

## Thematic approach based on Paulo Freire and research on teacher training in science education

### ABSTRACT

**Gislena Maria Duarte Rosa**  
[gislenafisica@gmail.com](mailto:gislenafisica@gmail.com)  
[orcid.org/0000-0002-7244-0174](https://orcid.org/0000-0002-7244-0174)  
 Universidade Federal de Santa Catarina (UFSC), Florianópolis, Santa Catarina, Brasil

**Fábio Peres Gonçalves**  
[fabio.pg@ufsc.br](mailto:fabio.pg@ufsc.br)  
[orcid.org/0000-0003-0172-2411](https://orcid.org/0000-0003-0172-2411)  
 Universidade Federal de Santa Catarina (UFSC), Florianópolis, Santa Catarina, Brasil

Education, from Paulo Freire's perspective, has been disseminated in research on science teaching focused on teacher education. Based on this scenario, this study sought to investigate the findings and conclusions of articles on teacher training practices that incorporate the Freirean thematic approach (FTA) in science teaching, to identify the potential and limitations of these practices and research gaps. To this end, an analysis of articles identified through the Dialnet, DOAJ, SCIELO, and Scopus indexers was conducted. Thirty-three articles relating ATF to teacher education were identified and subjected to discursive textual analysis. Among the results, four emergent categories arose: i) the student context as an object of reflection in teacher education in the field of science teaching; ii) teacher education and the knowledge systematized in the FTA within the scope of science teaching; iii) the interaction between basic and higher education teachers for understanding reality from the perspective of the FTA within the scope of science teaching; and iv) teacher educators in the field of science teaching and practice from the perspective of the FTA. Research focused on understanding teacher educators who guide training processes based on ATF was characterized as incipient.

**KEYWORDS:** teacher training; progressive education; science education

## Abordagem temática pautada em Paulo Freire e pesquisas em ensino de ciências sobre formação docente

### RESUMO

A educação sob a perspectiva defendida por Paulo Freire tem sido disseminada na pesquisa em Ensino de Ciências sobre a formação docente. A partir desse cenário, buscou-se investigar os resultados e as conclusões de artigos sobre as práticas de formação docente que contemplam a “abordagem temática fundamentada nas contribuições de Paulo Freire” (ATF), na área de Ensino de Ciências, de modo a identificar potencialidades e limites das práticas de formação docente e lacunas para pesquisa. Para tanto, realizou-se uma análise de artigos identificados por meio dos indexadores Dialnet, DOAJ, SCIELO e Scopus. Foram localizados 33 artigos que relacionam a ATF à formação docente, os quais foram submetidos aos procedimentos da Análise Textual Discursiva. Dentre os resultados, surgiram quatro categorias emergentes: i) contexto discente como objeto de reflexão na formação docente na área de Ensino de Ciências; ii) a formação docente e os conhecimentos sistematizados na ATF no âmbito do Ensino de Ciências; iii) a interação entre os docentes da educação básica e superior para a compreensão da realidade sob a perspectiva da ATF no âmbito do Ensino de Ciências; e iv) os formadores de docentes na área de Ensino de Ciências e a prática sob a perspectiva da ATF. Foram caracterizadas como incipientes as pesquisas centradas em compreensões de formadores docentes que pautam os processos formativos na ATF.

**PALAVRAS-CHAVE:** formação de professores; educação progressista; educação em ciências.

## INTRODUCTION

Historically, science teaching has been influenced by a traditional understanding of the educational process that disregards students' knowledge, their participation in peer interactions, and social issues. In general, from this perspective, purely content-based approaches and mechanized dynamics that reinforce the propagation of decontextualized content in basic and higher education, including in natural sciences courses, are recurrent.

Proposals that seek to oppose this traditional understanding of education in science teaching are well known, among them, the Freirean thematic approach (FTA) (Delizoicov, 1991). This theoretical-methodological perspective considers students' knowledge in real-world contexts (Delizoicov et al., 2018), thereby facilitating contextualization by linking scientific knowledge to local and global realities (Fernandes et al., 2016). The FTA seeks to apprehend what Freire called 'the generating theme' through the process of thematic investigation, by searching for and obtaining limit situations of a specific reality and the possibility of overcoming oppressive situations (Freire, 2021). Over time, formal education received its contributions, such as Silva's (2004) ethical-critical curriculum perspective.

On the other hand, research in teacher education is growing in the field of science teaching. In the field of chemistry teaching, for example, the literature has begun documenting it over the past decade (Silva & Queiroz, 2016). Thus, considering the number of publications aimed at investigating new methodological and curriculum possibilities for initial teacher education, it is evident that there is a need to overcome the recurring traditional understanding of the educational process (Silva & Queiroz, 2016), thereby meeting the FTA in the quality of a curriculum perspective (Silva, 2004).

Regarding the approach to teacher education in science teaching, more than a decade ago, Hunsche (2015) noted the lack of studies investigating its contributions to undergraduates. On the other hand, we recognize that the development of practices from the perspective of FTA is present in teacher education, fostering relationships between the university and the school and favoring teachers' permanent education (Delizoicov et al., 2020). Hence, studies have indicated, explicitly or implicitly, the need to systematize the contributions of Paulo Freire's references as support for teacher education processes (Delizoicov et al., 2020; Lambach, 2020; Santos, 2024). This justifies not only the relevance of works that analyze the development of teacher education practices from the perspective of FTA, but also works that seek to understand, through the analysis of the literature, their contributions.

