



# The Teaching of Ionizing Radiations in Science and Biology according to the National Common Curriculum Base (BNCC) and its Applicability in Brazilian Schools

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**Abstract:** Ionizing radiation is a topic of paramount importance, for the school environment. Thus, it is up to science professionals in schools across the country to observe teaching methods, based mainly on the National Curricular Common Base (BNCC) so that its application in the teaching teaching and learning process is increasingly diffused and facilitated.

**Keywords:** Education; ionizing radiation; biology

## 1. INTRODUCTION

When we talk about science teaching in the school environment, there is a great presence related to the investigative process, in which this role becomes of paramount importance for the creation of new minds in the scientific environment. The change in pedagogical processes over the decades played a fundamental role so that the science we know today could actually transgress the physical barriers of classrooms and create new perspectives, in which, according to the author Bell Hooks, questions related to multiculturalism, which by In turn, they end up bringing up questions of perspectives of social realities in the educational scope, thus demonstrating that teachers must go beyond a previous knowledge of a certain social group so that teaching methods can adapt to these realities.

The educator, in turn, assumes a role of paramount importance for the externalization of individual thoughts, being able to demonstrate other positions that are not commonly seen by that individual precisely because he is in a previously pragmatic group for that being in question. Critical and social thinking becomes a fundamental weapon for new perspectives to be initiated and for the evolution of concepts, thus arriving in modern thinking and having an active impact on previously established educational precepts, making science can have a growing in all aspects when related to pedagogical processes.

When observed in the school context, all the content to be analyzed uses as its main structure The National Common Curricular Base (BNCC) whose main role is to present the essential content related to Brazilian basic education, thus making an attempt at equity in the teaching process. and learning in Brazilian schools.



Regarding the teaching of ionizing radiation, which will be the theme proposed by this work, it can be observed that questions of modernity and nuclear issues are increasingly generating more questions in students about this type of energy that is not usually addressed in everyday life. of these students.

What can be observed is a pattern regarding the answers and doubts of the students, since for the majority of the society nuclear questions are considered in fact a very complicated subject to be approached and therefore disinformation processes in turn end up being generated.

When analyzed in the school curriculum proposed by the BNCC, it is observed that from the seventh year of elementary school onwards, issues related to obtaining energy through nuclear processes can be observed in the science content.

Subjects such as radiation and the very concepts of radioactivity are closer to the subjects of chemistry and physics, while in the area of biology the main focus that can be observed is in relation to the area of diagnostic medicine, treatment of diseases and the biological effects themselves. sayings.

In this way, the present study has as main objective the presentation of a pedagogical analysis about the content of ionizing radiation present in the disciplines of science and biological sciences using the National Common Curriculum Base so that there can be a greater understanding of how the subject has been approached. in the classroom since its implementation.

## **2. CURRICULUM ANALYSIS AND ITS COMPETENCES**

When analyzing the content presented, it can be noted that among the main skills of science and biology, issues related to electromagnetic radiation, observing issues related to their sources and applications, as well as advances in diagnostic medicine aimed at the use of X-ray, ultrasound and magnetic resonance , as well as its use in radiotherapy for the treatment of diseases.

When observing the frequency of these subjects, 2 to 4 weekly classes can usually be observed, which will vary according to the educational institution. Such workload becomes a limiting factor in the face of so many scientific and technological advances that are seen daily in the field of natural sciences.

With the advancement of technology and the implementation of industry 4.0, it is up to the educator to renew the theme referring to ionizing radiation, since issues related to artificial intelligence, robotics and the internet have been increasingly expanded in the environment, so that they will provide advances scientific evidence for the area in question.

While in the eighth year of elementary school II glimpses related to ionizing radiation are seen, such as the basic concepts for obtaining nuclear energy and the benefits that this type of energy brings, in the final year of elementary school II new skills related to the theme, as can be seen in the figure below.

## HABILIDADES

**(EF08CI06)** Discutir e avaliar usinas de geração de energia elétrica (termelétricas, hidrelétricas, eólicas etc.), suas semelhanças e diferenças, seus impactos socioambientais, e como essa energia chega e é usada em sua cidade, comunidade, casa ou escola.

**Figure 1:** BNCC skills for the eighth year of elementary school II, in this proposal we can observe how the issue of types of energy is actually addressed, in which nuclear energy is part of the content covered.

