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Contemporary transversal themes in science education: an analysis based on ENPEC's works

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ABSTRACT

This article deals with the Contemporary Transversal Themes in Science Education based on proposals published in the annals of the National Meeting for Research in Science Education (ENPEC) and shows the importance of conceiving Science Education with a view to civic training. The research aims to discuss the possibilities of using Transversal Contemporary Themes in Science Education, taking it as a mandatory component of Basic Education in science classes. We used a qualitative methodology, conducting a bibliographic survey of data selected in the annals of ENPEC, from 2005 to 2019. We use Discursive Text Analysis as a methodology to analyze the information. Contemporary Transversal Themes are a proposal to address social, cultural, and political issues in education, to develop civic and contextualized training. We identified research and educational proposals recommending the inclusion of social aspects in Science Education through transversality and articulation with scientific knowledge. We believe that Transversal Themes and Transversal Contemporary Themes must be recurrent in the school curriculum to promote civic education.

KEYWORDS: Transversal Themes. Science Education. Civic Education.[1]

INTRODUCTION

Science Education is a mandatory component of formal education and one of the key features in the teaching-learning school process. It needs to be articulated with an integral formation and must provide inclusion in social practices. In this sense, the present article approaches Contemporary Transversal Themes in Science Education, for we understand the inclusion of these themes in the science classes may enable the articulation of scientific knowledge with social issues.

The Transversal Themes (TT) of the National Curriculum Parameters (NCP) contextualize its importance for education and present topics to be studied, driven by ethics, cultural plurality, sexual orientation, environment, and health. In addition, through NCP for 3rd and 4th cycles, referring to the 5th, 6th, 7th, and 8th grades (currently, the cycle system refers only to three cycles, comprising first and final years, referring to elementary school (MENEZES, 2021), and high school for the third cycle), it was introduced a sixth transversal theme entitled "Work and consumption, to understand the sociocultural issue" (BRASIL, 1998). Besides transversality, these documents suggest pedagogical guidelines that permeate interdisciplinary issues. (BRASIL, 1997; DAMÁSIO, 2004; LIMA, 2008).

The initiative to include social themes in Basic Education is based also on the assumption that it is essential that students and teachers be aware of political, cultural, and historical characteristics involving Brazilian society. That is why we can speak about the social nature of the Transversal Themes and identify their aim so that it no longer is an area of knowledge incorporated as a school subject. Thus, it can be present, in an interdisciplinary and transversal way, in all subjects, even enabling collective work among teachers and school articulations with its community. (DAMÁSIO, 2004; LIMA, 2008; CORDEIRO, 2019).

From new current contexts, the proposal of Transversal Themes underwent a change, mainly influenced by the National Common Curricular Base (NCCB) (BRASIL, 2018), an official document that complements NCP and brings new guidelines Basic Education, based on the acquisition of new skills and competencies for several areas of knowledge included in school education (BRASIL, 2018; CORDEIRO, 2019). The BNCC is a common ground for the construction of curricula in educational systems across the country. (ALBINO; SILVA, 2019; CORDEIRO, 2019; SILVA, SANTOS 2021).

With the BNCC, the Transversal Themes are now called Contemporary Transversal Themes (CTT) (BRASIL, 2019). Contrary to what was proposed in the NCP, which did not postulate working with the Transversal Themes as mandatory, now its discussion becomes an essential part of school subjects. Therefore, they must be present in the school and teaching planning of Basic Education institutions. (BRASIL, 2019; CORDEIRO, 2019).

So, in this article we discuss the possibilities of using CTT in the teaching of sciences in Basic Education, taking it as mandatory. For this purpose, the CTT must be articulated with scientific knowledge and align themselves with the understanding of the social role of Science Education in the constitution of a democratic, plural, and civic education. With this in mind, this article aims to understand how studies in Science Education approach the contemporary transversal themes and their interfaces with science teaching.

