Science teaching and playfulness: Potentialities of the application "Desrotulando" as an educational resource

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ABSTRACT
In this work, of qualitative and documentary nature, the possibilities of an application, which does not have didactic purposes, as an educational resource for playful approaches in Science Teaching on topics related to food and health are investigated. Data collection took place through the capture of screens with a smartphone device, seeking elements in all areas of the application, taking into account its other tools. The process of data analysis occurred through proposals of documentary research, considering the processes of exploratory, selective, analytical and interpretative reading. With regard to interpretation, this occurred through correlations with the theoretical references of the areas of Biochemistry, Playfulness and Science Teaching. From the analyses, it is possible to conclude that the application, when thought of as an educational resource, presents potentiality for the development of playful approaches in the teaching of Sciences, fostering an active posture in the production of knowledge. In addition, the content has accessible and easily understood language, without losing the meaning of the concepts that are addressed about nutrients and health. However, the application only does not guarantee that the student reflects on the deeper aspects of these themes, being fundamental the role of the educator in the process of deepening, problematizing and contextualizing on the topics addressed.

Keywords: Science Teaching, Playfulness, Health, Digital Technologies.

1 INTRODUCTION

Within the scope of Science Teaching (ST), several challenges are constantly faced, such as the difficult understanding of the contents, the traditional methodologies used by some educators and the lack of interest of the students in the discipline (RODRIGUES;LIMA; AMARAL, 2023).

With regard to the contents, Luz and Oliveira (2011) highLUZ that the problems related to the teaching of topics related to nutrition are rare, and the studies reported focus especially on the aspects that refer directly to digestion. A fact that draws attention, because "knowledge of the functions of nutrients is important not only for the general formation of the student and for appropriate decisions

regarding social practices (such as the choice of diets or the practice of sports, but also for public health)" (LUZ; OLIVEIRA, 2011, p. 3).

In this sense, it is relevant that due attention be given to issues related to food and health in the ST, considering that, according to the document of Cross-cutting Themes of the National Curricular Parameters (PCN), with regard to the theme Health, "eating habits need to be critically debated in groups as a way to evaluate the artificial generation of 'needs' by the media and the effects of advertising in encouraging the consumption of energy products, vitamins and industrialized foods" (BRASIL, 1997, p. 277).

Understanding that the consumption of foods with a high degree of processing is frequent among individuals living in urban spaces, but also with marked growth in the rural population, and especially among children and adolescents in the school environment (OLIVEIRA; PETER; MUNIZ, 2021), it is relevant that these issues are problematized and deepened in the ST, through approaches that enable a formation for citizenship, based on an exercise of subjects in the face of health/disease processes (BRASIL, 1997).

In the educational context, amid the various strategies that aim to overcome such challenges and contemplate more pleasurable and engaging approaches, the use of educational resources[1] digital are increasingly present in the daily lives of individuals and begin to enter with greater intensity in the current context, a process accelerated by the Covid-19 pandemic (SANTOS et al., 2022).

However, it is not enough to rethink only about the digital educational resources that are being used, but also about the meanings that these constantly disseminate, as well as about the strategies adopted in the classroom. Thus, contemplating approaches that take "into account aspects that can promote interest and motivation" (FERREIRA; WENDLING; STRIEDER, 2021, p. 1339), and that stimulate an active and reflective participation in the students. Thus, aiming to ensure "their present possibility of social participation and mental development, to thus enable their full capacity to exercise citizenship" (BRASIL, 1998, p. 23).

Nowadays, society is increasingly immersed in digital technologies and media. However, although children, young people and adults are constantly in contact in their daily lives with these resources, "this does not mean that they are naturally equipped with the appropriate skills to deal with digital technologies in a responsible, safe and critical way" (SANTOS et al., 2022, p. 357). Aspects that make the demand for a critical training of subjects increasingly forceful, as well as the relevance of more discussions around Digital Information and Communication Technologies (DICT) in the educational context (SOUTO;LAPA; SPÍNDOLA, 2019).

[1] According to Graells (2010), it is any material that, in a given educational context, is used for a didactic purpose or to facilitate the development of training activities.

