

TESTE GENÉTICO PREDITIVO DE CÂNCER DE MAMA: UMA ABORDAGEM DISCURSIVA SOBRE O USO DE TEXTO DE DIVULGAÇÃO CIENTÍFICA E HISTÓRIAS EM QUADRINHOS NO ENSINO

PRUEBAS GENÉTICAS PREDICTIVAS DE CÁNCER DE MAMA: UN ENFOQUE DISCURSIVO PARA EL USO DE TEXTOS DE DIVULGACIÓN CIENTÍFICA Y LAS HISTORIETAS EN LA ENSEÑANZA

BREAST CANCER PREDICTIVE GENETIC TESTING: A DISCURSIVE APPROACH ABOUT THE USE OF THE SCIENTIFIC DIVULGATION TEXT AND CARTOONS IN EDUCATION

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RESUMO: Este trabalho tem por objetivo abordar, de forma discursiva, como o uso de textos de divulgação científica e histórias em quadrinhos pode contribuir para a interpretação de conceitos biotecnológicos no Ensino de Ciências e Biologia na Educação Básica. Aqui nos referimos a temática específica testes preditivos de câncer de mama. Utilizamos como referencial teórico uma vertente da análise do discurso francesa, que tem em Michel Pêcheux um de seus principais articuladores. Admitimos que as diferentes formas de uso da linguagem irão produzir sentidos específicos em cada sujeito. Consideramos que a proposta permite um movimento no sentido de contribuir para a atividade pedagógica na sala de aula e para leituras informais do tema.

PALAVRAS-CHAVE: Ensino de ciências. Divulgação científica. Teste genético. Ensino de biotecnologia. Histórias em quadrinhos.

RESUMEN: Este artículo tiene como objetivo tomar un enfoque de manera discursiva sobre la contribución del uso de textos de diseminación científica y historietas para la interpretación de conceptos biotecnológicos en la Enseñanza de las Ciencias. Como sujeto específico de estudio se utilizaron las pruebas predictivas de cáncer de mama. La base del marco teórico es la análisis del discurso francés, que tiene en Michel Pêcheux uno de sus principales articuladores, y por lo tanto admitimos que las diferentes formas de uso del lenguaje pueden producir significados específicos en cada persona, así como una interpretación única de los contenidos. Así, la propuesta permite una posible contribución para la actividad pedagógica en la clase y lecturas informales del tema.

PALABRAS CLAVE: Educación científica. Comunicación científica. Pruebas genéticas. Educación biotecnológica. Historietas.

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ABSTRACT: *This work is focused in a discursive way about how the use of divulgation scientific texts and comics can contribute to the biotechnology interpretation of concepts in the Science and Biology Education using the predictive breast cancer tests as specific theme. For the theoretical reference we worked with the French discourse analysis, which has in Michel Pêcheux one of its main articulators, and therefore we admit that the different use of the language forms will produce specific meanings in each subject, as well as a unique interpretation of the contents. In this way the proposal allows a movement in the sense of contributing to the pedagogical activity in the classroom and informal theme readings.*

KEYWORDS: *Science teaching. Scientific divulgation. Genetic tests. Biotechnology teaching. Cartoon.*

Introduction

Biotechnology is a field of knowledge that integrates other areas, such as genetic engineering, microbiology, cellular and molecular biology, botany, among others. Research in this field has grown rapidly in recent decades, generating a significant amount of scientific production, which is increasingly complex. Such productions generate innovations that, in a short period, become part of the life of part of human beings, optimizing products and processes, without many times that they are aware of what they are consuming or doing.

According to Lamphere and East (2017) since the first biotechnological product became commercially viable, in 1995, Biotechnology has become the fastest growing field of technology. The innovations generated are often being presented to society through newspapers, magazines, television, the internet and even food labels. This media dispersion inserts different biotechnological terms in people's daily lives, such as, for example, transgenic foods, genetically modified organisms (GMOs), stem cells, among others. However, even though many people are familiar with these terms, apparently there are few ways to clarify these concepts in a comprehensive and educational way.