In the literature on teacher education in science teaching, there are more works on the analysis of teaching practice than on theory (Razera et al., 2019), underscoring the need for further analysis on the theme. In this sense, a bibliometric analysis by Jesus and Razera (2020) identified the renowned Brazilian educator Paulo Freire as the most-cited author in the literature on teacher education in science teaching. Moreover, the authors' analysis of citations of Paulo Freire's works in research on teacher education in science teaching indicates that these studies are opposed to the growing neoliberal educational

trend in society (Jesus & Razera, 2020). This also suggests the importance of analyzing the nature of the results and conclusions of these studies.

Given the above, we seek to investigate the results and conclusions of articles on teacher education practices that include FTA in science teaching, in order to identify the potential and limits of these practices and the gaps in the research. Thus, we understand that the analysis of the literature can collaborate, to some extent, to characterize the directions that research and teacher education processes in the context of the FTA can advance, as well as to guide possible revisions, expansions, and redirections to research and teacher education processes in the context of FTA in science teaching.

### **THEMATIC APPROACH AGENDA IN PAULO FREIRE AND THE EDUCATION OF SCIENCE TEACHERS**

One of the objectives of education, based on the perspective advocated by Freire (2021), is to contribute to the transformation of reality. This implies an imperative questioning about educational understandings rooted in the educational system that value an alleged transmission and reception of knowledge and deny students' reality. With this, Freire (2021) contradicts the understanding to which educators and students are affiliated, characterizing it as a 'banking education'. According to the educator, education is a dialogic-problematizing construction based on studying and understanding reality.

Regarding dialogue, the educator argues that it is a "meeting of men, mediated by the world, to pronounce it, not exhausting, therefore, in the I-you relationship" (Freire, 2021, p. 109). In this sense, education is a construction based on dialogue and knowledge of situations of oppression to be understood, in order to obtain the generating theme, which represents the contradiction existing in concrete reality, enabling the construction of programmatic content (Freire, 2021).

In defense of a dialogic-problematizing education, Freire (2021) proposes the process of thematic investigation. Delizoicov (1991) systematized the author's thematic investigation in five stages, namely: i) "Preliminary survey": the first approach to the community, through obtaining and studying information from different sources and conversations with residents; ii) "Analysis of situations and choice of codifications": after examining the information obtained, there is a distinction between significant situations that represent local contradictions to be understood in the following stages; iii) "Decoding dialogues": obtaining the generating theme from coding-problematization-decoding of perceived contradictions, involving students, educators, researchers, and residents of the investigated community; iv) "Thematic reduction": the selection of knowledge to be studied to deepen the understandings necessary for understanding the generating theme; and v) "Classroom work": the implementation of the educational action from the planning built in the previous stages (Delizoicov, 1991). Over time, formal education received relevant contributions from the FTA, such as Silva's (2004) ethical-critical perspective.

According to Silva (2004), knowledge construction occurs through the interaction between the community and educators within the thematic network. Initially, an approximation is made with the community, and then significant

speeches are obtained (which represent the community's vision), creating contradictions; it is a denunciation of situations of oppression (Silva, 2004). In this relationship, the educators' vision is integrated by the countertheme, an antithesis to the generating theme (Silva, 2004).

Regarding the classroom, both Delizoicov's (1991) systematization and Silva's (2004) perspective are made possible by the theoretical-methodological dynamics of the three pedagogical moments (3 PMs) (Delizoicov et al., 2018). These favor pedagogical and curriculum restructuring practices consistent with the students' realities, grounded in the study and understanding of the generating theme (Paniz et al., 2018).

Initially, it is essential that students feel the need to establish relationships between knowledge of everyday life/reality and scientific knowledge (Delizoicov, 2008). Also considering this, the 3 PMs are systematized from three stages: i) initial problematization: presentation of real situations originating from the investigation, in order to favor the explanation of student knowledge about them and to foster the need to appropriate systematized knowledge; ii) knowledge organization: study of systematized knowledge from different activities; and iii) knowledge application: development of the study of the situations evidenced from the contributions of the systematized knowledge studied in the previous stage (Delizoicov et al, 2018).

Also, FTA enables critical education by fostering understanding of reality through a problematizing perspective that focuses on transformative actions and the re-signification of teaching practice (Giovedi & Nascimento, 2020). The practices, promoted from a Freirean perspective, view the school as a space for humanizing education, in which teachers are involved in the conception of permanent education (Delizoicov et al., 2020).

Permanent education, because it is linked to the inconclusion of the being and the knowledge to be built, raises reflections on the teaching practice itself, in what Freire calls praxis, action–reflection–action (Delizoicov et al., 2020). This movement mobilizes actions aimed at developing a reflective practice and future knowledge necessary for teacher education (Gonçalves & Marques, 2016). In addition, praxis is a way to raise awareness of acting and reflecting on the contradictions within a community, thus enabling transformative action (Lima et al., 2024). Finally, these contributions appear in the literature, supporting research that adopts Freire's progressive perspective of education. It is worth considering the high incidence of citing Freire's works in investigations of teacher education in science teaching, as indicated by Jesus and Razera (2020).

