

Sensitive Topics in Science and Biology Teaching

Temas Sensíveis e Ensino de Ciências e Biologia Temas Sensibles y Enseñanza de Ciencias y Biología

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Abstract

This article provides theoretical and methodological reflections on approaches to sensitive topics in Science and Biology Education. We explore conceptual references to discuss theoretical convergences and divergences between sensitive issues and other terms used in research in the human sciences and science education, such as controversial issues, socio-scientific issues, socially acute questions, and cordial content, among others, in an attempt to organise and relate them to their respective objects of study. We draw on the work of Ivor Goodson and Michael Apple to understand the historical tensions shaping the school subjects Science and Biology, particularly those related to current incursions by conservative social groups seeking to impose Judeo-Christian values on these curricula in the name of an objectivity allegedly based on impartial consensus. We present research findings that support our proposition of the relational and multifaceted nature of sensitive topics, adopting the narrative curriculum as an alternative to prescriptive curricula. This approach anchors the emotions and sensitivities required when addressing these topics and embraces the life stories of students and teachers. We conclude by advocating for the potential of life history research in understanding this relational aspect, as it is a privileged methodology for exploring the tensions between personal life memories and professional experience.

Keywords: sensitive topics, controversial issues, socially acute questions, life histories

Resumo

Neste artigo, produzimos reflexões teóricas e metodológicas sobre a abordagem de temas sensíveis no ensino de ciências e biologia. Percorremos referências conceituais para discutir aproximações e afastamentos teóricos entre os temas sensíveis e outras nomenclaturas empregadas em pesquisas das ciências humanas e da educação em ciências como os temas controversos, as questões sociocientíficas, as questões socialmente agudas, os conteúdos cordiais, entre outras, ensaiando organizá-las e relacioná-las com seus respectivos objetos de estudo. Tomamos como base os trabalhos de Ivor Goodson e Michael Apple para compreender as tensões históricas que constroem as disciplinas escolares ciências e biologia, principalmente as relacionadas às atuais incursões de grupos sociais conservadores que tentam hegemonizar valores judaico-cristão nos currículos destas disciplinas em nome de uma objetividade baseada em consensos supostamente imparciais. Apresentamos resultados de pesquisa que sustentam nossa proposição do caráter relacional e multifacetado dos temas sensíveis, assumindo o currículo narrativo como alternativa à prescrição curricular por ancorar as emoções e sensibilidades que são demandados na abordagem destas temáticas e acolher as histórias de vida de discentes e docentes. Concluímos com a defesa do potencial da pesquisa com história de vida na compreensão deste aspecto relacional, uma vez que é uma metodologia privilegiada no sentido de tensionar memórias de trajetória de vida pessoal e experiência profissional.

Palavras-chave: temas sensíveis, temas controversos, questões socialmente vivas, histórias de vida

Resumen

En este artículo, desarrollamos reflexiones teóricas y metodológicas sobre el abordaje de temas sensibles en la Enseñanza de Ciencias y Biología. Recorremos referencias conceptuales para discutir aproximaciones y distanciamientos teóricos entre los temas sensibles y otras nomenclaturas empleadas en investigaciones de las ciencias humanas y de la educación en ciencias, tales como los temas controvertidos, las cuestiones sociocientíficas, las cuestiones socialmente agudas, los contenidos cordiales, entre otras, intentando organizarlas y relacionarlas con sus respectivos objetos de estudio. Tomamos como base los trabajos de Ivor Goodson y Michael Apple para comprender las tensiones históricas que conforman las disciplinas escolares de Ciencias y Biología, especialmente aquellas relacionadas con las actuales incursiones de grupos sociales conservadores que buscan hegemonizar valores judeocristianos en los currículos de estas disciplinas, en nombre de una objetividad supuestamente basada en consensos imparciales. Presentamos resultados de investigación que respaldan nuestra propuesta del carácter relacional y multifacético de los temas sensibles, asumiendo el currículo narrativo como una alternativa a la prescripción curricular, ya que ancla las emociones y sensibilidades que se requieren en el abordaje de estas temáticas y acoge las historias de vida de estudiantes y docentes. Concluimos defendiendo el potencial de la investigación con historias de vida para comprender este aspecto relacional, ya que se trata de una metodología privilegiada para tensionar memorias de trayectorias de vida personal y experiencia profesional.

Palabras clave: temas sensibles, temas controvertidos, cuestiones socialmente vivas, historias de vida

Introduction

In recent decades, we have witnessed intensified disputes over school curricula and public policies for Brazilian education. Groups formed by neoliberals, neoconservatives, and some religious sectors have been gaining political power with the aim of aligning education with their interests and ideological biases, attacking the progressive nature of school curricula and teaching practices, at least in the Brazilian attempts that emerged after the end of the civil-military dictatorship (Borba et al., 2019). Referring to the US context of the early 1990s, Apple understands this ideological conjunction as a “conservative restoration” (Apple, 2001; 2015; 2017), as it associates groups that advocate for more freedom in schools, such as the right of choice for parents and guardians, even though they have particular views on the role of the state for this purpose. Exhibiting characteristics very similar to those seen in Brazil over the last 20 years, this conservative restoration seeks to purge schools of topics that are subject to sociocultural controversy, either through institutional power (bills similar to those of the No Party School Movement) or symbolic power (creating a climate of persecution of teachers’ pedagogical practices), claiming that they belong to the family sphere, specifically that of the patriarchal Judeo-Christian family.

In this field of dispute, feminist movements, LGBTQIA+ movements, black movements, and other social movements with specific organizations, histories, and demands have been expanding their claims for spaces in public administration and

legislative houses and demanding new public policies for inclusion, equality, visibility, and redress for historical injustices. By increasingly coordinating collective actions and mobilizing popular pressure, these groups have worked hard to win rights¹ amid fierce disputes that have impacted scientific production in universities, school curricula, teacher training, and the production of teaching materials in order to incorporate perspectives on gender, sexuality, and racial issues into these different educational guidelines.

In this context, school and university education became the target of this ideological vigilance, which interfered with teaching practices and the teaching of certain content. In this article, we focus on the school subjects of science and biology to examine the uniqueness of curricular themes affected by this vigilance. These subjects take on different formats and meanings, having been historically shaped by multiple influences, including decisive clashes and disputes over which teaching content, methods, and objectives are legitimate and which are not (Goodson, 1997). With traditions rooted in positivism, beginning in the 1960s, the mnemonic and encyclopedic nature of science and biology teaching in Brazil began to be questioned, following the reformulation of American and British science education, due to its inadequacy and departure from the canonical modes of experimental investigation in the natural sciences. Subsequently, the correspondence between teaching and a particular type of scientific activity, albeit hegemonic, was challenged by educational research movements in the 1980s and 1990s, which demanded greater curricular integration of biological content with social issues (Saucedo & Pietrocola, 2019). These movements have gained strength and relevance in recent decades and, mobilizing a diversity of theoretical contributions, research proposals, and pedagogical practices, have converged in explicitly associating the teaching of science and biology in schools with human, social, cultural, and identity issues. Without abandoning the idea that the biological sciences serve as a scientific and epistemic reference for the composition of the school curriculum, the field of research in biology education defends, under different theoretical frameworks, this integration as inseparable from the contribution of this discipline to student education.