A subject that is emerging with force today is that of predictive genetic tests for certain diseases. As an illustration we present a fact that gained a lot of media attention: the preventive breast removal by a famous American actress³. In this specific case of the actress, when performing a genetic test predictive of breast cancer, she discovered that there was a high probability of being affected by the disease. In this context, genetic testing has emerged as an important biotechnological innovation in the medical field. These tests allow the advance knowledge of the possibility of the appearance of a certain disease in the human organism, and

³ Angelina Jolie – My medical choice (2013)

also allow the genetic proof of the disease's heredity in patients who have already manifested it.

Since 2014, the National Supplementary Health Agency (ANS, Portuguese initials) has defined criteria for the appropriate use of technologies in the screening and treatment of 29 genetic diseases, to benefit users of individual and collective health care plans in the country. However, this decision does not include the Unified Health System (SUS, Portuguese initials), preventing genetic testing from reaching the entire Brazilian population. An example of a genetic test that is now required to be covered by ANS guidelines is the BRCA1/BRCA2 gene for the detection of hereditary breast and ovarian cancer⁴.

According to the National Cancer Institute (INCA, Portuguese initials) of the Ministry of Health, breast cancer is the most prevalent in the female population worldwide, including the Brazilian, with the exception of cases of non-melanoma skin cancer. The control of breast cancer is now a priority on the country's health agenda and is part of the Strategic Action Plan for Coping with Chronic Non-Communicable Diseases (NCDs) in Brazil, launched by the Ministry of Health in 2011.

So that the contents related to biotechnology are not only dispersed in media reports and in shallow approaches, in the school and informal context, we believe that the use of comic books and scientific divulgation texts (SD), as a pedagogical resource in school and informal reading activity, it can effectively contribute to a discourse related to science. In this way, our proposal is the use of texts from SD and comics on predictive tests of breast cancer to approach the biotechnological theme.

The specific choice of genetic testing for predisposition to breast cancer, as the theme for this work, was due to the fact that there is a scarce scientific dissemination material in the area of biotechnology focused specifically on human health and also, because it presents and/or clarify to students and other people who read the proposed SD and comics, the possibility of tracking the existence or not of genes prone to certain diseases.

The theme makes us think about teaching from the perspective of social responsibility and in this context, Santos (2007) defends the idea that scientific knowledge should be understood not only as important for access to specific formative content, but, fundamentally, as a social function with the potential to develop the subject's minimum functional capacity to act as a consumer and citizen. Thus, when interpreting the scientific content, the subject would be better prepared to act in society and participate in the decision-making process on issues

⁴ National Cancer Institute. Incidence of cancer in Brazil (2018)

involving health, energy, food, natural resources, environment and communication. Thus, an important social sense of scientific knowledge is configured, that of preparing the subject to act as a citizen capable of giving his opinion in his community. This social function of scientific knowledge, justifies the importance of working on issues related to biotechnological innovations at school and also outside it. With access to information, the student becomes able not only to understand scientific knowledge as part of his daily life, but also to understand that scientific knowledge makes him capable of acting as a citizen, giving his opinion and claiming for his rights.

Based on the focus that scientific education has an important value in the human formation of subjects, it is worth emphasizing the importance of teaching Biotechnology as a possibility for democratizing access to science and as a possibility for awakening the student to an active and critical positioning in society.

This work uses the French discourse analysis as a theoretical-methodological framework, from the perspective that has Michel Pêcheux as one of its articulators. This reference has as one of its main assumptions the notion of language as not transparent, considering that the subject is constituted by language so that, when speaking, it brings with it a whole historical, social and ideological context. When speaking, the student brings with him the whole lived, heard and read by him on that subject. He also brings in his speech his social context and symbolic formations that characterize his ideological position. Such notions are important because, when coming into contact with comic books and with scientific divulgation texts, each student will produce different meanings according to his “ocular lens” built by his history and by his social and ideological position.