Regarding this article structure, we chose to approach the topic contextualizing the Transversal Themes based on the publication of NCP (1997). Then, Contemporary Transversal Themes are presented according to the NCCB (2018). Through these documents, we established a theoretical section referring to CTT in Science Education. Afterward, we describe the methodology used, using data identified via Discursive Textual Analysis (DTA), applied to 12 selected works. Having completed this step, we present our final considerations.

TRANSVERSAL THEMES IN THE NATIONAL CURRICULUM PARAMETERS (NCP)

Transversal Themes are defined and understood by the NCP (BRASIL, 1997) as matters aimed at understanding social reality and rights and accountability concerning personal, collective, and environmental life. Thus, they are transversal content, for they do not belong to a single field of knowledge and can be discussed in transversality, multidisciplinary, and interdisciplinarity. In other words, they are topics to be discussed in the classroom by all school subjects, considering students' reality, contexts, and their integral formation for social interaction and political and cultural participation in society. Furthermore, the Transversal Themes are also of crucial importance for defining real situations and applying possible social interventions to the thought by the teacher and students, according to NCP for Transversal Themes:

> The inclusion of social issues in the school curriculum is not an unprecedented concern. These themes have already been discussed and incorporated into the areas related to the Social Sciences and Natural Sciences, in some proposals, even creating new areas, as in the case of the Environment and Health themes. (BRASIL, 2019, p. 4).

From the Transversal Themes onwards, discussions over social reality and problems and contexts of cultural, political, and historical order were included in the school curriculum. They began to be part of the subject programs because of the requirement of the guiding documents until then. At this point, the Transversal Themes proposal rises in the NCP, in the end of the 1990s (BRASIL, 1998), a document that poses the guidelines for the pedagogical work across the country, preceding the National Curriculum Guidelines (BRASIL, 2013) and, more recently, the National Common Curriculum Base (NCCB) (BRASIL, 2018).

One of the perspectives for the Transversal Themes is that of transversality. Transversality is a proposal from the National Curriculum Parameters (1997), which is based on the articulation of social content with specific components of school subjects. The document states:

> Therefore, it was decided to integrate them into the curriculum through what is called transversality: it is intended that these themes integrate traditional areas to be present in all of them, relating them to issues of the present. (BRASIL, 1998, p. 27)

According to the Transversal Themes of the NCP (1998), transversality allows establishing, in the educational practice, a relationship between the learning of theoretical and systematized concepts and real-life issues, which are transformed based on historical and cultural changes in society.

So, we realize that the work with transversality is a pedagogical possibility so that the school and teachers can, along with their students, experience discussions on social reality, both about the community of which the school is part and even the social problems of Brazil.

CONTEMPORARY TRANSVERSAL THEMES IN THE NATIONAL COMMON CURRICULAR BASE (NCCB)

Today, the NCCB guides the current guidelines for pedagogical work in Basic Education and, as such, it is an important foundation for building school curricula in education systems. It is seen as plural and contemporary document, offering a conception for the teaching process based on the development of skills and competencies (VIÇOSA *et al.,* 2020).

Therefore, NCCB guidelines present the Transversal Themes in a new perspective and nomenclature. In its additional document, titled "Temas Contemporâneos Transversais na BNCC – Contexto Histórico e Pressupostos Pedagógicos" (BRASIL, 2019), the transversal themes are called Contemporary Transversal Themes (CTT). Updating its nomenclature shows concern in attributing a certain up-to-dateness to the proposed topics. It also brings a wider range of themes to be addressed to school subjects, divided into macro thematic areas. They are the following: Citizenship and Civism; Science and Technology; Economy; Environment; Multiculturalism and Environment (BRASIL, 2019).