Considering, as Goodson (1995) suggests, that school discipline is an amalgam of curricular traditions that integrate academic, utilitarian, and pedagogical purposes, the demands to integrate human issues into scientific understanding, particularly those arising from students' world, are challenged by teachers in their daily lives. The decontextualized teaching of biological concepts, processes, and phenomena—like so many others in science education—seems unable to resist students' demands to attribute meaning as they delve into science and biology. Whether or not these demands are met, classes in these subjects are shaken by questions that technical explanations cannot always satisfy. In particular, there are topics that cannot be answered linearly by teachers, as if

1 The organization of the first National Plan for Women's Policies (PNPM) in 2004 and its second version in 2008, both preceded by the Conferences on Women's Policies (2004 and 2007), the Brazil Without Homophobia Program (BSH) in 2004, the approval of Law 10,639 in 2003, the creation of the National Council for Combating Discrimination and Promoting the Rights of Lesbians, Gays, Bisexuals, Transvestites, and Transsexuals (CNCD/LGBT) in 2010, and the quota law in 2012 are some examples (Vianna; Bertolini, 2020).

they could find the right answers by consulting textbooks: they run through science and biology classes, stir emotions, provoke personal identification, and are intertwined with the lives of teachers and their students, referring to different political positions. These are sensitive topics, and the subject of this article, which reiterates the understanding that knowledge and values are always in dispute in the curriculum (Selles & Ferreira, 2003).

In this sense, the school curriculum is built on the intersections between knowledge and values in constant motion, mediated by teachers in their classrooms. Even when regulations and standards attempt to stabilize certain choices about what is most valuable to be taught and learned at specific times and in specific school spaces, there will always be work done by teachers, as they are not mere transmitters of knowledge and learning external to their own life experiences and the pedagogical relationships they establish with students. If, on the one hand, regulations attempt to control teaching and learning in advance, with content and methods that favor predetermined objectives, there will always be undetermined surpluses that escape certain forms of control, since the classroom is an interactive and living space that surprises the prescription. Therefore, when Goodson (1997) refers to school discipline as historical testimony to disputes over its legitimacy, the daily work of science and biology teachers must also be highlighted as part of this construction. The weaving of pedagogical relationships with students can be a space for the intersections of their life stories that surprise the school discipline of biology and materialize it.

Guided by this understanding, in this article, we propose to explore the concept of sensitive topics and investigate how they are addressed, in order to understand how teachers' lives intersect with—and are intersected by—historical conflicts that shape the school subjects of science and biology. First, we will explore the concept of sensitive topics and other related terms, drawing on research by Brazilian authors in the fields of sociology and history teaching (Andrade et al., 2018; Alberti, 2014; Gil & Camargo, 2018) and by foreign authors (Mével & Tutiaux-Guillon, 2013). Still in the field of human sciences, we will explore the conceptual intersections between sensitive topics, and controversial topics, and issues. Secondly, we will discuss how these themes relate to science education, drawing on the history of research in science and biology education regarding the relationship between the natural sciences and the humanities, as part of the body of knowledge that historically references the field. In this sense, we approach the CTS movement as a precursor to more humanized approaches in science education and investigate research in the field of thematic science education that theoretically addresses sensitive topics such as socio-scientific issues, socially acute issues, socially relevant issues, and cordial content. Thirdly, we present a comparative conceptual framework that outlines the concepts explored in this article, their definitions, and the main theoretical references, in order to contribute to understanding the theoretical similarities and differences between sensitive topics and other aspects discussed. Fourth, we present our proposal for the use of the concept of sensitive topics in research in science and biology

education, especially those that adopt teacher narratives as a theoretical-methodological perspective, in dialogue with Ivor Goodson's contributions. We theoretically locate the concept and present results from ongoing research that support the theoretical choice for its use, distinguishing it from others mobilized in Science Education research. Finally, we will explore possible horizons and approaches to sensitive topics that embrace the lives and narratives of teachers and students.

Sensitive and Controversial Topics: Contributions from Sociology and History

According to authors in the fields of sociology and history (Andrade et al., 2018; Alberti, 2014; Gil & Camargo, 2018; Mével & Tutiaux-Guillon, 2013), a topic can be considered sensitive when it is emotionally charged, politically sensitive, intellectually complex, and important for the present and the common future. Generally, these topics involve a clash of values and interests (Mével & Tutiaux-Guillon, 2013), discuss social representations, and foster classroom debates (Simonneaux & Simoneaux, 2012). In this sense, when teaching sensitive topics, teachers are urged to take a stand against social inequalities and injustices and commit to the challenge of educating children and young people to defend human rights, coexist with diversity, and become citizens.

Sensitive topics share similarities with other concepts: delicate issues, controversial issues, controversial topics (Hess, 2009; Hess & McAvoy 2015; Ho et al., 2017), socially alive/acute issues (SAI) (Legardez & Simonneaux, 2006; Simonneaux & Simonneaux, 2011). In the field of science and biology, other concepts are theoretically similar to sensitive topics, such as cordial content (Oliveira & Queiróz, 2017), socioscientific issues (SSI), and socioscientific controversies (Martínez, 2012; Sadler, 2009). In this article, we will explore the theoretical similarities and differences between these concepts, the intersections between the relevant sciences, and ultimately define the conceptual choice of sensitive topics in science and biology education.

Firstly, we understand that what is sensitive can only be defined based on a specific time and place. Andrade et al. (2018), in dialogue with Jacques Rancière, argue that defining what is sensitive is an operation of power, so "what is defined as sensitive changes with time, age, place, or point of view" (p. 6). Thus, the authors urge us to think: which topics are sensitive? To whom are they sensitive? What is the purpose of addressing them in the classroom? Are they sensitive in themselves, or do they become so, depending on how teachers approach them and interact with students?

Due to the emotions they provoke, once raised, such topics take on ways that cannot be predicted or controlled. Therefore, addressing sensitive topics poses challenges for teachers who undertake certain teaching methods that cannot be ignored:

It takes considerable willingness and commitment to generate both curiosity and the desire to become fully involved in issues that will likely require dealing with emotions, taking a stand, complex reasoning, and conflict resolution. Students need to experience learning situations that involve reflecting on their own

representations, imaginations, and emotions. Thus, they are encouraged to take positions, identify themselves, and interact with identities and positions different from their own (Andrade, et al., 2018, p. 8).

For the authors of *History* (Alberti, 2014; Pereira & Saffner, 2018), the sensitivity of certain themes lies in their relationship with injustices committed in the past. Topics such as torture, colonialism, slavery, dictatorships, and patriarchy are considered by these authors to be sensitive topics, among other issues, due to their relationship with a past of violence and human rights violations that produce meanings and feelings in the present, as remnants of a “past that never passes.” From this perspective, Pereira and Saffner (2018) propose teaching history centered on the living pasts of these sensitive topics, which can only be understood, discussed, and overcome if guided by the principles of human rights education.

In international research, some authors (Hess, 2009; Hess & McAvoy 2015; Ho et al., 2017) establish a conceptual distinction between controversial issues and controversial topics². For these authors, a controversial topic is a subject that, although considered reprehensible, does not engender a plurality of perspectives that circulate in society. On the other hand, controversial issues correspond to problems open to public debate. Hess (2009) defines controversial political issues as “authentic questions about the types of public policies that should be adopted to address public problems” (p. 5) and gives the following example:

When I look at recent newspapers, for example, I see a multitude of issues embedded in many of the stories. Should the US send more troops to Iraq or withdraw? Should the federal government grant amnesty to people in the US without legal documents? What should be done to reduce dropout rates? Should my community build a new school? What should my state do to provide all its citizens with access to health care? What should the international community do to combat terrorism? Although these issues involve different political actors and stakeholders, they are all authentic and likely to generate multiple and competing responses (p. 5).