Thus, teacher education practices, developed from Freire's perspective on education in science teaching, lead to transformative actions, allowing the understanding of contradictions in concrete terms and raising awareness in the teaching environment. These relationships can be identified through studies that seek to investigate the contexts in which these practices are carried out.

## METODOLOGICAL TRAJECTORY

Literature analysis was based on articles identified through searches in Dialnet, DOAJ (Directory of Open Access Journals), SciELO (Scientific Electronic Library Online) and Scopus indexes, chosen for their relevance and the variety of published works in the area of science teaching. The articles were located according to the search procedures of each indexer, including adjustments to the related terms and their language (Portuguese and/or English).

Initially, the terms came from the relationship between FTA and teacher education. For "formação docente" [teacher education], the singular/plural/gender variations and additions were considered to identify the initial/continuing/permanent teacher education. The FTA had the following related terms: "abordagem temática" [thematic approach], "investigação temática" [thematic research], "tema gerador" [generating theme] and "abordagem temática freiriana" [Freirean thematic approach], based, *a priori*, on the development of FTA studies in science teaching. Then, different algorithms were developed for each index with the help of Boolean operators, "E" and "AND" and/or "OU" and "OR". The algorithms were transcribed into the Notepad for use in the different indexers, thus allowing necessary additions to the related terms without changing the formatting.

The Scielo indexer relied on searches in Portuguese and English, with algorithms: ("formação de professores" OR "formação de professor" OR "formação de professoras" OR "formação de professora" OR "formação inicial de professores" OR "formação inicial de professor" OR "formação inicial de professoras" OR "formação inicial de professora" OR "formação continuada de professores" OR "formação continuada de professor" OR "formação continuada de professoras" OR "formação continuada de professora" OR "formação permanente de professores" OR "formação permanente de professor" OR "formação permanente de professoras" OR "formação permanente de professora" OR "formação docente" OR "formação de docentes" OR "formação de docência" OR "formação da docência" OR "formação para docentes" OR "formação para docente" OR "formação para docência" OR "formação inicial de docentes" OR "formação inicial de docente" OR "formação inicial da docência" OR "formação inicial para docentes" OR "formação inicial para docência" OR "formação continuada de docentes" OR "formação continuada de docente" OR "formação continuada da docência" OR "formação continuada para docentes" OR "formação continuada para docente" OR "formação continuada para docência" OR "formação permanente de docentes" OR "formação permanente da docência" OR "formação permanente para docentes" OR "formação permanente para docente" OR "teacher training" OR "initial teacher training" OR "continuing teacher" OR "permanent teacher training") e ("thematic approach" OR "thematic investigation" OR "generator theme" OR "Freire and thematic approach" OR "the three pedagogical moments" OR "abordagem temática" OR "investigação temática" OR "tema gerador" OR "abordagem temática freireana"). In the Dialnet indexer, searches were generated with the terms only in the Portuguese language: ("formação de professores" ou "formação de professor" ou "formação de professoras" ou "formação de professora" ou "formação inicial de professores" ou "formação

inicial de professor” ou “formação inicial de professoras” ou “formação inicial de professora” ou “formação continuada de professores” ou “formação continuada de professor” ou “formação continuada de professoras” ou “formação continuada de professoras” ou “formação continuada de professora” ou “formação permanente de professores” ou “formação permanente de professor” ou “formação permanente de professoras” ou “formação permanente de professora” ou “formação docente” ou “formação de docentes” ou “formação de docência” ou “formação da docência” ou “formação para docentes” ou “formação para docente” ou “formação para docência” ou “formação inicial de docentes” ou “formação inicial de docente” ou “formação inicial da docência” ou “formação inicial para docentes” ou “formação inicial para docência” ou “formação continuada de docentes” ou “formação continuada de docente” ou “formação continuada da docência” ou “formação continuada para docentes” ou “formação continuada para docente” ou “formação continuada para docência” ou “formação permanente de docentes” ou “formação permanente da docência” ou “formação permanente para docentes” ou “formação permanente para docente”) and (“abordagem temática” ou “investigação temática” ou “tema gerador” ou “abordagem temática freiriana”). In the Scopus indexer, only the terms in English were used, according to the following algorithms: (“teacher training” OR “initial teacher training” OR “continuing teacher training” OR “permanent teacher training”) and (“thematic approach” OR “thematic investigation” OR “generator theme” OR “Freirean thematic approach”). The DOAJ indexer, which limits the number of characters per search, makes large algorithms impossible, requiring the fragmentation of related terms. In total, 70 searches were carried out in algorithms that related, in general terms, “abordagem temática freiriana” [Freirean thematic approach] and “formação docente” [teacher education]. The *corpus* of analysis consisted of articles published until 2022. A cutoff date prior to 2022 has not been established. The year 2022 was set as the limit because the article search was completed in 2023, with 2022 being the year before the search in the indexers. In 2024, the reading and examination of the articles was completed. The writing and revision of the article was completed in 2025.