The inclusion of new themes aims to meet the new demands that are assigned to the school and education, because of social changes and a new understanding of the various characteristics of the Brazilian society. (BRASIL, 2019; SILVA; ARAUJO, 2020) Thus, the fifteen themes to be considered are distributed in the following macro thematic areas:

- Environment. There are two themes: Environmental education, Education for consumption.
- Economy. There are three themes: Work, Financial education, and Tax education.
- Health. There are two themes: Health, and Food and nutrition education.
- Citizenship and Civism. There are five themes: Social and Family life; Traffic education; Human Rights education; Children's and adolescent's rights; Aging process, respect, and appreciation of the elderly.
- Multiculturalism. There are two themes: Cultural diversity; Education for appreciation in the historical and cultural Brazilian influences.
- Science and technology. One theme: Science and technology.

According to the NCCB, these themes are crucial for Basic Education, as they can enable the development of skills and competencies bound to curricular components. (BRASIL, 2019) In addition, such themes affect human life in the context of their inter and intrapersonal relationships and the actions of humanity around the world. That is why they ought to be considered in all school aspects,

including Science Education, since scientific content is not neutral and is integrated into social, historical, and political factors, being crucial in the realization of an integral and civic formation (SILVA, 2009; CORDEIRO, 2019).

Thus, while in the NCP the Transversal Themes were optional, they became mandatory after being regulated by law; in the additional document of the NCCB, this mandatory aspect of the TT was reinforced when it mentions "essential content for Basic Education and also mandatory skills of every component of the curriculum" (CORDEIRO, 2019, p. 71).

In this way, the NCCB attributes a mandatory nature on school curricula to the Contemporary Transversal Themes, and its discussion is not limited to specific school subjects but comprises all those that make up the curriculum. So, the access to the discussions considers all students, enabling them to clarify issues that permeate Brazilian society as well as the scientific knowledge interface with contemporary social, political, and cultural aspects.

TRANSVERSAL AND CONTEMPORARY THEMES IN SCIENCE EDUCATION

In the different areas of knowledge, the school pedagogical action comprises practices for the teaching and learning process and the sharing of knowledge in a systematic and organized way, to prepare, at elementary and high school levels, students for several social and professional sectors. (DAMIS, 2009; LIBÂNEO, 2013)

Thus, we consider the need to reflect on a pedagogical practice that is not understood as transmission of content, but which also has room for the inclusion of discussions of topics related to life and cultural, historical, and political development in society. Through this, we note that the Transversal Themes in Science Education are important for the inclusion of oneself in society. The NCP for Natural Sciences emphasizes that one of the characteristics of the area is that

> The content must be relevant from a social viewpoint and have revealed its effects in culture, to allow students to understand, in their daily lives, the relationship between man and nature, mediated by technology, overcoming naïve interpretations of the surrounding reality. The Transversal Themes points to content particularly appropriate for this. (BRASIL, 1997, p. 34).

We realize that the pedagogical work with the TT in Science Education is a chance for articulating social, cultural, and political situations with scientific content. Topics as health, sexuality, environment, and others, are commonly discussed in the Natural Sciences, according to NCP (1997). With that, the transversality approach corresponds to the inclusion, in these topics, real situations interconnected to them and that occur in society.

> The Transversal Themes' objective and content are incorporated in the areas that already exist, and in the school's educational work. They rise as alternatives so that the teaching takes place in a more globalized way and closer to students' reality, when they are taught differently in the different subjects in the interdisciplinary scope. (LANES *et al.*, 2014, p. 28).

Bringing themes as environmental education, cultural diversity; Education for appreciation of the historical and cultural Brazilian influences; Science and technology; Health and Food and nutrition education in Science classes, as

proposed in the NCCB, is a methodological possibility for approaching situations related to daily life. In this aspect, it is important to understand that bringing up these topics in a contextualized way means opening dialogical discussions with students with their teachers, based on a reflection over these themes, in a globalized way. Martins and Barbosa (2015) write:

> To speak of meaningful learning is to assume that learning has a dynamic character that requires targeted-teaching actions so that learners deepen and expand the meanings created through their participation in teaching and learning activities. (SILVA; MARTINS; BARBOSA, 2015, p. 98)

In Science Education, scientific topics can be taught so that they collaborate with the construction of knowledge, competencies, and skills of students. In our opinion, it also must consider meaningful pedagogical actions that set knowledge relationships with students. In this respect, we understand that both the Transversal Themes and the Contemporary Transversal Themes ought to be a starting point for the adoption of dynamic and active methodologies that interact with the students' realities (CORDEIRO, 2019).