Camicia (2008) analyzed how different groups shaped the controversy surrounding the curriculum of a sixth-grade social studies program in a US school district, called “Leaving Our Homes,” around the discussion of concentration camps for Japanese Americans during World War II. At first, teachers and administrators in the local district³ regarded this as a controversial topic, considering the internment of Japanese Americans a violation of civil rights, and not intending to allow students to decide whether this policy was justified or not. On the other hand, some members of the District challenged the curriculum on the grounds that the issue of internment is controversial and open to discussion, as it involves debates about national security and

2 Free translation for “controversial issues” and “controversial topics” in Portuguese: “questões controversas” and “temas controversos”.

3 Broadly speaking, they are local educational authorities, comparable to municipal education departments.

civil rights, reflecting tensions between different historical narratives and interpretations of what constitutes justice and civil rights. Thus, for the author, categorizing internment, as well as other topics, as a controversial theme or issue is dynamic and depends on historical, temporal, and ideological contexts.

Camicià's study exposes the ethical challenge of teaching controversial topics as controversial issues, since the former fall within consensus that exhibit universalized judgments, for example, the rejection of human rights violations in concentration camps, while controversial issues demand open debate. Teachers play a central role in addressing these challenges because, in line with Ho et al. (2017), it is up to teachers to deal with the ethical complexity of decision-making in teaching these topics, since it involves the need to balance the presentation of multiple perspectives and the responsibility not to minimize or distort the gravity of historical injustices. Added to this are the set of external and internal factors that circumscribe their curricular decisions, such as institutional curriculum documents, government guidelines, the political and social context, the values of parents, students, colleagues, and school administrators, as well as their own ethical, moral, and religious values.

Diana Hess, Paula McAvoy, Li-Ching Ho, and other authors advocate for the discussion of controversial issues as the path to building an effectively democratic society and choose schools as the ideal place to teach these issues based on three characteristics as follows: (i) the diversity of topics that can be included in the school curriculum within different subjects; (ii) the experience that teachers have—or can acquire—in mediating and fostering discussions among students; and (iii) the high degree of ethnic, religious, racial, and gender diversity that can exist within a classroom. Even in classes that are more homogeneous in these dimensions, the ideological and political diversity in these spaces is greater than that found in their family contexts. When discussing controversial issues in this context, students are exposed to points of view, values, and principles that differ from their own and are motivated to construct arguments and think critically. Thus, teaching controversial issues is a way to strengthen democracy—ultimately, based on democratic principles of social justice—since it teaches young people to engage in controversial political issues and deliberations involving different political actors and stakeholders, in addition to creating an atmosphere of intellectual and political freedom and engaging students in political decision-making.

Hess and Mcavoy (2015) point out that studies conducted in more centralized and authoritarian political contexts reveal that, in these scenarios, teachers' main concern is breaking the law, violating political norms, and deviating from the prescriptive authority of the curriculum. Even when differentiating between political regimes, the authors suggest that in less authoritarian contexts with less restrictive education laws, teachers' concerns are no less significant. Studies conducted in the US, for example, indicate that high-stakes exams, curriculum standards, and perceptions of the community's political climate influence teachers' decisions about teaching controversial topics.

It is noteworthy that the American authors' definitions of freedom, democracy, and authoritarianism in their study are based on liberal and Western principles. Marina Basso Lacerda (2019) points out that, in the post-Ronald Reagan period, a “punitive idealism” emerged in the US—a term coined by Greg Grandin (2006) to define the neoconservative use of violence for imperial purposes. The dismantling of the welfare state that took place during this period resulted in brutal inequality and a reduction in individual freedom. To counterbalance the insecurity caused by social instability, fear of real and imaginary enemies is encouraged and, in many cases, state repression against political dissidents is increased to ensure “law and order.” Thus, if we view the the research considered by the authors through a less Westernized theoretical lens, the convergence of teachers' insecurity across these different political contexts may or may not be rooted in policies of persecution and censorship more akin to those evaluated by the authors.

Socially Acute Questions and Socio-Scientific Issues: Contributions from Science Education

From a first reading of research on teaching sensitive and controversial issues, these topics that engage with experience might seem confined to humanities disciplines such as history and sociology, given their close relationship with political and social issues and historical contexts. Similarly, they would be distanced from disciplines such as biology, which proposes a reading of the natural world based on more objective methods. However, as Vilela and Selles (2020) point out, research in science education has been producing axes, thematic lines, and subareas of research in increasingly close dialogue with the humanities. These research movements take a critical stance toward empiricist and positivist science education and incorporate ethical, social, cultural, historical, political, and economic aspects into reflections on science. Topics such as gender, sexuality, environmental education, and health have been the focus of research because they challenge the boundaries of traditional reference sciences, such as biology, and require anchoring in humanities knowledge due to their close relationship with social, political, and identity issues.

The first movements to break with a systematized, supposedly impartial, timeless, and socially detached approach to science education date back to the 1970s, in a context in which society became more aware of the social and environmental damage caused by scientific and technological development (Bencze et al., 2020). The CTS (and later CTSA) movement emerged with proposals for research, curricula, and practices that integrated scientific knowledge and technological development with social issues, aiming to train students to make responsible decisions.

In the following decades, new proposals for science education research emerged to strengthen the relationship between scientific knowledge and human issues. Several authors (Levinson, 2006; Reis, 1999; Ratcliffe & Grace, 2003; Sadler, 2009; Martinez, 2012; Duso, 2015) converged on the goal of advocating for science education based

on the approach of Socio-Scientific Issues⁴ (SSI) and issues related to science and/or technology that have social relevance.

Sadler (2009) posits that socio-scientific issues involve problems whose solutions are multifaceted and require negotiation of scientific concepts, principles, and practices. In teaching, they challenge the exclusivity of addressing at least some topics that would accommodate only a given objective rationality, which does not welcome other meanings. According to Sadler, there are issues to be taught that tend to be controversial, partly because they are not subject to single, rehearsed answers, and partly because they involve economic, social, political, and/or ethical issues that cannot be reduced to these characteristics. In this sense, the teaching of SSI is defended by the authors as a way of “transforming classroom practices so that students engage in the negotiation of real-world science” (p. 12), that is, it proposes to train citizens to be participatory and engaged in making responsible decisions in a constantly changing world, mobilizing scientific knowledge. These claims seem problematic if they focus on a specific type of didactic training, since they also narrow the range of possibilities and reduce the unpredictability, or exceed the control of the senses in pedagogical interactions.

In this regard, Socio-Scientific Issues share common goals with Socially Acute Questions (SAQs) (Legardez & Simonneaux, 2006), such as engaging students in responsible decision-making. However, French authors Alain Legardez, Laurence Simonneaux, and Jean Simonneaux argue that SSI fail to prioritize the critical thinking necessary to deal with uncertainties and risks generated by scientific advances. In contrast, according to the authors, SAQs have the potential to promote not only scientific literacy but also political literacy among students.