After the searches, the works made available in PDF format were *downloaded* and organized in a table with the indexers containing information on the references, totaling 193. The first cutoff was based on titles, keywords, and abstracts to identify empirical works. From this division, analyses of the study object were carried out through empirical research on teacher education related to FTA, resulting in 33 analyses. The studies selected for the study, according to the inclusion/exclusion criteria mentioned above, are: Lucatto and Talamoni (2007), Muenchen and Auler (2007), Torres et al. (2008), Cassiani and Linsingen (2009), Halmenschlager et al. (2011), Hunsche and Auler (2012), Watanabe-Caramello et al. (2012), Gehlen et al. (2014), Sousa et al. (2014), Bernardi et al. (2015), Britto and Silva (2015), Novais et al. (2015); Silva and Gehlen (2016), Silva et al. (2016), Abreu and Freitas (2017), Halmenschlager et al. (2017), Umpierre et al. (2017), Bomfim and Gehlen (2018), Milli et al. (2018), Neres and Gehlen (2018), Almeida and Gehlen (2019), Assunção et al. (2019), Ferreira et al. (2019), Fonseca et al. (2019), Silva et al. (2019), Freitas and Queiróz (2020), Magoga and Muenchen (2020); Schwan and Santos (2020), Silveira et al. (2020), Fonseca et al. (2021), Gonçalves et al. (2021); Solino et al. (2021), and Stoeberl and Brick (2021).

Although the 33 selected articles were read in full, the analysis *corpus* was limited to the results/discussion and final considerations sections. The procedures used to examine the articles were those of discursive textual analysis (DTA) by Moraes and Galiazzi (2007), based on the following steps: unitization, categorization, and communication. In unitization, the fragments of the *corpus* of analysis are extracted from the delimited object of study; in categorization, similar fragments are approximated to enable the formation of *a priori*, emerging or mixed categories; and the communication that takes place through a metatext and the categories of analysis are discussed, involving references from the literature in the area (Moraes & Galiazzi, 2007). The DTA option is justified by the fact that its epistemological assumptions align with those of Freire (Gonçalves, 2020a, 2020b). Regarding the *a priori*, emerging, and mixed categories, the first, which precedes the analysis of the *corpus*, stems from knowledge derived from the theory/literature studied. In contrast, the emerging ones derive from the analysis of the *corpus* from the organization of similar elements by the researcher. The mixed ones combine the *a priori* and emerging categories. For example, they can originate from *a priori* categories stemming from theory/literature and receive contributions throughout the analysis of the selected *corpus* through emerging subcategories (Moraes & Galiazzi, 2007).

In this work, we opted for the construction of emerging categories. The fact that emerging categories were chosen, consequently, dispensed with the use of categories from Freire's educational framework for *corpus* analysis. As Demos and Gonçalves (2025) analyzed works (articles, complete works in events, etc.) using the DTA, we used direct citations of the analyzed articles in the metatexts, recognizing that this is important for validating the categories. We also understand, as the authors do and as supported by Moraes and Galiazzi (2007), that the validation of the categories is not *a priori* and is not confined to a unique stage of the DTA. The communication process itself is important for the validation of the categories. The citations are interpreted with the support of theoretical interlocutors who do not constitute the *corpus*. It is true that citations of certain works that represent results of others were selected, considering the unfeasibility of space to cite all articles.

The categories presented were: i) the student context as an object of reflection in teacher education in the area of science teaching; ii) teacher education and systematized knowledge in the FTA in the scope of science teaching; iii) the interaction among teachers of basic and higher education to understand reality from the perspective of the FTA in the scope of science teaching and iv) teacher educators in the area of science teaching and practice from the perspective of the FTA.

## RESULTS AND DISCUSSIONS

### Student context as an object of reflection in teacher education in the area of science teaching

Concerning science teaching, both initial teacher education and basic education have traits strongly related to technical rationality (Paniz & Muenchen, 2020). This culminates in mechanized methodologies and the propagation of a teaching approach focused on knowledge distant from the student's reality. On the contrary, FTA brings scientific knowledge closer to the student's reality by considering the development of thematic research to search for/obtain the generating theme (Freire, 2021). In initial teacher education, supervised practicums can be guided by the process of thematic investigation. Silveira et al. (2020), for example, developed a proposal based on thematic research that involved a group of undergraduates, a pre-service teacher in her practicum from a graduate course, a teacher, basic education students, and a teacher educator. The thematic investigation at work was based on Sousa et al.'s (2014) proposal. According to Silveira et al. (2020), the planning of classes to be taught by undergraduates was supported by a collective virtual class diary, in which the teacher educator and the pre-service students participated. The following is an example and interpretation of the understanding of one of the undergraduates about the perception of the subjects (students of basic education) about their reality:

During planning, the undergraduate student contradicted her tacit expectation that students' questionnaire responses would, with relative safety, reveal the information sought about students' reality. However, it is necessary to share Freire's idea when highlighting that the subjects' gaze on their own reality may be influenced by what is called "naive consciousness". The interpretation of the undergraduate student may have been influenced by the fact that the decoding dialogues stage, which is part of the thematic investigation, was not promoted, indicating a possible limit on the methodological option adopted – even if based on Sousa et al. (2014) – by the educator in defining the theme (Silveira et al., 2020, p. 1533).