In the case of classroom activity, both the teacher and the student represent a social position that may imply the establishment of power relationships, such as, for example, the teacher's position as an authority in relation to the student. Given this fact, if activities are developed in the classroom with the SD and the comics proposed here, we need to take into account that the statements are not transparent and that they may be suffering interference from the power relationships present in that environment (SILVA; ALMEIDA, 2017). Therefore, for the analysis of didactic resource proposals in the classroom, it is essential to take into account the established production conditions and the determinant power relationships.

In view of the proposition of using scientific dissemination text and comic books as a teaching resource at school and in particular in Science Teaching, we will discuss the reasons for choosing these specific resources.

Scientific divulgation

According to Almeida (2010), there are many publications on the scientific use and dissemination in school situations or not, with different perspectives, which demonstrates its relevance both to understand its functioning in non-formal education, and to think about ways of using it in the classroom.

As the school is one of the main places for the dissemination of accumulated knowledge in society, and in particular those related to scientific knowledge, the possibility of using scientific divulgation, as a type of discourse for didactic resources in the mediation of knowledge, becomes of considerable importance (ALMEIDA, 2010).

The school discourse related to science seeks contents and procedures of scientific practice for greater access to the population, without isolating the discourses from the conditions of production. It must incorporate the historical character of scientific discourse and the recognition of science as human production. In this sense, scientific divulgation has a discourse that is not the same as the discourse of science, and how it is produced, but, because it is focused on it, it can contribute effectively to the conduct of school discourse related to science (ALMEIDA, 2010). The same can happen in non-formal teaching situations.

According to Martins *et al.* (2004), in his study addressing the use, in the classroom, of scientific divulgation texts on cloning, shows how this activity can function as a motivating or structuring element, organizer of explanations, trigger of debate and as a context for the acquisition of new reading practices. In this way, this textual type can favor the establishment of relations between scientific knowledge and the reader's daily life, expanding its discursive universe and allowing to highlight aspects of the nature of scientific practice.

Considering what has been discussed so far, we admit that the use of scientific divulgation as a didactic resource, in conducting school discourse related to science, allows students, with their different interpretations regarding their historical-social and ideological conjuncture, to have the possibility to debate ideas for forming an active position in society.

Promoting notions about breast cancer

Breast cancer does not have a single cause. Several factors are related to the increased risk of developing the disease, such as: age, endocrine factors/reproductive history, behavioral/environmental factors and genetic/hereditary factors. Genetic/hereditary factors are related to the presence of mutations in certain genes, especially BRCA1 and BRCA2. Women who have several cases of breast cancer and/or at least one case of ovarian cancer in

consanguineous relatives, especially at a young age, or breast cancer in a man who is also consanguineous, may have a greater genetic predisposition and are considered to be at higher risk for the occurrence of the disease. It can be estimated, as an example, that of the 59,700 new cases of breast cancer, around 5,970 may be related to hereditary predisposition, according to the estimate for the 2018-2019 biennium.

Genetic testing brings the possibility for about 6,000 people, prone to developing breast cancer each year, to monitor the onset of the disease, for early diagnosis and even a chance to decide on preventive amputation surgery.

The Brazilian Society of Medical Genetics (SBGM, 2018) has prepared an opinion on genetic tests for disease predisposition where it highlights the importance of using these only when there is a clinical and social utility for this. As published, the “Clinical and Social Utility” of a genetic test refers to:

[...] the possibility that the test result can truly lead to an improvement in the quality of the person's health, including not only the clinical aspects, but also the ethical, legal and psychological aspects that these results can bring to the individuals, their families and the population as a whole. For a Predictive Genetic test to have an important Clinical and Social Utility, a fundamental premise is that Science has already clarified an important part of the genetic component of that particular condition. This is already a reality for thousands of rare diseases and for rare forms of common diseases (for example, in hereditary forms of breast and ovarian cancer), but it is not yet a reality for frequent diseases such as Diabetes, Hypertension, Alzheimer, Schizophrenia, Bipolar Disorder, Osteoporosis, among other diseases that affect a large part of the population. Without knowing what is the share of genetics in the cause of these diseases, how many and which genes are involved, it is not possible to offer a Predictive Test with “Clinical and Social Utility”. This positioning is in line with international conduct guides, such as the American College of Medical Genetics in the USA (SBGM, 2018).⁵