Therefore, Legardez and Simonneaux define “socially acute questions”⁵ as complex social and scientific issues embedded in a global context of uncertainty, environmental crises, and health crises. These issues challenge the social practices of school actors, question their social representations and value systems, and often spark debate and controversy (Legardez & Simonneaux, 2006; Simonneaux, 2014). Such issues are considered “acute” when they are located in the following areas:

In society: they have the potential to stimulate debate—such issues are often covered in the media, and students may therefore have some knowledge of them. In research and professional fields: this occurs when conflicting viewpoints, and opinions, and controversies can lead to debates about the production of reference knowledge within academia [...]. In the classroom: they are often perceived as “acute” because they arise during discussions about society and research (Simonneaux, 2014, p. 38).

⁴ Terms such as “socio-scientific controversies” and “controversial socio-scientific issues” may appear in publications with the same meaning (Galvão et al., 2011; Duso, 2015).

⁵ In the authors’ publications in English, the term originally published in French as “Questions Socialement Vives (QSVs)” is translated as “Socially Acute Questions” (SAQs). In Portuguese, the term can be translated as *Questões Socialmente Vivas* or *Questões Socialmente Agudas* without changing the meaning.

Regarding the school subjects of science and biology, socially acute questions (SAQs) integrate knowledge from the natural sciences and the humanities. Topics related to the human body, health, the environment, and consumption are some of the many themes that lie at the intersection of these sciences. Fueled by public debate, SAQs bring to light uncertainties and controversies deeply rooted in the interactions among science, society, and cultural values, prompting teachers to set aside the underlying rationality of scientific knowledge in favor of human concerns.

Simonneaux (2014) positions SAQs within the field of postmodern sciences, given the affective and social dimensions of these issues, which are permeated by the perspectives of social groups and individual identities. These perspectives are affected by value systems, cultural identities, politics, gender, professional identities, perceptions of norms, and projections of the future. In this sense, for the author, analyzing socially acute issues requires considering the context and psychosocial factors that shape individuals' behavior. Despite this, the affective dimension seems underrepresented in the author's empirical work, which is primarily dedicated to analyzing the school's approach to topics related to the climate emergency, scientific development, technoscience, sustainability, and other topics of common interest.

In short, socio-scientific issues and socially acute issues differ in their relationship with the reference sciences. While SSS include discussions, controversies, or topics directly related to scientific and/or technological knowledge that are socially relevant, socially acute issues are less closely related to the reference sciences, engage in dialogue with other forms of knowledge, and challenge social representations and values, thereby enhancing the possibilities for debate in the classroom. Even so, we need to examine other perspectives to define their similarities and differences with sensitive topics.

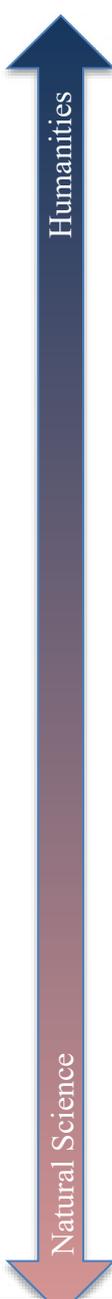
Friendly content also bears similarities to the two perspectives mentioned above, as argued by authors in the field of science education, and is affiliated with the philosophical approach (Teixeira, 2018; Oliveira & Queiroz, 2017; Teixeira et al., 2019). This concept is based on the principle of cordial reason proposed by Adela Cortina, a Spanish philosopher affiliated with discourse ethics. The introduction of the author's contributions in the Brazilian academic context is associated with the work of Marcelo Andrade, a researcher at PUC-Rio who died prematurely but left behind inspiring works on cordial content (Andrade, 2006; 2012).

The ethics of cordial reason incorporates affective dimensions into the ethics of discourse, seeking a broader sense of communication and argumentation beyond pure rationality⁶. According to Cortina's argument, this principle assumes that authentic communication stems from mutual understanding and the appreciation of minimum values such as equality, freedom, solidarity, and justice. In school contexts, the development of students' argumentative skills must consider ways to find values, knowledge, and meanings that can be shared by everyone in a pluralistic society.

⁶ Associated with the work "Critique of Pure Reason" by the rationalist philosopher Immanuel Kant (1724–1804).

In this sense, friendly content integrates Science Education and Human Rights Education (HRE) and privileges the humanization of biological content with a view to plurality, dialogue, and ethics. To this end, it is necessary that these contents be taught based on social values grounded in human rights—values that encourage the recognition of others who are different and the questioning of prevailing social logics (Oliveira & Queiroz, 2017). For these authors, HRE provides an ethical basis for a more humanized and humanizing teaching of biology (Teixeira et al., 2019), in which students understand the content of science and biology in their social, economic, and cultural contexts and can thus position themselves as critical citizens of the current social reality.

In order to conceptually organize the terminologies presented, given that they sometimes align with and sometimes diverge from our proposition of sensitive topics in science and biology education, we present a conceptual framework developed from a bibliographic survey of the main theoretical references on sensitive topics, controversial topics, socially acute issues, cordial content, and socio-scientific issues. To understand this framework (Figure 1), some issues need to be considered: (i) in organizing the framework, the spatial proximity of the concepts respects the theoretical similarities between them. (ii) The concepts located at the top of the figure are more rooted in the humanities, while those located at the bottom are more rooted in the natural sciences. The most centralized themes are located at the intersection between these reference sciences. (iii) This organization takes the concepts most used in research and disregards, for the purposes of synthesis, other terms taken as synonyms, such as sensitive issues, controversial socio-scientific issues, among others. (iv) These conceptual boundaries were designed by the authors and are not expressed in all the works cited. Benoit Falaize (2014), for example, treats controversial issues, socially sensitive issues, and sensitive/delicate issues as synonyms, as do other authors.

Figure 1*Sensitive topics and related terms*


Concept	Definition	Ethical commitments between research and teaching	Authors	Field
<i>Controversial topics/issues</i>	Political issues that bring together different perspectives, based on objective reasoning, on matters of public interest, whose deliberation strengthens democracy.	Strengthen democracy and educate students to make political decisions.	Hess (2009), Hess & Mcavoy (2015), Ho et al. (2017)	History and sociology teaching
<i>Sensitive topics</i>	Emotionally charged, politically sensitive, and intellectually complex topics. They relate to experience and subjectivity. They may be related to memories of violence and violations of the rights of groups and/or individuals.	Mobilize individual and collective experiences and memories, with a focus on subjectivities. ²	Andrade et al. (2018); Alberti (2014), Gil & Camargo (2018) ¹	History and sociology teaching
<i>Socially Acute Questions</i>	Complex, controversial, open-ended issues integrated into real contexts. They are “alive” because they generate debate, involve uncertainty, and challenge social values and representations.	Advocate for the association of scientific and social issues.	Mével & Tutiaux-Guillon (2013); Falaize (2014) ¹ Simonneaux & Pouliot (2017); Simonneaux & Simonneaux (2012)	History and sociology teaching Science and biology teaching
<i>Friendly content</i>	They are based on integrating Science Education with Human Rights Education (HRE) and prioritize the humanization of content with a view to plurality, dialogue, and ethics.	Seek a possible consensus based on a set of universal ethical principles.	Oliveira & Queiroz (2017); Teixeira et al. (2019)	Science and biology teaching
<i>Socioscientific issues</i>	Discussions, controversies, or topics directly related to scientific and/or technological knowledge that are socially relevant.	Educate students who are engaged and capable of making responsible decisions involving science in real-world contexts.	Legardez & Simonneaux, (2006); Sadler (2009); Martínez (2012)	Science and biology teaching

Note¹. The works taken as reference for the conceptual study of sensitive topics in this article are Brazilian. These authors take French authors (Mével & Tutiaux-Guillon, 2013; Falaize, 2014) as international references, who use the term “*Questions Socialement Vives*” with the same meaning.