As for the subjects' understanding of their own reality during the development of thematic research, Rocha (2013), after interviewing science teachers, identified that they recognize that, in their formative process, a critical view of the student's reality was not valued. For the author, rare spaces can strengthen the professionals' praxis, which, in turn, could enable understandings about the real student and teacher context.

Thus, the contradictions existing in a given location can be reduced to an illustrative daily life to supposedly motivate students to appropriate the concepts to be studied, without considering the possibility of transformative education (Roso et al., 2015).

Fonseca et al. (2021) emphasize the need for teachers in basic education to overcome practices focused solely on content. For this reason, from the analysis of two dissertations and a thesis in the area of chemistry teaching, they sought to "identify and problematize limit situations from the perspective of teaching and science teachers' education, signaling possibilities of coping in

pedagogical practice" (Fonseca et al., 2021, p. 4). As for the reality in which the themes are chosen/obtained, the results indicate that the teachers support a superficial view of the contradictions, indicating an "uncritical" and "unproblematic" view of reality, as follows:

The teacher recognizes the relevance of the pesticide theme to students' lived experience. We can say that it takes a critical view of the concept's approach in its pedagogical practice; however, it does not show evidence of articulating this work. As in the study by Coelho (2005), the teacher appears to identify the problem but does not offer a critical view of its cause, perhaps because she is involved in it (Fonseca et al., 2021, p. 16-17).

Fonseca et al. (2021) indicate that understandings that direct the approach to the theme are oriented toward a conceptual implementation, disregarding the potential of the thematic approach. Moreover, the theme is recognized, although its approach distances itself from a critical conception that hinders relations with the locality in a more significant way and, thus, of transformation. Therefore, the authors apprehend, to a certain extent, an uncritical teaching view of reality, which is close to the research result of Silva et al. (2016), indicating an uncritical teaching understanding of a local problem that affects students:

In this investigation, they sought residents' understanding of the situation with a polluted river. However, there was also the revelation of the understanding of teachers and members of GEATEC of some aspects related to the Água Preta river. In this sense, it is puzzling that some teachers show an uncritical understanding of the use of river water and even an accommodation to the problem of river pollution (Silva et al., 2016, p. 137-138).

According to Silva et al. (2016), this is due to a naive conception fostered by teachers, who want to work on themes of water or pollution without considering the impact of slaughterhouses and the incorrect use of the river by the inhabitants for washing clothes and household items. According to Coelho (2005), the lack of criticality of teachers regarding local problems and contradictions is not unusual.

The aforementioned fragments suggest evidence of incautious views on the part of teachers in the field of basic education sciences and undergraduates regarding student reality. In this lies one of the potentialities of the teaching practices investigated, i.e., the apprehension of this knowledge. These understandings must be considered in the development of FTA-based practices. And the imperative immersion of teachers in the contexts of thematic research must consider these student understandings of contradictions (Freire, 2021; Delizoicov et al., 2018). Thus, the results of the research indicate that the search for a theme in the thematic investigation, or in part of its stages, can be permeated by the uncritical perceptions of science teachers regarding the contradictions in the student context under scrutiny. On the other hand, this also suggests the formative role of FTA in the education of science teachers.

## Teacher education and systematized knowledge in the FTA in the scope of science teaching

As highlighted, the development of thematic research is present in teacher education in its relationships with basic education. The following fragment contains the result of research on the initial education of chemistry teachers, guided by the FTA, in the context of the supervised practicum in basic education:

In short, we understand that, in undergraduates' understanding, the definition of a theme and its underlying content were permeated by limitations during their formative process. The analysis suggests that undergraduates were influenced by understandings that value conceptual content as the defining feature of the program (Silveira et al., 2020, p. 1534).

Silveira et al. (2020) call into question the conceptual content as an influencer in the construction of the programmatic content, since the choice/direction of the themes was interpreted under the influence of the conceptual approach. The prevalence of the conceptual approach distances itself from the FTA, in which the conceptual contents are subordinate to the theme (Delizoicov et al., 2018). Silva and Carvalho (2009) found that teachers and undergraduates recognized that developing works based on controversial themes could simplify teaching and learning and reduce the number of concepts to be studied. This content view is present among graduates and can be influenced by their education path in basic education (Watanabe & Kawamura, 2017).

The relationship between content and theme in science teaching is a topic of study in the field (Watanabe & Kawamura, 2017). In the same vein, Stoeberl and Brick (2021) state that:

A major difficulty in the project's elaboration was selecting the concepts from the natural sciences and mathematics. The selection of concepts cannot be arbitrary; they must be articulated with the central theme to contribute to confronting dehumanizing situations.

Other adversities were the most conceptual and expository moments that did not promote greater interaction between students and the teacher, and were disconnected from the issues related to the central problem, leading to a decrease in student participation, and even when open to questions and doubts, the moments students expressed themselves were scarce and it was even more difficult that they made comments or brought perceptions about the content (Stoeberl & Brick, 2021, p. 16).

Centa (2015) states that a curriculum reorientation based on the FTA represents a challenge, given the lack of teaching time for collective planning and the excessive value placed on their scientific conceptualization. At FTA, scientific conceptualization is also valued, but it is not the starting point. Also according to Centa (2015), students' resistance to FTA is related to the passive way they were educated, since they were used to propaedeutic teaching (Centa, 2015).

