguistic and literary games, often marked by irreverence and unpredictability. Children's literature is also an aesthetic object. It allows the child to interact with other languages - the literary language and the visual language -, which diverge from stereotypes and present children with another way of looking at reality and representing it.

However, children's literature still has a formative function, not only in terms of literary and aesthetic values, but also regarding social and cultural values. It shows



children the world, its people, its problems, simultaneously suggesting them an involvement that allows children a constant, enjoyable search for new meanings.

Today, many topics are present in the works of children's literature and science is no exception. Through the books of this literary genre, children come in touch with scientific issues, and they can simultaneously reflect on them, with the help of the mediator, in a multidimensional context closer to the complex reality of their everyday world. If we take into account that primary school teachers work in a mono-teaching scheme, we can easily see that, with no need to instrumentalise the children's book, the relation between the teaching of Portuguese and the teaching of the science may use a text from this literary genre as a pedagogical resource. Indeed, as Lajolo (2009) states,

[...]the school should deal with *the text in the context* of its production, its circulation and its reading, since perhaps the misunderstandings in works done in school with the text arise from the *disregard* of this context (LAJOLO, 2009, p. 107).

In the case of this study, as previously mentioned, we have focused on the issue of food education. The issues of food or of the lack thereof have always been present in both traditional literature and children's literature. In traditional literature, and just as an example, we recall the tales of *Tom Thumb* and *Hansel and Gretel*, in their various versions, where poverty and the subsequent lack of food led the parents to abandon children in the forest to their fate. Also in this literary genre, we remember stories like *The Little White Bunny* or *The stone soup*, in which the topic of food remains quite evident.

In children's literature, there are many works available on the market that can point to the issues of food, healthy eating and education. We'll mention just a few: *Come a sopa, Marta!* ["Eat Your Soup, Marta!], by Marta Torrão; *A sopa verde* [The Green Soup], by Chico; or *O menino gordo* [The Fat Boy], by José Viale Moutinho. If we look briefly at the titles of these works, we notice that they immediately refer to health and food education concerns, such as the presence in the daily diet of vegetables, often in the form of soup, and the topic of excess weight, namely in children.

Thus, it is in this context that the proposed work appears as a pedagogical resource in this study: Authored by Isabel Maria Fernandes, with illustrations by Cesária Martins, it is called *Os meninos gordos: a história dos meninos gordos que viraram peças de faiança* [The Fat Kids: The Story of The Fat Kids Who Became

Pieces of Earthenware], published in Portugal by Campo das Letras. This book ended up accompanying an exhibition aimed at children called *Meninos gordos: contar uma história através da faiança* [The Fat Kids: Telling a Story Through Earthenware]. The book and the exhibition were intended to shed light over the story of two Italian children who travelled through Europe in the mid-nineteenth century and were put on show because of their weight: Mateus was 11; he weighed 201 kilos and was 1.52 m high; Ana was nine; she weighed 129 kilos and measured 1.37 m. The visit of these children to Portugal was recorded by the potters, who portrayed them in countless pieces of earthenware that can be seen in the above-mentioned exhibition. The exhibition also made it possible to raise awareness to the problem of obesity and childhood obesity in contemporary Western societies.

### **Methodology**

The research developed was based on an intervention in a primary education class of an urban school. The goal of this intervention was to put in place a sequence of learning that would allow to carry out activities related to the topic of food education and to evaluate its impact on children.

Thus, using an instrumental case study we were able not only to perform an in-depth analysis of this group/class but also to carry out an intervention within the unit, and therefore to add characteristics of action research to the process.

The group consisted of 20 children and the data collection instruments included a pre-test phase and a post-test phase, where activity sheets were used. Since the data were of a qualitative nature, the set of responses to be categorised was analysed using the content analysis technique (BARDIN, 1977). This process involves searching for regularities and patterns or topics present in the data and generating words or phrases that represent the same topics and patterns - coding categories (BOGDAN; BIKLEN, 1994). These categories were created according to the units of meaning that resulted from the responses written by the children in the different activity sheets.

Despite having worked with only one class, we considered appropriate to establish some comparisons between the initial and final state of the students in order to detect possible indicators of change. The initial and final diagnosis sheets allowed us to establish some interesting inferences, although as a consequence of the methodological choices made their interpretation is confined to the specific scope of the group studied.

## Study Presentation

The study developed and presented here had as a starting point the work *Os meninos gordos: a história dos meninos gordos que viraram peças de faiança* [The Fat Kids: The Story of The Fat Kids Who Became Pieces of Earthenware] (FERNANDES; MARTINS, 2005). This didactic proposal had the following objectives:

### Objectives

1. To explore the paratextual aspects of the book.
2. To listen to the verbal text being read and to explore the iconic text.
3. To use oral retelling as a way of taking ownership of the text read.
4. To identify the reasons for obesity/excess weight.
5. To explore the food plate.
6. To identify the characteristics of healthy eating, taking into account different habits and cultures.
7. To build balanced meals (mid-afternoon snacks), associating various foods.