Note². Sensitive themes and socially relevant/acute issues share ethical commitments when considering the works of French and Brazilian authors, respectively, in the fields of Sociology and History education. For this reason, the horizontal line in the table between these two concepts is deliberately interrupted.

It is beyond dispute that the various strands of research presented in this article have numerous conceptual intersections involving sensitivity, controversy, interdisciplinarity, ethical commitment, and the social and political relevance of these themes. The choice to address sensitive topics rather than others, however, reflects theoretical and methodological decisions compatible with certain educational research objectives. In this sense, we list arguments supporting the theoretical choice of the concept of sensitive topics, grounded in sociology and history, as an alternative to other concepts more widely used in science education research and discussed throughout this paper.

Firstly, we argue that sensitive topics are not confined to their categories. Gender, sexuality, abortion, climate emergency, environmental racism, contraceptive methods, and eugenics are some of the topics that cut across science and biology curricula and can be investigated under socio-scientific assumptions that are socially acute, sensitive, or controversial, depending on the methodological choices and epistemological principles assumed in the research. Take, for example, the content of “contraceptive methods”. If a strictly physiological and hygienic approach is taken, presenting the different available methods, their mechanisms of action, and clinical indications, this topic can be identified as content traditionally prescribed in science and biology curricula. It can be considered a socially acute issue if we critically address scientific advances in contraceptive methods, considering the gender issues that have influenced research choices throughout history. It can be considered a controversial issue if we focus on the discussion regarding the distribution of contraceptive methods in schools or even on legal attempts to ban the sale of emergency contraceptives. It can be considered a sensitive topic if we consider the difficulty of access to these methods for poorer populations or the role of women responsibility in family planning. This topic can also become sensitive when a lesson planned using any of these approaches is interspersed with the life story of a student who decides to share their dilemmas, doubts, questions, and experiences as part of their teenage sexual experiences.

In this sense, what we call “sensitive topics” in the context of science and biology teaching are not sensitive by their very nature, but rather because of their potential to generate sensitivity, empathy, and affectivity, especially when they are addressed in relation to human issues that resonate with the experiences that permeate the lives of teachers and students in the classroom and allow them to be affected by this interaction. Therefore, such topics can be considered sensitive only from a relational perspective, depending on factors such as time, place, culture, and the emotional availability of the teachers and students involved.

Secondly, if we consider the context of conservative movements’ persecution of topics that cut across science curricula, such as gender, sexuality, abortion, and climate emergency, the use of the concept of “controversial topics/issues” seems costly in terms of understanding the external and internal tensions and conflicts that science and biology teachers face when addressing these topics. However, controversy alone cannot

encompass the sensitivities that certain topics provoke in teachers and students. Some topics that run through science and biology curricula place teachers in a vulnerable position, calling on them to explore their own feelings and experiences and encouraging students to do the same, turning the classroom into a space for welcoming, sharing, belonging, and recognizing oneself and others, leveling the relationships between teachers and students and exposing the distances and similarities that exist in the democratic and diverse space that is the school. It is in this space between themselves and others, at the intersection of subjectivity and the excess of individual vision, that students and teachers open themselves to understanding the problem collectively and engaging with it. As it is about understanding themes through negotiation with their own differences, mobilizing knowledge and emotions, we are provoked to reflect on the inclusion of sensitive themes in the debate on curriculum prescription, as we will do below.

Sensitive Topics and Curriculum as Prescription

In this section, we mobilize the concept of curriculum as prescription (CAP) developed by Goodson (2005) to weave reflections on the curricular treatment of sensitive topics. For the author, the curriculum as prescription “supports the mystique that expertise and control reside within central government, educational bureaucracies or university communities” (p. 133). Goodson argues that the rhetoric of prescription and management can coexist with education as practice as long as CAP agencies are “in control” and schools are seen as “delivering”, and that schools can enjoy “a good degree of autonomy” if they accept and do not challenge the rules. Drawing on Goodson’s conceptualization, we question whether it would be appropriate to recommend prescribing sensitive themes when examining the implications for curricular production in teaching.

Initially, we were prompted by Hess’s (2009) proposal, which recommends that the teaching of controversial topics/issues be conducted in a planned manner; that is, they should be included in the curriculum to ensure that they are addressed. The author suggests adopting discussion as a central pedagogical strategy and that teachers guide students to critically explore the opinions raised in order to understand which questions are open (have multiple and competing answers, based on reason) and which are closed (are not open to discussion and require the student to construct a specific answer). Following these guidelines, the study of controversial topics could lead to specific ways to introduce them into curricula.

While recognizing the relevance of Hess’s proposition, the research we have carried out on sensitive topics (Valiente & Selles, 2023; Valiente, 2024) has, in turn, tended to move away from predictions. To develop our argument, we draw on research results and consider other directions. As investigated by Valiente and Selles (2023), sensitive topics are included in the practices of science and biology teachers, in almost all of the 30 participating teachers, even though they are not documented in the curriculum

documents available to them. They stated that they addressed sensitive topics to some extent in their classes, and the majority (60%) indicated that these topics were addressed spontaneously when students asked questions during class.

In dialogue with these teachers' reports, we identified issues that enriched our proposal. On the one hand, sensitive topics are present in students' experiences; they bring them into the classroom and provoke teachers. In this relationship, they challenge the curriculum by sharing these topics in the classroom. On the other hand, teachers are sensitive to the issues raised and anchor their pedagogical practices in their students' experiences and demands. This way of teaching, which is context-based and genealogical—from the bottom up—is, as Goodson (2019) points out, a path to the construction of meanings and the formation of identities. When students' life stories and experiences are in focus, and the learning process and content are connected, students produce meaning and engage.

Expanding this survey among the 30 teachers, we conducted interviews with biology teachers and developed an understanding that tends to reinforce the relational nature of sensitive topics. In Valiente (2024), we present the life narrative of a teacher that allows us to make some considerations aligned with what is discussed in this article. First, the relational aspect of addressing sensitive topics seems to emerge in the teacher's narrative, in which, without being challenged by the interviewer, she draws parallels between her life story and her experiences with sensitive topics. Not because she makes a strict correspondence between her experiences and those of her students, but because she constructs herself professionally as a way of understanding, and understanding herself, through the emotions that arise in her interactions with them. Secondly, the interview allows us to reaffirm the potential of life history research in understanding this relational aspect, since it is a privileged methodology in the sense of bringing into tension memories of personal life trajectories and professional experience, and of promoting the voice of teachers in order to understand the profession "in all its human and scientific complexity" (Nóvoa, 1995, p. 10).

The results of this research encourage us to reflect on Hess's proposition regarding the compulsory adoption of controversial topics in the curriculum and argue in a slightly different direction. The research option that chooses sensitive topics in science and biology is based, on the one hand, on theoretical perspectives that reflect its democratic commitment and, on the other hand, stands politically alongside teachers who experience internal and external conflicts within the discipline when these topics become the target of persecutory movements. While conservative ideological persecution calls for the removal of these topics, much of the literature discussed in this text shows signs of claiming them as part of school subject programs, that is, to formally include them in the curricula. This proposal, although derived from committed, honest, and commendable research, warrants consideration because we understand that this defense aligns with the curriculum prescription.