## HABILIDADES

**(EF09CI06)** Classificar as radiações eletromagnéticas por suas frequências, fontes e aplicações, discutindo e avaliando as implicações de seu uso em controle remoto, telefone celular, raio X, forno de micro-ondas, fotocélulas etc.

**(EF09CI07)** Discutir o papel do avanço tecnológico na aplicação das radiações na medicina diagnóstica (raio X, ultrassom, ressonância nuclear magnética) e no tratamento de doenças (radioterapia, cirurgia ótica a *laser*, infravermelho, ultravioleta etc.).

**Figure 2:** BNCC skills for the ninth year of elementary school II, in which it can be observed how the study of science related to the proposed theme is actually carried out, with greater depth when dealing with ionizing radiation.

When only the biology content is observed, a teaching pattern can be observed regarding ionizing radiation, bringing mostly the biological effects of ionizing radiation, such as radiolysis and cell death. Fundamental principles such as ALARA, are addressed within these materials in a superficial way due to many logistical issues related to all the content that must be addressed throughout the school year, which brings as a consequence a restriction and limitation in the knowledge of these young people to what in fact it deals with ionizing radiation.

## HABILIDADES

**(EM13CNT103)** Utilizar o conhecimento sobre as radiações e suas origens para avaliar as potencialidades e os riscos de sua aplicação em equipamentos de uso cotidiano, na saúde, no ambiente, na indústria, na agricultura e na geração de energia elétrica.

### **Figure 3:** BNCC skills for high school

According to Durkheim, a social fact is “every way of acting, whether fixed or not, capable of exerting an external constraint on the individual; or, still, that it is general in the extension of a given society, presenting its own existence, independent of the individual manifestations that it may have”, thus, the importance of the teacher in the process of development of young people, especially in the school environment, is notorious, even more if dealing with a subject that must instigate the individual as it is observed in the natural sciences.

What can actually be observed in this issue is the need to implement new models of approach related to ionizing radiation, with a view to presenting new terms and standards for these students in a way that stimulates their curiosity. Visits to specialized institutes, lectures and even films on the subject can be used as pedagogical tools in favor of the dissemination of content among these young people.

### **3. CHALLENGES AND PERSPECTIVES OF EXPERIMENTATION AND EAD**

Other points to be discussed are directly linked to practical teaching and also to the Ead teaching model that become a great challenge for this teaching and learning process related to ionizing radiation.

Experiments related to natural radiation can be considered a starting point, in which the use of portable detectors becomes a viable idea, as it would be possible to raise several questions about ionizing radiation, as well as the understanding that it is naturally present in the environment. our planet, thus demystifying and bringing these students closer to the theme.

In the presupposition of distance education education, we can highlight the use of virtual reality glasses, for an immersion of these students in laboratories and institutions that use ionizing radiation, because then the accessibility of these students with this type of environment would result in a greater understanding of how a laboratory works on these issues. Another point also to be analyzed and discussed is the use of informal teaching environments that are found virtually, which mainly during the period of the Covid-19 pandemic were widely used,

In this way, countless alternatives to instigate teaching can be adopted so that the experience, both practical and in the distance education model, can in fact result in greater interest in the proposed theme.

### **4. CONCLUSION**



Primarily, it is necessary to carry out a mapping study to understand the absorption of this content in the classroom in order to plan an ideal teaching model for the reality of these students, as factors such as the language used with them will directly influence what will be actually understood by them.

The limitation regarding the workload also becomes an important factor, making the educator need to think about other alternatives besides the classroom so that students can actually have a more in-depth perspective.

Another point is the need for a more in-depth study on how in fact the implication of this content has been addressed in the classroom, bringing new perspectives about the methodologies and program content of ionizing radiation, because when we talk about teaching practice, which consists of the teacher in the classroom context and its mediation, is of paramount importance in the learning process. It is thanks to the capacity for innovation in mediation processes that pedagogical advances have made it possible and more attractive content such as ionizing radiation, generating new perspectives and dreams for these students.

The use of technologies is also a very important point, whether using detectors in experiments carried out in the classroom or even the use of distance learning methods for teaching these young people, bringing as the main point the interest factor and greater learning of these students when deals with ionizing radiation.

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