Given the relevance of genetic testing to predict breast cancer, as a biotechnological innovation, some questions become latent: How to bring this subject to the attention of people? How to allow this scientific knowledge to be part of people's daily lives to the point that they

⁵ [...] a possibilidade de que o resultado do teste possa verdadeiramente levar a uma melhoria na qualidade da saúde da pessoa, incluindo não apenas os aspectos clínicos, mas também éticos, legais e psicológicos que estes resultados possam trazer aos indivíduos, suas famílias e à população como um todo. Para que um teste Genético Preditivo possa ter uma importante Utilidade Clínica e Social, uma premissa fundamental é que a Ciência já tenha esclarecido uma parcela importante do componente genético daquela determinada condição. Isto já é uma realidade para milhares de doenças raras e para formas raras de doenças comuns (como por exemplo, nas formas hereditárias de câncer de mama e de ovário), mas ainda não é uma realidade para doenças frequentes como Diabetes, Hipertensão Arterial, Alzheimer, Esquizofrenia, Desordem Bipolar, Osteoporose, entre outras doenças que afetam grande parte da população. Sem conhecermos qual é a parcela da genética na causa destas doenças, quantos e quais genes estão envolvidos, não é possível oferecer um Teste Preditivo com “Utilidade Clínica e Social”. Este posicionamento vai de encontro a guias de condutas internacionais, como o do American College of Medical Genetics dos EUA (SBGM, 2018).

have the capacity to intervene socially and politically so that they have the right of access to these genetic tests?

In an attempt to answer these questions, this work proposes to encourage the use of DC texts and comic books, related to predictive tests of breast cancer, for students of formal Basic Education and for informal readings, as an activity for the interpretation and understanding of the content related biotechnology.

When working on biotechnological content in the classroom, Neves (2016) in his study, with eighth grade students, researched their opinions on the subject of transgenics. In this study, some students showed difficulties in building a concept on this topic, others said they did not know what it was about and the majority adopted a positive position in relation to GMOs, even if they did not get the concept right. Many of the students' speeches used terms published by the media and even terms obtained in teaching situations, but with a lack of mastery of the scientific basis, as they did not have an understanding that surpassed common-sense discussions. The author concludes that current and technological themes, such as insertion and use of transgenics, must be worked on in the school environment so that students can appropriate scientific knowledge and can interpret it. Considering the transgenic theme as essential in the content of biotechnology and verifying the difficulty presented in its comprehension by the students, we admit the necessity of the use of a speech in the school that constitutes with characteristics of a school speech related to science.

Comic books

The use of Comic Books, as a didactic resource to approach biotechnological concepts, was considered because we observe that its use as a form of language has been studied for many years inside and outside the school.

Borges (2001) argues that, in the contemporary world, the narrative technique that unites the image to the text has been taking on ever greater proportions, which allows the image to have a materiality of language that not only reflects, shows or illustrates a reality, but also give meaning, promoting the interpretation of the image for its expressiveness as a language capable of suggesting and/or cause thrill. For the researcher, in comic books, through the union of verbal and iconic elements, it is possible to verify a double articulation of language through a complex relationship between two channels, visual and linguistic, which allows to expand the possibilities of forwarding the message and the prospects of receipt by the recipient.

From a linguistic point of view, according to Pecheut's discourse analysis, the materiality of the language promoted by the image can bring different meanings, depending on the subject's position. We believe that the reader, when faced with the language presented through the comic books, shows himself surrounded by a socio-historical situation capable of interfering in the understanding of the text and/or the image he experienced.