Silveira et al. (2020) expose the problem of the lack of interdisciplinarity with other undergraduate degrees until the moment of the curriculum practicums in those courses. In this sense, they highlight that:

The articulation between the curriculum component Chemistry and others in the approach to the theme constitutes a limit. In the curriculum components that precede the practicum in that course in the teaching degree in Chemistry, there is no articulation with the curriculum components of other teaching degree courses in the institution. This

contributes to the disadvantage of the thematic reduction stage by involving specialists from different areas of knowledge and, therefore, corroborates the excessively disciplinary view of the development of the supervised practicum (Silveira et al., 2020, p. 1534).

The practicums are problematized by Pimenta and Lima (2021), who define them as interventions, underscoring the need for interaction among the subjects involved in this fundamental stage of teacher education. These lived experiences in practicum can bring together, in an interdisciplinary way, educators, undergraduates, teachers, basic education students, and the community (Pimenta & Lima, 2021). Regarding interdisciplinarity, Muenchen (2006) showed, from the analysis of interviews with teachers of Youth and Adult Education (EJA), the importance of collective work. Nevertheless, the author considers this collective work a challenge to be addressed, given the limited time available for planning and teacher resistance.

Thus, the conceptual approach influences the processes of teacher education in science teaching, according to the research analyzed. In addition, the organizational structure and curriculum frameworks —as they are based on the conceptual conception of teaching— represent obstacles to the implementation of an education perspective from the FTA in the education of science teachers. Facing teachers' understanding guided by a conceptual approach seems to be a slow process, representing, to some extent, a limit to teacher education.

### **The interaction among teachers of basic and higher education to understand reality from the perspective of the FTA in the scope of science teaching**

As already mentioned, within the scope of teacher education, it is possible to foster interaction between basic and higher education through curriculum components, such as the practicum, which enable this interaction, and through research involving the school context and communities. In this sense, Almeida and Gehlen (2019) investigated the process of selecting the contents established for the understanding of a generating theme from the construction of the thematic network based on Silva (2004), which allows the interaction among the various subjects involved in the thematic investigation and directs the historically systematized knowledge to be studied (Silva, 2004). The top of the network embodies the vision of educators, i.e., the countertheme — to be considered as an antithesis in relation to the generating theme, as systematized by Silva (2004). And it is referenced from Strieder and Kawamura (2017), under the science, technology, and society (STS) approach, also based on Freire:

To understand the generating theme: "Olivença: eu vivo em um paraíso esquecido" [Olivença: I live in a forgotten paradise], teachers and researchers, participants in the formative process developed in Olivença, selected some content, knowledge, and actions that can be developed in the school context, in the community and within the scope of the municipal government. In general, the educational purposes present in the thematic reduction process, specifically in the elaboration of the top of the thematic network, involve different levels of criticality, aimed at developing perceptions of the relationship between scientific knowledge and the student's life context, questions of reality, and social commitments. It is concluded that these purposes are important to consider in the elaboration of the thematic deduction, as they can guide the selection of knowledge and actions to be developed in the school context (Almeida & Gehlen, 2019, p. 19-20).

The thematic network facilitates interactions among the community, basic education educators, and higher education teachers, enabling the visualization of the required knowledge and the planning and organization of the curriculum. The thematic network transcends individual teacher planning and predetermined curricula (Demartini & Silva, 2021), and allows the establishment of relationships among different understandings from the perspective of the subjects involved in the link between higher education institutions and schools. In addition, the interaction between higher education and basic education teachers with popular groups mobilizes the study and investigation of local needs (Pinheiro & Brick, 2023). Also, the knowledge of these professionals complements each other and enables the construction of new knowledge in a significant way, through dialogical-problematizing construction, the essence of FTA (Delizoicov et al., 2018). Higher education teachers are, in this process, active subjects who should not impose their knowledge, something characteristic of cultural invasion processes (Freire, 2021). These higher education teachers are participants in a collective action with the community, students, and teachers of basic education through dialogicity and problematization (Freire, 2021).

Lucatto and Talamoni (2007) exemplify the possibilities of the relationship between the different subjects in the process of obtaining and understanding a generating theme. The following fragments indicate the interaction between students and teachers of basic and higher education in the approximation of the investigated community from the collection of information:

All participants (teachers, students, and researcher) were involved in the interviews with the former residents of the place; in the collection of data and bibliographies necessary to conduct the scheduled activities; in the analysis of the old photos provided by some members of the community, or in the activities of environmental perception (Lucatto & Talamoni, 2007, p. 395).

I believe that the search for knowledge, as well as the training of educators in EE, are not defined in individual action, nor in its isolated expression, and were only possible due to the perspective of teachers to consolidate themselves as subjects of production and appropriate their reality through a collective action in a process of mobilization, action, and reflection (Lucatto & Talamoni, 2007, p. 396).

Within the scope of environmental education (EE), Lucatto and Talamoni investigated school teachers' conceptions of the development of practices from a thematic perspective (Lucatto & Talamoni, 2007). For Freire (2021), the study of concrete reality goes beyond the present material existence and includes the perception of subjects within the contexts in which they are situated. Thus, even with different understandings about the same reality, students and teachers of basic and higher education constitute a research collective in the search and development of the generating theme (Freire, 2021).