As a first step, we administered a pre-test aimed at understanding the students' representations on the issues of diet and obesity.

Then, with the help of the class teacher, the children explored the paratextual aspects of the book. In order to do this, the teacher took not only the book to the classroom - to help the children come into contact with its materiality and its physical aspects - but also a colour enlargement of the cover of the book, to explore the paratextual aspects present in the book with the students. Thus, the author, the illustrator and the publisher of the work were identified. Subsequently, the title of the work was also identified, the students' attention was drawn to the subtitle, and both items were related to the cover illustration. The cover illustration was also given particular attention, namely with regard to the materials used by the illustrator in its design. Then the children listened to the verbal text being read, explored the iconic text, and used oral retelling to take ownership of the text.

At the following stage, the children were offered a worksheet, whose purpose was to answer the questions made in the text by the Queen of Portugal to the Fat Kids. In the text, we came across rhetorical questions, so we wanted the students to make

inferences that would help them not only to communicate better with the text, but also to draw conclusions on the principles of a balanced diet and a healthy life.

In a subsequent step and with the aid of the class teacher, the children explored another worksheet dedicated to the study of the food plate. This allowed the children an opportunity to learn the characteristics of healthy eating and to understand that these characteristics are also cultural, eating habits varying according to each person's region and culture.

The final phase of the study included a post-test. The objective was to understand whether or not changes had occurred in the representations of children regarding the issues of diet and obesity following their study.

### **Presentation and Discussion of the Results**

The presentation and discussion of the results of the study started with the results of the worksheet in which the children answered the questions asked, in the text, by the Queen of Portugal to the Fat Kids. These questions can be divided into two categories: the first refers to food issues (category A) and the other to the issue of physical exercise (category B). Thus, in category A, we included questions no. 1 (Do you eat a lot of fat meat?); no. 2 (Are you so fat because you devour chocolate?); no. 4 (Have you ever tried to eat more fruit, more vegetables?); no. 5 (Do you always eat soup before meals?). In category B, questions no. 3 (Or are you so fat because you are always sitting down?) and no. 6 (And do you usually walk?). In terms of health education, these categories cover the two aspects that, according to the World Health Organisation, are combined and complement each other for the enjoyment of a healthy life.

Regarding the students' answers, we focused on category A, which refers to food issues. Some answers to the question "Have you ever tried to eat more fruit, more vegetables?" call for particular comments. One child replied "Yes, we have tried them, but they taste bad, they're crap," trying to put forth a possible justification for the Kids being so fat. In fact, they had already tried eating vegetables and fruits; however, the reason for not eating these foods was related, according to this student, to their flavour. Another child put forth another justification. Although the Fat Kids had already eaten vegetables and fruits, they could not stop eating sweets: "Yes, but we cannot resist sweets." The two justifications advanced by the students seem to us very close to the universe of children and to many children's reactions to certain foods. While vegetables

and fruit are often rejected (“they taste bad,” “they’re crap”), sweets are usually seen as something irresistible. Campaigns and warnings of health professionals to change the eating habits of children are abundant these days, many calling attention to the need to replace high-calorie foods in school meals (such as chocolate-filled bread or chips) with fruit, as we have previously noted. Yet another child put forth an economic reason for the Fat Kids not eating fruit: “No, we were poor and we had no fruit.” In this answer, we cannot help noticing signs of conversations among adults about the living conditions of some families, which do not go unnoticed by children.

Let us now focus on the answers to Category B questions, which refers us to the question of physical exercise. Some answers to the question “Or are they so fat because they are always sitting down?” warrant our attention. Two children answered that it's not that the siblings are always sitting down - rather, they're disabled - “No, we are disabled.” The possible reason for this seemingly disconcerting answer is that the Fat Kids really look unusual for their age, a notion inferred by the children probably from the picture of the Italian siblings included in the work. To these children, the Fat Kids' huge size ends up corresponding to the notion of disability. Another student answered that the Fat Kids are always standing: “We are always standing.” Once again, it seems to us that this answer may have been inferred from the portrait of these children, included in the work, and from the iconic text itself, since they are always depicted standing up. Another child, in their answer, relates the children's obesity not to the lack of physical exercise, but to the fact that they overeat. - “No. It's because we're always eating.” We think we can say that, for this child, obesity arises only from overeating and not from the lack of physical exercise. Another student seems to be more aware of the reality of the diet/exercise association, since in his answer he states that the Fat Kids are so obese because they do not exercise and because they are always eating. - “Yes, and we eat a lot.”