And We understand by DICT, in the context of this research, the technological cultural artifacts, that is, as any electronic equipment that performs the conversion of data and consequently facilitates daily life and manifestations in virtual environments (PÉRES; GOMES, 2022). Characteristics that can facilitate the teaching-learning process, as they enable "the modification, amplification and exteriorization of numerous cognitive functions such as memory, perception, imagination, reasoning" (ANJOS; SILVA, 2018, p. 24).

However, the DICT must be understood as cultural tools, because they have a particular language and the mastery of these tools is "linked to the understanding of their particular semiotics, to the mastery when reading their symbols" (LALUEZA; CRESPO; CAMPS, 2010, p. 47). In other words, it is not enough just to master the use of the DICT, it is necessary to understand the various meanings that are disseminated in their particular language.

In the scope of the ST, the use of DICT responds to the need to train students able to understand and use different technological resources and discuss the ethical and environmental implications of the production and use of technologies (BRASIL, 1997). In addition, these enable approaches that contemplate playfulness, which is understood by Bartholo (2019) as an internal process, which is the gateway to creative experience, in which subjects vibrate in another intensity, with more LUZness and a feeling of fullness of life, providing an exercise of interiorization that stimulates the experience of knowledge that needs to be learned.

From this perspective, for the development of playful activities from the DICT, it is necessary that teachers have "knowledge about available multimedia tools, the use of the device to seek, interpret and communicate information, evaluate its use and critically judge the information collected" (ANJOS; SILVA, 2018, p. 25).

It is worth differentiating, at this moment, that playfulness is understood as an internal state of fullness, pleasure and well-being, being an internal experience to the subject, through experience; playful activities belong to the external domain of the subject (LUCKESI, 2014). In this perspective, not always a playful activity will bring the same internal experience to all subjects, but these are relevant for them to develop a full experience from their fragmented experience (LUCKESI, 2000).

Thus, the ST has in playfulness a valuable range of possibilities for approaches in the classroom, allowing students to have their experiences and the different ways to study nature and technology (FERREIRA; WENDLING; STRIEDER, 2021). And, when combined with the DICT, they make it possible to stimulate the feeling of belonging and explore relevant formative aspects for a critical formation and for the exercise of citizenship (BARROS; CAVALCANTI; GARCIA, 2017).

In view of these concerns, this article seeks to discuss the possibilities of a digital application, which has no educational purpose, as an educational resource for playful approaches in the ST on topics related to food and health. In this sense, it is directed to contribute to the development of

pedagogical activities that stimulate the development of critical-reflective sense in the discipline of Sciences and an active posture of the students in the production of knowledge around the field of Health.

2 METHODOLOGY

2.1 THE ANALYZED APPLICATION

The application analyzed was the Desrotulando, launched in 2016, being considered "the first application of *Food score* of BRASIL. Made by nutritionists, without fads or radicalisms" (DESROTULANDO, 2016). In this sense, in its proposal, the application allows its user to scan the barcodes of food products and have access to a nutritional assessment (with scores from 0 to 100) of these products, in order to find healthier options of industrialized products and feel good about their choice. Thus, it also makes it possible to research the evaluation of products by name, brand or category (DESROTULANDO, 2016).

2.2 TYPOLOGY OF RESEARCH

The nature of this research is characterized as qualitative and Documentary, since it aimed to understand the possibilities of the application "Desrotulando" as an educational resource for the teaching of Sciences. With regard to qualitative research, Minayo and Deslandes (2007) define it as a typology that works with the universe of meanings, motives, aspirations, values and attitudes that permeate reality, corresponding to a deeper space of relations, processes and phenomena, which cannot be quantified.

We adopted, therefore, the documentary qualitative research, taking into account that the concept of document is very broad, since any data carrier can be considered a document (GIL, 2019), as is the case of the analyzed application.

2.3 DATA COLLECTION

The application was found through searches in the app store *Google Play* using as keywords: "Healthy Eating", "Food Labels", "Nutrition". In this sense, we sought an application that was easy and freely accessible and that contemplated features that would enable a more active role of its user.