From the pedagogical point of view, the use of comics as a form of language at school, according to the statements of Santos and Vergueiro (2012), can be efficient in the teaching and learning processes. However, it is advisable to carry out a thematic screening of materials, always respecting language by age group. The authors also emphasize that comics also provide scientific dissemination and address issues inherent to science, which can subsidize classes and we believe that the same can occur in informal readers. This position is in line with what was observed later by Arruda (2017), who, in a study with the use of cartoons in the teaching of natural sciences, found that this strategy helped in the interpretation of content by students and also promoted a great involvement in all activities proposals.

We consider, therefore, comics as an important resource for pedagogical conduct as a school discourse related to science.

In order to illustrate the use of comic books some comics were created. With this we hope to awaken an environment of reflection, debate, reconstruction, reorganization and reframing of the teaching activities used inside and outside the school - Figures 1, 2 and 3.

Figure 1 - Comics “OS DNAstutos” - Breast Cancer Predictive Tests Series⁶

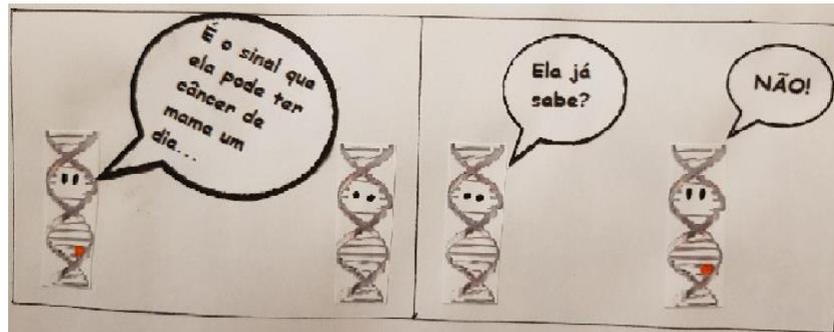


Source: Moraes (2018)

Figure 2 - Comics “OS DNAstutos” - Breast Cancer Predictive Tests Series⁷

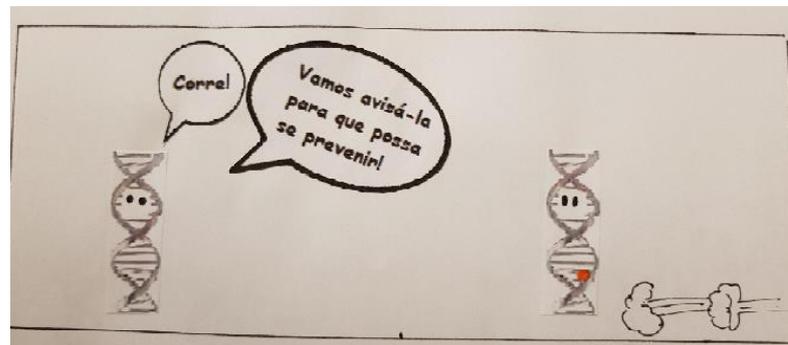
⁶ We read on the comics: Title – The DNAstutes; First image – What’s that orange thing on you?; Second image: It’s the BRA / What’s that?

⁷ We read on the comics: First image – It’s the sign that she might have breast cancer one day; Second image: She already know? / NO!



Source: Moraes (2018)

Figure 3 - The “OS DNAstutos” - Breast Cancer Predictive Tests Series⁸



Source: Moraes (2018)

Readings of texts and comic books about cell, cell nucleus, DNA, genes, BRA, predictive genetic tests and prevention possibilities can enrich the notions outlined here.

A final consideration

We consider both scientific divulgation texts and comic books to be relevant in Science Education, as well as in informal readings, specifically in the field of Biotechnology. Through school discourse related to science, these activities represent a rich material to be used as a resource in pedagogical mediation in the classroom.

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⁸ We read on the comics: Quick! / We must warn her, so she can prevent herself.

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