As mentioned above, possibilities of activities with the Contemporary Transversal Themes emerge from science classes. These classes are strongly linked to Natural Sciences (Environment, Health, Multiculturalism, Science and Technology, etc.). In this sense, our approach of these topics will be shared in a globalized way in the classroom, that is, it will be a contextualized to a given reality, whether local or state. Thus,

> It is necessary that Science Education provides the development of competencies involving social issues, that allow students to deal with information, understand them, elaborate on them, challenge them, when necessary. In other words, to understand the world and act on it autonomously, using knowledge acquired in Science classes; understand nature and society as a network of relationships of which the human being is part, and with which they interact, of which they depend on and in which interferes. (ALMEIDA, 2006, p. 3-4).

The process of articulation within the school is crucial so that Natural Sciences and its subjects incorporate, whenever possible, Transversal Themes in association with scientific knowledge. Because this articulation is important for students to be also participants in real learning situations.

For instance, in Environmental Education classes it is possible to contextualize the topic by referring to several contemporary events, such as the burning of large forests, lack of investment by public administration for the preservation and maintenance of natural forests, and implications for health with a visible lack of care for the environment. It is possible to provide a discussion on social problems, designing an education that goes beyond concepts. Silva, Martins and Barbosa (2015) criticize artificial classes for teaching environment and ecology:

> The environment or ecological topics, primarily those linked to city waste collection, are a priority only understood due to their rational, almost technical appeal, and their clear relationships with the area of sciences. The fact that science textbooks present themes such as the environment and ecology lend legitimacy and support for the work of teachers, avoiding further justifications in addition to those of humanist nature. (SILVA; MARTINS; BARBOSA, 2015, p. 94).

Furthermore, health is particularly important in science classes. This topic can be addressed in a transversal way by pointing out the following issues: healthcare, precautions, the importance of vaccination, etc. It is also crucial discussing healthcare as well as issues related to access and rights to public and free health services. Health education is also necessary and must play a prominent role, promoting students' awareness about their rights and granting them tools for individual and collective intervention (ALMEIDA, 2006). Based on the observations, we think that Science Education can go beyond what is specified in school curricula. As mentioned above, Contemporary Transversal Themes are crucial for articulating conceptual content with real-world situations. This teaching paradigm is important to bring students to a participatory sphere of education:

> For this very reason, education, in order to not instrument having as its object a subject – a concrete being that not only is in the world but also is with it – must establish a dialectical relationship with society's context to which it is intended, when it is integrated to this environment that, in turn, offer special guarantees to man through his rooting in it. Superimposed on him, it becomes "alienated" and, therefore, inoperative (FREIRE, 2011, p. 35).

Freire suggests teaching science as part of the educational process, in a constant dialogue with social factors. As Lanes *et al*. (2014, p. 29) state, "in this sense, it is necessary for each teacher to provide room for addressing relevant, current themes, themes that are part of the daily lives of students". According to the authors, the purpose is reaffirmed because

> […] we understand it is needed to study the reality with which students find themselves to defining situations, issues and topics to be studied with them. Among activities to be carried out, we also call attention to the *sharing of results*, as this action may contribute to the development of social commitments. (SILVA; STRIEDER, 2020, p. 14, emphasis added)

Given the involvement with social issues, is there a way to make things meaningful without associating them to real situations experienced by students? In a conversation between scientific knowledge and transversal contemporary themes, Science Education establishes a teaching and learning process and enables the development of relationships with power.