Given these characteristics, "Desrotulando" was chosen because it allows scanning the barcodes, as well as access the reading of the nutritional tables of any industrialized product with the use of *smartphones*. In addition, it proposes to explain about energetic, regulatory and structural nutrients, as well as about the additives found in some of the industrialized foods.

After choosing the application, During its use, 22 screenshots were taken by means of a *smartphone*, seeking textual elements contained in several available evaluations and in the other scopes of the application, taking into account the other possibilities that it allows.

2.4 DATA ANALYSIS

In this step, the proposals of Gil (2019) for documentary research were adopted, being initially carried out the reading of the textual elements contained in the screenshots, serving to identify the information and data extracted from the application, establish relationships between these textual elements with the research question and, finally, analyze their consistency from the theoretical references.

Based on these assumptions, an exploratory reading of the collected textual elements was initially carried out, pondering the extent to which they were of interest to the work. Next, a selective reading took place, to select the excerpts of the textual elements that were really of interest to the objectives of this research. The next step was the analytical reading of the selected excerpts, allowing the ordering and summarization of the information of relevance to the present work, consequently fostering preliminary answers to the research question.

In the last stage, of interpretative reading, notes were made and the establishment of relationships between the textual elements obtained and the research question (GIL, 2019). In this sense, the interpretation of the data was based on its comparison with the theoretical framework in the area of Biochemistry (HARVEY; FERRIER, 2012; MARZZOCO; TORRES, 2015), in order to analyze the coherence in the contextualization of the content, verifying if the language is accessible in the approaches made by the application; and, to discuss its potential as an educational resource for playfulness in ST, with the references of the area of Playfulness (LUCKESI, 2000, 2014; BARTHOLO, 2019), from ST (BRASIL, 1997, 1998; LUZ; OLIVEIRA, 2011; ZÔMPERO et. al. 2014) and other research with the same imprint.

3 RESULTS AND DISCUSSION

3.1 CONTEXTUALIZATION OF THE CONTENT AND ITS LANGUAGE

When analyzing the information contained in the evaluation of the products presented in the Desrotulando application, we found explanatory texts that addressed about some nutrients and other components that are part of the composition of some products. In the case of carbohydrates, the application explained that

> We use the 'added sugars' information, stated on the label, to identify whether or not the product falls within the high range established by the legislation. For products that do not yet inform the added sugars, we perform an estimate based on the 'carbohydrates and/or 'sugars' present in the list of ingredients (DESROTULANDO, 2016, emphasis added).

As noted, the app does not bring a direct concept about carbohydrates, nor information about the problems caused by its excessive consumption, being concerned primarily with explaining how the estimates are made in certain products that have high rates of carbohydrates and sugars. However, by dissociating the concepts of carbohydrates and/or sugars, it allows the teacher to explain that not all carbohydrates can be termed as sugar, as well as these have quite diversified functions, both providing immediate energy and providing support and reserve, since they may be associated with lipids and proteins, forming glycolipids and glycoproteins (MARZZOCO; TORRES, 2015).

In addition, it may corroborate the demystification that the consumption of carbohydrates a priori would promote strong weight gain, but rather that, if associated with a sedentary lifestyle and calorie-dense foods, it can lead to the condition of obesity (HARVEY; FERRIER, 2012).

With regard to lipids, "Desrotulando" presents the following concept, more specifically about saturated fats:

> Saturated fat is a type of fat that tends to be solid at room temperature and is present both in animal products (such as meats and dairy products and in plant products such as coconut and palm fats). The WHO recommends limiting the consumption of this type of fat, since excess intake is associated with a higher risk of developing cardiovascular diseases (DESROTULANDO, 2016, emphasis added).

At this moment, we note that the "Desrotulando" brings a contextualized concept with examples of everyday life, as well as addresses the risks in the development of cardiovascular diseases from the excessive consumption of this type of fats, citing the World Health Organization (WHO). According to Marzzoco and Torres (2015), coconut, some tropical palm and cocoa oils are rare examples of vegetable oils rich in saturated fatty acids. In addition, we can observe that the application brings pertinent information, because "the consumption of saturated fats is positively associated with high plasma levels of total cholesterol and LDL cholesterol and an increased risk of CCD[2]" (HARVEY; FERRIER 2012, p. 231). Aspects that the educator can deepen from the description of the application, understanding that the contextualization is adequate, as well as the language of the application is accessible and well explanatory with regard to the approach of lipids.