For Lucatto and Talamoni (2007), the participation of basic and higher education teachers and the community enabled collective action that facilitated the construction of common knowledge among the participants. In addition, it instigated the appropriation of a critical view among the people involved in the investigation:

All activities, discussed and developed together, contributed to the expansion of participants' knowledge and helped form citizens who are more aware and critical of their reality. Then, the need to socialize the knowledge generated emerged. Thus, it was decided to hold a forum for debates and to exhibit to the public the work resulting from

the activities carried out. The event prioritized the discussion among the school community and various segments of society on the need/possibility of a collective search for solutions and alternatives to the most urgent problems identified in the Ribeirão dos Peixes watershed (Lucatto & Talamoni, 2007, p. 395-396).

For Paniz et al. (2018), the study of reality should not be limited to data collection, but to how students perceived/understood such reality. The interpretation of reality and the understanding of the generating theme enable actions that can overcome school walls and achieve effective social transformation.

Britto and Silva (2015) present field education as a possibility for interaction between basic and higher education. Field education, as described in the article, operates in an alternating regime, divided into community time (CT) and university time (UT). In this case, reality is lived and discussed in universities from Freire's dialogical-problematizing perspective. Britto and Silva (2015) believe that the space of the degree, specifically that of the curriculum practicums, when prospective teachers are inserted in schools to develop teaching activities, favours the process of permanent education in the school context and collective construction in favour of understanding reality. According to the authors:

Given these bridges between an experience of thematic research in the education of teachers for field education and systematizations of continuing education projects for teachers based on the Freirean perspective, we reinforce the existence of guidelines of the former that not only indicates the possibility of adopting thematic research as a formative practice in field education degrees, but suggest research and theoretical deepening in the identification of limits and possibilities. [...]

The collective work (although limited by the school's time conditions) involved professors/teacher educators, prospective teachers in practicum, and field educators. Given the complexity of the theme and the dialogical and problematizing principles that supported the process, different knowledge and subjects participated in the construction and application of educational practice (Britto & Silva, 2015, p.779-780).

The practicums in the degree favor the interaction between teachers of basic education and students of the degree. For Delizoicov et al. (2020), humanizing education is done through the continuous action of "action-reflection-action", when considering the search for "being more" through knowledge and "man-world" relations. Delizoicov et al. (2020) also underscore the role of teachers in the development of thematic research.

Another point to consider in the relationship between teachers of higher and basic education is the research groups. Silva et al. (2016), for example, highlight the contributions of a research group in teacher education processes, highlighting the positive results in relation to curriculum organizations and teacher practices in basic education:

GEATEC studies, resulting from partnerships between UESC and basic education schools, have focused especially on the analysis of the relationships of teacher education processes and the dynamics of obtaining the generating theme and point to significant changes in the school organization and in the teacher's pedagogical practice (Silva et al., 2016, p. 128-129).

For Pinheiro and Brick (2023), basic education teachers find university research groups to be an environment for studying, deepening the information obtained, and planning and organizing curricula from an ethical-critical perspective, which does not mean admitting that the university is the only space

for teacher education or that teachers of basic education do not have autonomy in their professional development. In the same sense, Silva et al. (2023) argue that the research group was a theoretical contribution to the development of practices from the perspective of FTA during the practicum period in the Physics degree. In addition, they highlight the possibility of collective work during practice planning and a space for discussion to study the theoretical framework of the FTA.

Magoga and Muenchen (2020) analyzed the understanding of the actions of higher education teachers who work in the guidance of pre-service teachers in the development of a thematic approach and highlighted that:

The groups are therefore spaces for study and research, also helping to develop formative processes for basic education teachers. In fact, the formative processes are other important contexts of action of the investigated subjects (Magoga & Muenchen, 2020, p. 326).

Research/study groups represent possibilities for teacher education. They also enable actions in school contexts through practices based on FTA. It is important that the relationship between teachers of higher and basic education, within the scope of the FTA, is not restricted to formative spaces, such as curriculum practicums. For Saul and Saul (2016), the educational perspective based on Freire enables the construction of a "counter-hegemonic" education, resistant to traditional (based on technical rationality) and dominant formative models. The authors also emphasize, drawing on Freire, that education enables rethinking teacher education within a critical-transformative conception.

Lima et al. (2024) argue that transformative mediation with the world occurs through reflective praxis, from elevating subjects' awareness to what Freire calls "maximum possible consciousness". Teachers' permanent education, from a perspective focused on the educator, goes beyond the commodified vision of education as preparation for the new or, at best, an incessant search to meet the demands of the field. This perspective of permanent formation brings the relationship with the world, which occurs in a mediatized way, to a critical formation of the subjects involved. In the same sense, Stuani (2016) defends the potential of FTA for the permanent education of teachers, reinforcing the collective construction in the school and the understanding of reality and pedagogical practice. For the author, the relationship between FTA and continuing education enables teachers to develop a critical view of the profession and of how school content is approached.

Thus, it is possible to conclude that teacher education processes based on the FTA can foster interaction among teachers of higher and basic education, as well as among students, the school, and the community. In this context, undergraduate science students also constitute themselves as subjects being educated. These interactions enable the development of thematic research, favoring the awareness of those involved about their own reality through collective action.