METHOD

We used a qualitative approach, as it aims to understand a certain social phenomenon from the analysis of perceptions, intentions, and behaviors, describing the problem's complexity to understand and classify dynamic processes experienced by social groups (RICHARDSON *et al*., 2007). This is bibliographic research.

For Oliveira (2007), bibliographic is the study and analysis of documents in the scientific domain, such as books, journals, encyclopedias, critical essays, dictionaries, and scientific articles. The main purpose is to provide researchers with direct contact to works, articles, or documents dealing with the topic studied. With that, we carried out a survey of scientific articles published in the minutes of the National Meeting for Research in Science Education (ENPEC), from 2005 to 2019.

ENPEC is a biennial event endorsed by the Brazilian Association for Research in Science Education (ABRAPEC). It has been held since 1997, when the first edition took place in Aguas de Lindoia city, in the state of Sao Paulo. Today, it is the main ABRAPEC event. It is held every two years in different places and brings together several researchers and workers in the field of Science Education. The most recent edition took place from June 25th to 29th, 2019, at the Federal University of Rio Grande do Norte (UFRN), in the city of Natal, RN. The event's theme was "Research in Science Education: Difference, Social Justice, and Democracy."

Thus, the research steps that allowed us to gather data for our analysis involved the following procedures: at first, we conducted a search on articles published in the minutes of ENPEC meetings from 2009 to 2019. To guide our study towards the topic we had in mind, we decided to select articles that have the following descriptors in their titles, abstracts, or keywords: transversal themes; contemporary transversal themes; social themes; socioscientific themes. We found 13 articles, as seen in Table 1.

We used as source papers edited in annals of the National Meeting for Research in Science Education (ENPEC), seeking those dealing with transversal themes and contemporary transversal themes in Science Education. The time frame considered here is 2005-2019. We chose these years in virtue of the low presence of such publications (CORDEIRO, 2019). It may have occurred because many papers are focused on the presence of topics such as Education CTS (science, technology, and society), which also proposes an articulation between science, technology and society, in the perspective of understanding the effects of scientific and technological development on social processes.

Table 1 - Papers found at ENPEC (2005-2019) - Descriptors: transversal themes; contemporary transversal themes; social themes; socioscientific themes

Article title (year)	Descriptor
R1- The importance of contemporary social themes in science teaching training (2005)	Social themes
R2- Transversal themes: what elementary school teachers think about the interdisciplinary approach of these themes (2005)	Transversal themes
R3- Games and sciences in interdisciplinarity in transversal themes perspective: the puzzle matches example (2009)	Transversal themes
R4- The contribution of contemporary social themes approach in teacher initial training (2011)	Social themes
R5- Media and social themes: expanding the CTS teaching in chemistry degree (2013)	Social themes
R6- The approach of socioscientific themes in Science Education national journals from 2005 to 2014 (2015)	Socioscientific themes
R7- Environmental education, environment, and health: study on high school students' perceptions (2017)	Transversal themes
R8- The appropriation of curricular integration discourse by Science Education research 2017)	Transversal themes
R9- Socioenvironmental themes in Natural Science teaching training: reflections (2019)	Social themes
R10- Environment as transversal theme in Biology: photography as discursive tool (2019)	Transversal themes
R11- Understandings on drug and its harmful effects on the body: a case study (2019)	Transversal themes

R12- The CTS relations and the civic formation in Biology: necessary articulations for teacher training (2019)	Socioscientific themes

Source: Own construction (2020).

Having selected the papers, identified from R1 to R12, we read them in full searching for perspectives they presented to ensure they are adequate for our purpose, that is to analyze, based on the abstracts, what they say about transversal themes; contemporary transversal themes; social themes; and socioscientific themes, in the development of activities conducted in classrooms (Sciences, Chemistry, Physics, Biology).