When dealing with proteins, "Desrotulando" contemplates that

> Protein is known to form our muscles, but it is also necessary for good bone formation and the production of enzymes, hormones, and antibodies. In foods of plant origin, legumes (group of beans) stand out as a source of protein; Among those of animal origin, meats are the main source. It is essential to consume a variety of food sources of protein since our body does not produce all the compounds necessary for its formation (DESROTULANDO, 2016, emphasis added).

[2] Coronary Cardiovascular Disease (CCD), may also be known as Coronary Artery Disease (CAD), a disease that is characterized by insufficient blood supply to the heart through the coronary arteries (PINHO et al., 2010).

According to Marzzoco and Torres (2015), proteins are associated with much of the functions mentioned in the content of “Desrotulando”, but are also related to the transport of molecules, such as oxygen and lipids, as well as ions by plasma, as well as in the control of gene activity. Although this information is not present in the content of the application, it can be deepened by the teacher by promoting more in-depth discussions on the subject.

Within the framework of the that the body does not produce all the compounds necessary for its formation, there is a gap that can be explained about the composition of proteins and that there are non-essential amino acids, which are synthesized by the body and essential amino acids that "cannot be synthesized (or produced in sufficient quantities) by the organism and, therefore, they must be obtained from the diet in order for normal protein synthesis to occur" (HARVEY; FERRIER 2012, p. 261). Given these perspectives, we observe again that the approach is contextualized and easy to understand in the context of proteins.

With regard to presence of fibers in products, the analyzed application brings again an approach that contextualizes with everyday issues, highLUZing that

> The fibers provide satiety and help in the proper functioning of our intestine. They are naturally present in plant foods such as fruits, vegetables and whole grains. Also, fibers can be added by the manufacturer (ingredients such as inulin and polydextrose). Always give preference to the consumption of foods naturally rich in fiber (DESROTULANDO, 2016, emphasis added).

It is evident that the approach on fibers is blunt with regard to the benefits pointed out in the application and where they can be found naturally. Starting from thisand north, the educator can contemplate with more information, such as the aspects related to the consumption of fibers called soluble, which, in diets of 25 to 50 grams per day (g/day), "are associated with a modest but significant reduction in the risk of cardiovascular disease, because of the decrease in the levels of total and LDL cholesterol" (HARVEY; FERRIER, 2012, p. 366).

According to the comparison of the content of the application with some of the theoretical references in the scope of Biochemistry, it was evident that the approaches of "Desrotulando" are forceful, fostering discussions and/or deeper approaches from the mediation of teachers with their students.

The contextualization and adequacy of the scientific language present in the treatment in the content of the application did not cause losses in the proposed meaning, making it more accessible, facilitating its understanding. These aspects are relevant, because contextualization is a "resource capable of giving meaning and relevance to these themes that permeate school curriculum, making them closer to the reality of the student, in a clearer way and that enables their critical reflection" (CARVALHO et al., 2021 p. 241).

3.2 POSSIBILITIES FOR PLAYFUL APPROACHES IN SCIENCE TEACHING

Starting from the analyses present in the previous topic, in this will be made some reflections on the possibilities of this application as an educational resource for playful approaches within the scope of the ST. Given this, it is directed to contribute to stimulate reflections to the development of various pedagogical activities, not as a didactic sequence or a ready and finished instruction manual that must be strictly followed.

Entering into these discussions, it is important to start on the application to enable flexibility for the development of various activities within the scope of the ST. At allow users to scan any barcode with a *smartphone* and have access to nutritional information, as well as a brief explanation of the function of some of the nutrients and additives used in their manufacture, bring together approaches that contemplate the student at the center of the teaching-learning process.