Agreeing with some terms of this defense, on which it would be contradictory to admit that we are against the political, ethical, and epistemological potential of sensitive—or related—topics for youth education, we need to question not only the relevance of the topics themselves, but also the pedagogical understandings for their inclusion, among which we encounter views of control over teaching and the curriculum implicit in the defense of the prescription. The dilemma seems to arise when, in the face of the conservative alliance between religious and neoliberal forces, the conflict shifts to the aggressive project of curricular control over teaching and schools, and we would need to respond with prescriptions for these topics. Would we be trapped in this paradox in which, in order to resist a type of prescription, we need to reinforce it?

Perhaps we need to walk a little further in this debate to clarify our proposition, which is that it does not intend to qualify the prescription by admitting the axiological argument that the prescriptions we defend in research are always “good”. We subverted this qualification by assuming teachers’ capacity to make pedagogical decisions, contrary to current discourses, which hold that research always determines what is best for the school (Selles, 2015). Undoubtedly, if the issue exacerbates conflicts over curriculum concepts, which is desirable in academic and pedagogical debate, it is worth insisting on problematizing control, given that it occupies a central place in recent national curriculum policies, such as the entire curriculum-assessment system of the National Common Core Curriculum (BNCC). Much has been said about the extent to which a centralized curriculum exercises this control, as it runs counter to a Brazil that is diverse and different in terms of its territories, cultures, and especially the identities of collective subjects who are spokespersons for the inclusive demand for pedagogical approaches to their bodies, their racialities, their desires, and their sexual orientations. Therefore, if the prescription has been naturalized in Brazilian educational history, it is necessary to address questions that connect curriculum and initial teacher training, challenging views on the control of teaching within the framework of recent educational policies, and what it means to have such restrictive national regulations.

Thus, it is worth emphasizing the assumption that there is universal, consensual content, accumulated through human research efforts, which is not open to negotiation. Several laws have already set their percentage, and in its current version, it should be guaranteed in more than 50% of curriculum programs, as is the case in the BNCC. In the case of the science and biology curriculum, as in the other components, it is this percentage that large-scale exams will attest to. If the deepening of this debate goes beyond the scope of this article, it is unavoidable to explain that all curriculum prescriptions are based on forms of control over teaching, more or less authoritarian, even though they fit and explain agreements and disagreements about which list of content should prevail. Considering that this list may vary, the question has been limited to what it includes (or excludes). We thus return to the initial point that there are universal lists and and we should ask whether research could determine which are better than others.

In addition to indicating that part of the dispute concerns curriculum content, as a research community, we continue to arbitrate over the curriculum, often reducing it to what is most limiting: a list of concepts, phenomena, and themes, treated in isolation from their construction process. In fact, for decades in Brazilian educational history, a hierarchical mode of curriculum production has flourished, external to the school, or at best, with marginal participation from teachers. At most, teachers are called upon to give their opinion in official educational forums on predefined options, under the argument that they represent the professional category. With such timid participation, curriculum lists are produced, taking time and budget items, neglecting teacher autonomy, and deepening the modes of control over teaching. The presumption persists that schools and their teachers are incapable of developing their own curricula: they do not know how to mobilize knowledge acquired during university education or even make pedagogical decisions consistent with their students' education. Underlying this judgment is the view that teachers are always deficient and that their obsolescence is an inescapable condition they inherit from the moment they leave university. Therefore, they need to be constantly fed with pedagogical ideas from the academic domain, generally carriers of vague notions of innovation, to avoid obsolescence. Returning to Goodson's (2020, p.200) provocations about the CAP, it is worth asking: what views of professional teaching—and of its actors—are implicit in the defense of this zeal for updating that the prescription entails?

It is in this set of reflections that the issue of prescription deeply affects the hierarchical relationships that pedagogical discourse exerts on schools. In other words, countless examples of this discourse found in the literature either reinforce the “unproductive” condition of schools and portray them as mere reproducers of externally systematized knowledge, or issue abundant recommendations on how schools should follow them to solve their deficiencies. Accompanying and implicit in this pedagogical discourse of control are disparaging judgments about the lack of possibilities for teachers to make their own pedagogical decisions and select content and methods for their teaching. Perhaps the issue could be addressed, at least in some respects, by invoking the role of training institutions existing and curriculum guidelines for initial teacher training regarding professional competence. Admitting that teacher training is insufficient to establish autonomous practice displays a distance between initial teacher training programs and schools. In a way, it would mean that universities would renounce their responsibilities for their graduates' academic performance. This hypothesis is far from being confirmed, even though we know that training experiences do not always respond in the same way to these demands, but rather occupy a broad spectrum of successful practices and public policies that attempt to circumvent their shortcomings, particularly in public higher education institutions.

Nor can it be denied that the set of Curriculum Guidelines for Teacher Training, approved after LDBEN/96, already contains references to curriculum organization that have long been recognized by the school education community. In other words, it is

not for lack of curriculum guidance or knowledge of how to organize schoolwork that teaching faces its challenges. Focusing on a specific type of curriculum prescription, it is better to ask what purpose a level of detail between objects of knowledge—expressed in competencies and skills—as observed in the BNCC would serve, other than to guide strict compliance that can be audited in national exams? Summarized in these terms, it remains to be agreed that curriculum prescription serves primarily to control teaching and schools rather than to guide innovative, creative, and unusual practices.

Returning to Hess's proposition and questioning the relevance of prescribing sensitive topics in science and biology classes, the considerations we have listed are not exclusively directed at defending or opposing the prescription, but invoke responsibilities and accountability, sensitivities, and institutional commitments regarding teaching. Primarily, these considerations focus on the understanding that research on sensitive topics and training in teacher education programs do not provide the answers to the challenges of addressing them in school. Ultimately, we avoid running the risk of adding new forms of prescription that demand not only the usual and increasing knowledge and bureaucratic efforts from teachers within the framework of the BNCC, but also efforts to manage emotions and conflicts.

In this sense, the defense of the curricular prescription of sensitive topics conflicts with a curricular project constructed by the school, as opposed to the imposed national standardization or its local translations. If our purpose in this article is to highlight the human and social intersections in the teaching of biological topics in the school subjects of science and biology, we assume that the relational nature of sensitive topics is not closed to prescription, nor we are saying that it cannot be planned by teachers⁷, but it needs to be open to democratic listening in classroom interactions, since they involve personal and collective experiences. Whether anticipated or not, sensitive topics are windows that open up to educational dialogue and give meaning to school teaching. After all, how can biology be taught separately from the historical, social, economic, and cultural experiences of teachers and students? We agree with Gil and Camargo (2018) that teaching choices require emotional investment and engagement, as they give up “learning as a certainty, the class as an organized presentation of content, and the conception of students as those who lack knowledge for debate” (p. 145).