The qualitative data analysis methodology used is the Discursive Textual Analysis (DTA) (MORAES; GALIAZZI, 2016). We opted for this methodology because we believe DTA allows us to study the data so that a deeper understanding of some phenomena can occur. These phenomena are classified by impregnation processes coming from interpretations, (de)constructions, synthesis, and other activities carried out by the researcher in an immersive process.

In addition, the DTA is useful for the reorganization of the theoretical framework. It raises re-readings and expansions so that we can interpret the data collected. These data emerge gradually, in the comings and goings conducted during the writing and rewriting process based on three recursive procedures:

I. Unitarization. It consists of selecting, disassembling, and fragmenting sentences in the search for units of meaning from the papers.

II. Categorization. Step in which units are grouped according to their similarities and approximations of common factors. They help to identify positions presented in the text fragments.

III. Metatext. It allows us to build new understanding in a dialogue with data, the theoretical framework, and the researchers' contributions. It might be used as the moment in which one communicates the data analysis results, which may or may not lead to a new contribution.

The analysis we conducted allowed us to identify some of the approaches used in the social themes applied in Science Education. Thus, we were able to elicit three categories that appear recurrently in research, namely: 1) Science Education for Civic Training; 2) Science Education Teacher Training and Contemporary Transversal Themes; and 3) the Articulation of Social Themes and Scientific Knowledge.

Having obtained our final categories, we move on to present our data analysis and metatext. In the DTA, metatext is the closing step of the data analysis process.

DISCUSSION AND RESULTS

The approach of Contemporary Transversal Themes in Science Education is a based on the perspective of including social, cultural and political themes in Science classes, considering matters of interdisciplinarity and transversality in the study of such topics, articulating them with scientific knowledge and enabling that students have a integral training that considers Science as a something constantly

dialoguing with social changes. To present our results and discuss what we found in the papers analyzed, we show at first what their abstracts say.

SCIENCE EDUCATION FOR A CIVIC TRAINING

In this category, we discuss the principle that deals with Science Education for a civic training found in the papers analyzed. We found that understanding the Science Education social function in the process of creating critical and reflexive individuals is crucial to fulfill the foundation of education, which is the integral training of students. R10 holds transversality as a principle to integrate conceptual knowledge with social knowledge. There is the perception of Science Education as a non-neutral component, one that must contribute to overcoming common sense and in the scientific literacy process.

What we have seen recurrently in the papers is the understanding according to which Science Education must provide subsidies and tools so that students understand civic and social participation principles for their inclusion in society. For instance, R1 and R15 suggest a path in which teaching can reflect on daily lives of students, allowing an awakening to science and community. This perspective enables knowledge relationships that students build throughout their learning process. According to Cordeiro (2019), teaching social themes leads the teaching and learning process to go beyond memorizing scientific concepts. It enables the connection between knowledge and reality. As mentioned in R1, integrating social themes in Science Education provides the construction of citizenship and the development of students' integral formation.

In this same sense, R2 and R7 demonstrate that Science Education can articulate knowledge of the contemporary world so that they provide students to understand the world around them, as well as decision-making and individual and collective actions, and how scientific and technological developments impact on society and the environment. Lanes *et al*. (2014, p. 27) writes that contextualizing science with reality enables a "more consistent work in terms of a training that let people act in a complex society and that is in permanent transformation, when linked to the development of transversal themes."

In the process of building learning in Science Education, R9 and R10 express concern about the curriculum. They say that, in many cases, the way schools' approach scientific topics does not help students to relate them to social factors. They point to a certain understanding about content that convey the idea of neutrality and timelessness. Almeida (2006) said that schools need to create ways in which education does not turn into a transmission of fixed and decontextualized knowledge. Schools contribute to educating and exercising people for living in society. With that, Science Education must focus on a scientific concepts approach, that are linked to civic training, so they can provide a learning process contextualized with historical, social and political factors, since these components influence the scientific production and human development. (CACHAPUZ, 2005; GARVÃO; SLONGO, 2019)

SCIENCE TEACHER TRAINING AND CONTEMPORARY TRANSVERSAL THEMES

In this category, we have seen how the papers analyzed indicate the importance of teacher training in Science Education to address social themes. This is because training teachers in Science, because of a civic education, is one of the reverberating focuses of the studies. It shows how this element is crucial for the educational process. In this line of thought, R2 points out that the training of teachers must equip them so that they can work in articulating social themes with scientific knowledge. In the same way, R9 say that, in teacher training for teachers of Science Education reflections on the importance of social themes must be offered for the building of civic practices and Basic Education students' attitudes.