From these perspectives, it reinforces the role of the educator as a mentor, and also as "[...] a companion of the learner, therefore, it is not enough to study in books what happens to the other, he needs to learn by experimenting so that he can, from personal experience, understand the other when he is working with him" (LUCKESI, 2014, p. 14).

As previously presented, the “Desrotulando” comes to relate the excessive consumption of some nutrients to some diseases related to the Cardiovascular System, as well as observed when treating on sodium:

> It is a mineral used to impart flavor that can also serve to better preserve food. In addition to the sodium present in table salt (sodium chloride), it can appear in the form of sodium-based additives. The WHO recommends limiting daily sodium intake to 2,000 mg in order to avoid increased blood pressure and the risk of cardiovascular disease (DESROTULANDO, 2016, emphasis added).

Addressing such issues, according to the PCN of the Transversal Health Theme, are of paramount importance for the ST, because, interpreting labels of marketed foods, the students identify the composition of the different foods and recognize themselves as consumers. Thus, they can also study about the role of nutrients in the body with the help of texts on nutrition, understand about the processes of conservation of industrialized foods and reflect on the needs and possibilities of food in different stages of development, contemplating on hunger and diseases resulting from food shortage (BRASIL, 1998).

In this perspective, with the application can be developed activities that explore playfulness, through active methodologies, such as Teaching by Research[3]. In this way, students can by themselves scan various packages and the most diverse products, with which they have daily contact in their daily

[3] It is a multifaceted practice, which has several involvements, such as elaboration of questions and search for information, planning involvement, interpreting data, proposing answers, explanations and describing the results obtained (COSTA, 2020, p.7).

lives, realizing the importance of the elements that are present in the packages and their meaning with the mediation of the educator.

In this context, Zômpero et al. (2014) argue that investigative activities within the scope of the ST are relevant, given the need for students to recognize evidence in certain information, such as nutritional tables, because these encourage students to prioritize evidence, thus knowing aspects related to the nature of Science.

Another point that should be discussed in the context of the application concerns the grades assigned in the evaluation of "Desrotulando", which is evident when dealing with the products *clean label* or clean label:

> We consider a product as "clean label" when it has more natural ingredients, close to what we find in our kitchen, and is free of food additives. These products are less processed, thus being aligned with the guidance of the Food Guide for the BRASILian Population that we should prioritize the consumption of less processed foods and avoid the consumption of ultra-processed foods (DESROTULANDO, 2016, emphasis added).

Through the evaluation of the products attributed by the application, problematizations in the scope of food insecurity and socioeconomic vulnerability can be stimulated, and a comparison can be made between the value of the poorly evaluated products with the well-evaluated products. In this perspective, it is possible for students to recognize that "depending on the socioeconomic condition, people with lower incomes tend to have difficulties to obtain a minimally adequate diet (SILVA; KERNKAMP; BENNEMANN, 2013, p. 39).

In these perspectives, approaches that explore playfulness on these themes are relevant, since they are directed "to an educational practice that is attentive to the formation of a human being or a healthy citizen for himself and for his coexistence with others, whether in private or public life" (LUCKESI, 2000, p. 43).

Reinforcing thus, the role of education in forming more psychologically integrated subjects and aware of their social responsibilities, and should be attentive to the demands of the human being and society (BARTHOLO, 2019). Thus, also avoiding approaches that dictate a universal diet considered as correct, "under penalty of discouraging the construction of a desirable eating pattern and compatible with the local culture, composed from the foods rich in nutrients proper to each reality (BRASIL, 1997, p. 277).

4 FINAL CONSIDERATIONS

We found, in this research, that the application Desrotulando, when thought of as an educational resource, brings several possibilities to explore the playfulness in Science Teaching, in which students can have an active posture with regard to the teaching-learning process. In addition, its content has

accessible and easy to understand language, without losing the meaning of the concepts that are addressed about nutrients and health.

However, the educator has a fundamental role as a mediator in the process of problematization and sensitization in the students, being able to deepen the approaches contained in this application, contemplating with the social, political, cultural, historical and environmental issues. In this sense, leading to a more holistic understanding around these themes and reinforcing the social role of students in the fight against social injustices, such as poverty and food insecurity, which the application does not address hard.

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