To escape the prescriptive trap, it is necessary to abandon the development of curricular alternatives *for* teachers and instead produce reflections on the teaching of sensitive topics in science and biology *with* the teachers themselves, mobilizing their knowledge, practices, and experiences. This is consistent with what Ivor Goodson (2020; 2022) understands as the “decolonization” of teaching practice based on life story research. Both as a research perspective and in curriculum development, working with sensitive topics unequivocally interrelates life and teaching work and paves the way for the narrative curriculum. Thus, we ponder the limits of framing them as a curricular prescription, since they are not objects displaced from the human issues experienced by teachers and students: teachers are challenged to mobilize their life stories and those of their students when these themes cross their classrooms.

⁷ See Cassar et. al, 2023.

In this sense, investigating how sensitive topics are approached allows us to understand some of the historical conflicts that shape the school subjects of science and biology and permeate teachers' lives. Topics related to the human body, gender, sexualities, ethnic-racial relations, food security, access to housing, and basic sanitation are some of the many topics that permeate the curricula of these subjects and engage teachers in particular processes of meaning-making due to the emotions they arouse in students when they relate them to their own experiences. In addition to the emotional undertaking, by integrating moral, social, and cultural values, these themes are placed at the center of ideological disputes over the values that schools should promote, thereby exposing conflicts waged within and outside the disciplinary community. In other words, mobilizing sensitive themes in both teaching and research implies acknowledging their relational nature for pedagogical action and for the investigative ways of understanding it.

Final Remarks

In this text, we explore numerous studies that examine how schools address biological topics that raise social issues and lack a single or objective answer. We review conceptual references to discuss theoretical similarities and differences between sensitive topics and other nomenclatures used in humanities and science education research, attempting to organize them and relate them to their respective objects of study. This effort at conceptual organization does not presume the confinement of certain topics taught in schools to specific nomenclatures, nor does it propose to hierarchize theoretical references to determine the use of one concept over another. Our purpose is to compose the theoretical basis necessary to support the options that best serve the objective of investigating how teachers' lives are affected by the treatment of these themes.

We base our work on the writings of Ivor Goodson, who discusses school subjects, since the author adopts a historical approach to understand them not as monolithic, but as permeated by disputes between groups of greater or lesser power and influence, which shape and reshape their trajectory and strain attempts to establish universalised lists of content and methods. Focusing on science and biology education, we argue that conservative social groups attempt to impose their Judeo-Christian values on the topics covered in these subjects, in the name of objectivity, based on a supposedly impartial consensus. As mentioned earlier in this article, these consensuses are understood by Michael Apple as "conservative restoration". Allied with the principles of standardisation and neutrality, these groups resort to attempts to violate the Constitution and introduce bills that would modify the LDBEN (Law n. 9.394, 1996) to censor and remove the teaching of topics that engage with the cultural plurality of school communities. Given the state's secular and democratic nature, guaranteed by the Brazilian Constitution, education cannot privilege the values of these groups when teaching these topics that challenge social norms and moral and religious principles.

In fact, the intersections of human experiences with these themes have been the subject of various levels of dispute in school curricula, covering civil and political spheres, under arguments defending the freedom of choice of those responsible for students. By welcoming these discussions into the classroom, or at least allowing them to take place, teachers take a stance of resistance and confrontation against movements that wield strong political and economic power by monitoring, curtailing, and seeking to punish initiatives and practices that make schools democratic, fair, and egalitarian spaces.

When teachers take a confrontational stance, they make a challenging choice amid political polarization, knowing it can be seen as a form of indoctrination. Therefore, the approach to sensitive topics will always be relational and cannot avoid the obvious tension between different religious and political affiliations within school communities. Through a range of strategies that identify the personal and collective relationships of their classes, we have brought research records that (i) confirm the treatment of sensitive topics in science and biology classes even though they are not prescribed in curriculum programs, and we have included (ii) the narrative of a teacher who has been addressing some of these topics in a relational way, as she recognizes herself as a responsible teacher committed to the formation of a just and egalitarian society.

Finally, the reflections in this article are supported by Goodson's proposal to situate the approach to sensitive topics in the narrative curriculum, involving emotions, sensitivities, and an understanding of its relational and alternative nature to the current curriculum prescription. In this sense, understanding sensitive topics as part of the narrative curriculum and taking them on as research responds to what Ivor Goodson summarizes as a "representative crisis" of research movements in which teachers are, to a certain extent, represented in order to serve the objectives of the study, welcoming the teacher as a 'practitioner' and "colonizing" their voice.

Narrative movements arise as a need for a counterculture that resists ways of researching the teaching labour that leave teachers "in the shadows," and provide a catalyst for the search for understandings of the life and work of teachers. Together, studies with narratives and life stories make explicit the relational nature of sensitive topics and support their proposition. Therefore, they make it possible to construct a multifaceted understanding, produce knowledge at the crossroads of various fields of knowledge, and open paths to access the complexity of teaching through the presentations presc that teachers make of themselves.

Authors' Contribution

Conceptualization: Valiente, C., Selles, S.; **Data curation:** Valiente, C.; **Formal analysis:** Valiente, C.; **Funding acquisition:** Selles, S.; **Investigation:** Valiente, C.; **Methodology:** Valiente, C., Selles, S.; **Project administration:** Selles, S.; **Resources:** Selles, S.; **Supervision:** Selles, S.; **Visualization:** Valiente, C.; **Writing – original draft:** Valiente, C., Selles, S.; **Writing – review & editing:** Valiente, C., Selles, S.

Data Availability Statement

The data will be provided upon request.

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References

- Alberti, V. (2014). O professor de história e o ensino de questões sensíveis e controversas. *Palestra proferida no IV Colóquio Nacional História Cultural e Sensibilidades*. Centro de Ensino Superior do Seridó (Ceres) da Universidade Federal do Rio Grande do Norte (UFRN), Caicó, Rio Grande do Norte.
- Andrade, J., Gil, C., & Balestra, J. (2018). Apresentação: ensino de história, direitos humanos e temas sensíveis. *Revista História Hoje*, 7(13), 4–13. <https://doi.org/10.20949/rhhj.v7i13.458>
- Andrade, M. (2006). *Tolerar é pouco? Por uma filosofia da educação a partir do conceito de tolerância* (Tese de Doutorado, Pontifícia Universidade Católica do Rio de Janeiro, Rio de Janeiro). Repositório institucional da PUC-Rio. https://www.maxwell.vrac.puc-rio.br/9472/9472_1.PDF
- Andrade, M. (2012). Sobre os Fundamentos Ético-Filosóficos para uma Educação Intercultural. *Revista Cocar*, 2(3), 15–22. <https://periodicos.uepa.br/index.php/cocar/article/view/116/>
- Apple, M. (2001). Reestruturação educativa e curricular e as agendas neoliberal e neoconservadora: entrevista com Michael W. Apple. *Currículo sem Fronteiras*, 1(1), 5–33. <http://www.curriculosemfronteiras.org/vol1iss1articles/apple.htm>
- Apple, M. (2015). Produzindo diferença: neoliberalismo, neoconservadorismo e a política de reforma educacional. *Linhas Críticas*, 21(46), 606–644. <https://doi.org/10.26512/lc.v21i46.4684>
- Apple, M. W. (2017). A luta pela democracia na educação crítica. *Revista e-curriculum*, 15(4), 894–926. <https://doi.org/10.23925/1809-3876.2017v15i4p894-926>
- Bencze, L, Pouliot, C., Pedretti, E., Simonneaux, L., Simonneaux, J., & Zeidler, D. (2020). SAQ, SSI and STSE education: defending and extending “science-in-context”. *Cultural Studies of Science Education*, 15(3), 825–851. <https://doi.org/10.1007/s11422-019-09962-7>
- Borba, R. C., de Andrade, M. C. P., & Selles, S. E. (2019). Ensino de ciências e biologia e o cenário de restauração conservadora no Brasil: inquietações e reflexões. *Revista Interinstitucional Artes de Educar*, 5(2), 144–162. <https://doi.org/10.12957/riae.2019.44845>