Addressing social themes in Science Education is not considered an easy task that could be done overnight. R12 suggests that for the articulation of science, technology, and society takes place, it is crucial that, in teacher training, curriculum proposals are included focusing on themes to support the pedagogical practice. Thus, we understand that teachers must be trained with specific knowledge to work with social themes, in conjunction with social, political and cultural aspects of society.

In this regard, R10 and R1 indicate that undergraduate, in their initial training, must reflect on the social role teachers have in the face of the society's contemporary challenges. They say that in the continued training process, they can access training courses in their search for building theoretical frameworks and methodologies to work with social themes in Science Education. Silva, Martins and Barbosa (2015) suggest that there are gaps in the initial training in Science Education making it difficult work with social topics. However, a teachers' constant concern towards these challenges paves a way in the search for ways to build theoretical and practical knowledge, so that they can work with contemporary social themes in a transversal manner in their pedagogical planning.

Likewise, R9 and R4 hold an inclusion of Transversal Themes in the training of Science Education teachers to equip future teachers with practices that deal with social themes at schools. We found that recent studies have been relevantly concerned with the issue of teacher training, endorsing social issues in the Science Education context. Therefore, their training curricula must be open to a reconfiguration that is aimed to train civic teachers, teaching them how to work the topic of citizenship at schools. In this same regard, R12 points out the need to reformulate curricula so that there is room for a Science Education school subject concerned with critical, reflective and civic training. For this reason, R12 says that Science Education teacher training is crucial for addressing social themes in Basic Education classes.

ARTICULATION OF SOCIAL THEMES TO SCIENTIFIC KNOWLEDGE

In this category, we discuss the papers that point out ways of articulation between social themes and scientific knowledge. We also identify educational and methodological proposals that can be adopted in Science Education and the integration of school subjects. R6 maintains that social, economic, political, and cultural dimensions must be present in classes to encourage students to establish

relationships between school experiences in Science Education with situations and issues taken from everyday life and thus also develop social accountability.

We recognize that there are possibilities for Science Education to play a social role in the formation for citizenship, based on the inclusion of social themes in the curriculum. We understand that scientific knowledge must be contextualized with these themes. Relating the issue of scientific knowledge to its harmful effects on the human body, R11 points out the importance of education over the functions of the body's systems in the context of care and prevention. In the paper, we read:

> This educational proposal sought to emphasize some general and specific competencies of the new National Common Curricular Base (NCCB). Some of the general competency would be the exercise of students' intellectual curiosity, appreciation and care related to their physical and emotional health, and leadership in decision-making in a personal and collective way (R11, p. 3).

As we can see, it is an educational proposal that is not based on teaching concepts about health, body, and drugs. It is based on a reflective and critical training that relates scientific topics to social reality and the issue of social accountability through decision-making. Another study that follows this path is R3. It articulates Math in conjunction with Science Education and other subjects, an educational proposal about the use of matches, which allowed discussion issues such as reforestation, recycling, the greenhouse effect, environmental education. In R3, the educators were able to work with conceptual, procedural, and attitudinal curriculum ideas. They could involve students in the process, something promoting leadership and relationships with knowledge.