Looking at some of the children's answers to the question “Do you usually walk?”, we can see why the Fat Kids do not walk - “No, because we do not have time”/“No, we take the bus.” These are very interesting reasons, because they are very present in contemporary society, and felt perfectly by children. At the same time, however, they reveal a temporal mismatch regarding the time in which the characters of the story lived. The justification given in another child's response - “No, we do not like to walk,” refers us to an inference made by the child, possibly due to the physical appearance of the Fat Kids.

The questions presented in the pre- and post-test phases built on a logic of continuity with the narrative structure of the book (materialised in the question: *What do you think we could do so as not to be fat?*), wanted to collect data that would indicate trends in the thinking of children and any changes in this thinking, on the issue of excess weight in children.

Although it is a short-term learning sequence, we can see in Tables 1 and 2 how the students' answers differed, reinforcing the effect and importance of this type of projects in this age group.

Table 1 - Indications given by children to avoid excess weight (pre-test)

Category	Pre-test (N=19)	
	N	%
Doing exercise/gymnastics/sports	19	100
Avoid eating (too many) sweets/chocolates	12	63
Dieting	3	15
Eating well	2	10
Eat less	2	10
Avoid eating fat	2	10
Avoid eating (too many) chips/crisps	2	10
Eating fruit	1	5
Avoid eating hamburgers	1	5

Source: The authors

Table 2 - Indications given by children to avoid excess weight (post-test)

Category	Post-test (N=19)	
	N	%
Doing exercise/gymnastics/sports	17	90
Drinking water (1.5 l/day)	15	79
Healthy diet	11	58
Eating vegetables	9	47
Avoid eating (too many) sweets/chocolates	7	37
Avoid eating fat	5	26
Eating fruit	5	26
Drinking milk	3	15
Eating carbohydrates	2	10
Having a varied diet	2	10
Having a balanced diet	2	10
Eating well	1	5
Eating pasta, eggs, fish and meat	1	5

Source: The authors

We must highlight the difference in the terms and the concepts that arise in the post-test phase and were non-existent in the pre-test phase, such as *healthy eating* or *balanced diet*. Also the references to the variety of foods suggests that this notion has been internalised. In addition to becoming aware of the importance of water, passing from no mentions to it in the pre-teaching situation to being referred by almost 80% of the children in the group in the post-teaching situation.

In our view, the disappearance of the *dieting* indicator in the post-test phase is very interesting. This seems to indicate that students now consider that if they eat in a varied, balanced and adequate way, and combine it with physical exercise and water intake, they will have no need for weight loss diets. This is why indicators are mostly positive at this stage (*eat pasta, eggs, fish and meat; eat vegetables, eat a little of everything, drink milk, etc.*) and restrictive in the initial phase (*do not eat crisps; do not eat hamburgers*).

Exploring the food plate, among other activities included in the learning sequence, will have contributed for this change in trends in children's responses. Therefore, following the discussion with the teacher in the classroom and the filling-in of an activity sheet, we wanted to know what this instrument meant to the class. The synthesis shown in Table 3 resulted from the categorisation of the presented answers.

Table 3 - Indications given by children about the Food Plate

What does the Food Plate teach us? Category	(N=20)	
	N	%
Eating healthy and/or in a balanced way	18	95
Eating a variety of foods	1	5
Hydrating our body	1	5
What we should eat	1	5
Eating better	1	5
Eating adequate portions	1	5
Eating well	1	5
Knowing foods	1	5

Source: The authors

Confirming and reinforcing the test results, we see that almost all students referred that the food plate provides indications that allow for a healthy and balanced diet planning. Judging by the various indicators that were recorded in association with

this response (eating adequate portions; having a varied diet; knowing foods), we can infer that many children will have internalised these concepts in a meaningful way, that is, interpreting the food plate as meaning balance, proportion and variety of foods in their daily meals. Notwithstanding, we know that changes in habits are difficult, time consuming and complex and do not operate simply and immediately, involving many stakeholders. Still, mobilising these concepts could be a valuable step in this direction.

## Conclusions

The intervention carried out and described here was positive and significant for the participants. The results obtained suggest that the involvement of the school is recognisably important due to its potential to change the habits of children. The school can thus act at the level of building concepts and behaviours, inducing changes, and opening possibilities for improving the quality of life for future citizens.

In particular, we highlight raising awareness to adopting a healthy diet, which should be varied, complete, balanced, and in quantities adequate to individual needs.

We also emphasise the importance of these studies, which certainly allow greater openness of the school and of teachers to practices that we intend not only to be distinct, but also holistic. The relationship between two seemingly opposing areas of knowledge was very positive in that it allowed students to mobilise knowledge and languages from several areas simultaneously. We end this study with Galvão (2006), agreeing with his words and with the certainty that the didactic sequence implemented with these children was undoubtedly a small contribution so that, increasingly, "From a compartmentalised world view and compartmented partial explanations, we move towards a growing need for holistic thinking." (GALVÃO, 2006: 48).

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