- Camicia, S. P. (2008). Deciding what is a controversial issue: A case study of social studies curriculum controversy. *Theory & Research in Social Education*, 36(4), 268–316. <https://doi.org/10.1080/00933104.2008.10473378>
- Cassar, C., Oosterheert, I., & Meijer, P. C. (2023). Why teachers address unplanned controversial issues in the classroom. *Theory & Research in Social Education*, 51(2), 233–263. <https://doi.org/10.1080/00933104.2022.2163948>
- Duso, L. (2015). *A discussão de controvérsias sociocientíficas: uma perspectiva integradora no ensino de ciências* (Tese de Doutorado, Universidade Federal de Santa Catarina, Florianópolis, Santa Catarina). Repositório Institucional da UFSC. <https://repositorio.ufsc.br/xmlui/handle/123456789/160651>
- Falaize, B. (2014). O ensino de temas controversos na escola francesa: os novos fundamentos da história escolar na França? Trad. Fabrício Coelho. *Revista Tempo e Argumento*, 6(11), 224–253. <https://doi.org/10.5965/2175180306112014224>
- Galvão, C., Reis, P., & Freire, S. (2011). A discussão de controvérsias sociocientíficas na formação de professores. *Ciência & Educação*, 17(3), 505–522. <https://doi.org/10.1590/S1516-73132011000300001>
- Gil, C., & Camargo, J. (2018). Ensino de história e temas sensíveis: abordagens teórico-metodológicas. *Revista História Hoje*, 7(13), 139–159. <https://doi.org/10.20949/rhhj.v7i13.430>
- Goodson, I. F. (2013). *Currículo: Teoria e história*. Vozes.
- Goodson, I. F. (2015). *Narrativas em Educação: A vida e a voz de professores*. Porto Editora.
- Goodson, I. F. (2019). *Currículo, narrativa pessoal e futuro social*. Editora da Unicamp.
- Goodson, I. F. (2020). *Aprendizagem, currículo e política de vida*. Vozes.
- Hess, D. (2009). *Controversy in the classroom: The democratic power of discussion*. Routledge.
- Hess, D., & McAvoy, P. (2015). *The political classroom: Ethics and evidence in democratic education*. Routledge.
- Ho, L.C., Hess, D., McAvoy, P., & Gibbs, B. (2017). Teaching and learning about controversial issues and topics in the social studies: A review of the research. In M. M. Manfra, & C. M. Bolick (Eds.), *The Wiley handbook of social studies research* (pp. 319–335). Wiley. <https://doi.org/10.1002/9781118768747.ch14>
- Legardez, A., & Simonneaux, L. (2006). *L'école à l'épreuve de l'actualité*. Issy-les-Moulineaux: ESF, 110.
- Lacerda, M. B. (2019). *O novo conservadorismo brasileiro: De Reagan a Bolsonaro*. Zouk.

- Lei nº 9.394, de 20 de dezembro de 1996. (1996). Lei de Diretrizes e Bases da Educação Nacional. Ministério da Educação. Secretaria de Educação Básica.
- Levinson, R. (2006). Towards a Theoretical Framework for Teaching Controversial Socio-scientific Issues. *International Journal of Science Education*, 28(10), 1201–1224. <https://doi.org/10.1080/09500690600560753>
- Martinez, L. P. (2012). *Questões sociocientíficas na prática docente: Ideologia, autonomia e formação de professores*. Editora Unesp.
- Mével, Y., & Tutiaux-Guillon, N. (2013). *Didactique et Enseignement de l’Histoire-géographie au Collège et au Lycée*. Publibook.
- Nóvoa, A. (1995). *Vidas de professores*. Porto Editora.
- Oliveira, R. D., & Queiroz, G. R. (2017). *Conteúdos Cordiais – Química humanizada para uma escola sem mordanças*. Editora Livraria da Física.
- Pereira, N. M., & Seffner, F. (2018). Ensino de História: passados vivos e educação em questões sensíveis. *Revista História Hoje*, 7(13), 14–33. <https://doi.org/10.20949/rhhj.v7i13.427>
- Ratcliffe, M., & Grace, M. (2003). *Science education for citizenship: Teaching socio-scientific issues*. Open University Press.
- Reis, P. (1999). A discussão de assuntos controversos no ensino das ciências. *Inovação*, 107–112.
- Sadler, T. D. (2009). Situated learning in science education: socio-scientific issues as contexts for practice. *Studies in Science Education*, 45(1), 1–42. <https://doi.org/10.1080/03057260802681839>
- Saucedo, K. R., & Pietrocola, M. (2019). Características de pesquisas nacionais e internacionais sobre temas controversos na Educação Científica. *Ciência & Educação (Bauru)*, 25, 215–233. <https://doi.org/10.1590/1516-731320190010014>
- Selles, S. E. (2015). Quando as políticas curriculares e a pesquisa educacional mandam: reflexões sobre a colonização do trabalho docente. *Boletim Gepem*, (67), 100–117. <https://doi.org/10.69906/GEPEM.2176-2988.2015.64>
- Selles, S. E., & Ferreira, M. S. (2003). Análise de livros didáticos em Ciências: entre as ciências de referência e as finalidades sociais da escolarização. *Educação em Foco*, 8(1), 63–78.
- Simonneaux, J., & Simonneaux, L. (2011). Educational configurations for teaching environmental socioscientific issues within the perspective of sustainability. *Research in Science Education*, 42(1), 75–94.

- Simonneaux, L. (2014). Questions socialement vives and socio-scientific issues: New trends of research to meet the training needs of postmodern society. In C. Bruguière, A. Tiberghien, & P. Clément (Eds.), *Topics and trends in current science education: 9th ESERA conference Selected contributions* (pp. 37–54). Dordrecht: Springer Netherlands, .
- Teixeira, P. P. (2018). As relações entre diversidade e a discussão de temas controversos: desafios atuais para a escola. *Revista e-Curriculum*, 16(2), 494–515. <https://doi.org/10.23925/1809-3876.2018v16i2p494-515>
- Teixeira, P. P., Oliveira, R., & Queiroz, G. (2019). *Conteúdos Cordiais: Biologia humanizada para uma escola sem mordação*. Editora Livraria da Física.
- Valiente, C., & Selles, S. E. (2–6 de outubro, 2023). *Temas sensíveis no Ensino de Ciências e Biologia: disputas entre os movimentos sociais e a coalizão conservadora*. XIV Encontro Nacional de Pesquisa em Educação em Ciências (ENPEC), Caldas Novas, Goiás.
- Valiente, C. (2024). *Temas sensíveis e narrativas docentes no currículo de Ciências e Biologia* [Tese de Doutorado]. Universidade Federal Fluminense, Niterói.
- Vilela, M., & Selles, S. E. (2020). É possível uma educação em ciências crítica em tempos de negacionismo científico? *Caderno Brasileiro de Ensino de Física*, 37(3), 1722–1747.



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