In the articulation of social themes with scientific knowledge, R3 holds that the use of educational games needs to make available components of students' everyday lives, as well as relates to some scientific concept to be used in Science Education. In addition to enabling a form of active learning, the games lead to a differentiated assessment of a teaching and learning process by teachers and students. In this sense, R5 says that for these proposals to become effective at schools, there needs to be a curricular reconfiguration focused on approaching themes socially relevant in Science Education. They need to use teaching materials made from the daily lives of students and link scientific knowledge to historical and social problematization. R7 holds that articulating scientific knowledge and components from social, historical, and political fields establishes a learning environment that raises social accountability, citizenship training, and access to several and plural knowledge, things that escape traditionalism present so deeply in Science Education.

The curricular integration is meaningful for the teaching and learning process in Science Education. In addition to knowing relationships with topics studied at schools, it allows students to contextualize real situations they experience in daily life. R8 holds that providing knowledge disconnected from students' reality does not suffice to enable learning. Because it is a fundamental issue in education introducing people into the social order so that they can exercise their citizenship functions and political and cultural exercise.

FINAL CONSIDERATIONS

Challenges of addressing Contemporary Transversal Themes in Science Education are given in different ways in the pedagogical process of schools. However, we see that there is a chance for the inclusion of social themes in Science and other subjects, generally recognized for their conceptual content. In many cases, these topics seem to have no connection to daily life. On the other hand, according to this article's objective, we identify that an approach to these social themes in education, as presented in NCP and NCCB, can be developed, and the use of Transversal Themes and Contemporary Transversal Themes is an educational possibility.

In the papers we analyzed, we see that their authors point to the importance of social themes in Science Education to understand them as a crucial component in the formation of citizenship, where their specific knowledge can be developed in view of a critical, reflective education that considers the students' reality. We also note that, for social issues to be addressed in Science Education, it is crucial that in teacher training, both initial and continued, teachers have access to knowledge about social themes in Science Education. In this way they can build theoretical frameworks and methodologies for their work at school. Finally, we understand some possibilities of articulation between scientific knowledge and social aspects.

We also note some scarcity of research related to the theme in one of the main events of Science Education, that brings together several studies conducted in Brazil. With that, this paper aims to elicit further research to show new perspectives, educational proposals, and methodologies to deal with social themes in Science Education. Scientific research has a crucial role in this process, highlighting real conditions of new Science Education approaches. We think Transversal Themes and Contemporary Transversal Themes must be recurrent in school curriculum, meaning that they must lead to a civic education and make students, teachers, and the community understand the effects of society's aspects on Science and its role in the development of humanity.

Temas contemporâneos transversais no ensino de ciências: uma análise a partir dos trabalhos do ENPEC

RESUMO

Este artigo trata da abordagem de Temas Contemporâneos Transversais no Ensino de Ciências, a partir de propostas evidenciadas em trabalhos publicados nos Anais do Encontro Nacional de Pesquisa em Educação em Ciências – ENPEC, e mostra a importância de conceber o Ensino de Ciências com vistas a uma formação cidadã. O objetivo da pesquisa é discutir sobre as possibilidades de uso dos Temas Contemporâneos Transversais no Ensino de Ciências, compreendendo-o como elemento obrigatório da Educação Básica nas aulas de Ciências. A metodologia do trabalho é de natureza qualitativa e o procedimento se caracteriza como levantamento bibliográfico de dados selecionados nos Anais do ENPEC, entre os anos 2005 e 2019. Utilizamos como metodologia para analisar as informações a Análise Textual Discursiva. Os Temas Contemporâneos Transversais se constituem como uma proposta de abordagem de temas de cunho social, cultural e político na educação, para desenvolver a formação cidadã e contextualizada. Verificamos pesquisas e propostas didáticas que recomendam a inserção de aspectos sociais no Ensino de Ciências através da transversalidade e articulação com conhecimentos científicos. Consideramos que os Temas Transversais e Temas Contemporâneos Transversais devem ser recorrentes no currículo escolar, a fim de promover uma educação cidadã.

PALAVRAS-CHAVE: Temas Transversais. Educação em Ciências. Educação Cidadã.

NOTES

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