## Teacher educators in the area of science teaching and practice from the perspective of the FTA

Few identified articles investigated aspects of the professional development of teacher educators in science who use FTA. Magoga and Muenchen (2020) characterized how a group of researchers in the fields of science teaching work and understand the FTA, among other perspectives of thematic approach:

Despite working at different universities, the researchers share some common characteristics, the main one being the TA perspective they most identify with: the Freirean one.

The identification from the perspective of the Freirean thematic approach (FTA) is justified by several reasons, among them the change in the status quo — both of the subject and the context — it enables (Magoga & Muenchen, 2020, p. 324).

Regarding performance, Magoga and Muenchen (2020) identified the performance of those teacher educators who usually teach curriculum components, such as didactics and curriculum practicums. Moreover, the research groups they coordinate are identified as formative spaces for basic education teachers, undergraduate students, scientific initiation scholarship holders, postgraduate students, and teacher educators. According to the authors, the actions, from Freire's (2021) perspective, follow the praxis (action-reflection-action) when developing a thematic investigation or an adaptation of it. Regarding the subjects' reality, the teacher educators bring the transformation of those involved, whose results are exemplified below:

The units of meaning presented represent the precepts of this category, showing that both in initial education (as described by P3) and in continuing education (as explained by P5), there is a clear importance of Freire's concepts and assumptions as beacons for this process. [...]

To carry out formative processes based on Freirean assumptions is to reaffirm the protagonism of educators who, as subjects, are existential and historical beings; that is, formative processes from the Freirean bias enable subjects to problematize their realities not from the perspective of the "teacher educator", but from the perspective of each of the teacher educators/subjects. [...]

During the dialogue with the researchers, in addition to the reports on the actions, it was possible to perceive that they understand that the work from the local reality is a mark of the Freirean perspective of the TA (Magoga & Muenchen, 2020, p. 328-329).

In short, the teacher educator is identified as one of those responsible for the formative process, but not the only one. In tune, Gonçalves et al. (2021) characterized the problematization of the teacher educator during the practicum of a degree in Chemistry. For this, we examined a virtual diary prepared collectively by the undergraduates and the teacher educator. Among the results found, two stand out: i) "Respect for the knowledge of the undergraduate students" and ii) "Awareness of the incompleteness of teaching" (Gonçalves et al., 2021). Regarding respect for undergraduates' knowledge, the teacher educator problematizes this by considering that the concerns stem from their lived experience, in order to bring their reflections into the formative environment. Thus, Gonçalves et al. (2021) point out that:

The undergraduates' repeated appreciation of the ideas explained highlights the dialogicity of the formative process. To the extent that the undergraduates express their understanding of the experiences lived in the practicum, they can, with the teacher

educator, reflect on their teaching practices. In this regard, it is important to consider what Freire (1992) said about teaching: "The more tolerant, the more transparent, the more critical, the more curious and respectful, the more they authentically assume teaching practice" (p. 81). The reflections shared by the teacher educator and the undergraduate students are interpreted as constituents of problematization that can help the people involved in the formative process authentically assume the teaching practice, as the author highlights (Gonçalves et al., 2021, p. 14).

This dialogical movement of apprehending student knowledge aligns with Freire's notion of problematization (Delizoicov, 1982). In addition, problematization grounded in students' knowledge reinforces the collective construction of knowledge between teacher educators and undergraduates. The following fragment exemplifies the teacher educator's action in problematizing the incompleteness of teaching with the undergraduates:

The teacher educator shares reflections with the undergraduates on the need to acquire new knowledge in Chemistry teaching, explaining how this relates to their own pedagogical practice, not only in the process of developing the thematic research project but also in its planning. At the same time that the teacher educators explain their reflections, they defend their point of view and value the incentive for undergraduates' reflections [...] (Gonçalves et al., 2021, p. 22).

Another point highlighted in the fragment is related to the need to continue building knowledge of the area to be taught. This values the need for reflection on the teaching practice itself. In other words, these discussions align with Freire's (2021) conception of permanent education. For Delizoicov et al. (2020), Freirean permanent teacher education is rooted in an ontological and gnosiological conception. In other words, while the first refers to the "incompleteness of teaching" in the search for knowledge during its exercise, the second relates to the construction of knowledge through dialogical-problematic actions of collective construction.

Thus, Magoga and Muenchen (2020) and Gonçalves et al. (2021) present directions for the potential of the FTA and Freire's fundamental assumptions when considering reflections on practice, the relationships established with knowledge of reality, and the students/undergraduates and permanent education. In addition, it reinforces the relationship of the institution of higher education with the school. It should be noted that research focused on teacher educators in the field of science was limited to the two articles cited in this category, suggesting that their actions involving the FTA constitute a research gap and warrant further investigation in the literature.

## CONCLUSIONS AND IMPLICATIONS

FTA, at its essence, contradicts the traditional approach to education, enabling the development of dialogic-problematizing practices grounded in reality. Thus, the relationship between FTA and teacher education in science teaching is presented in the literature. From the emerging categories, the results of the research indicate that science teachers hold an uncritical perception of the contradictions in students' reality when they participate in the thematic investigation or in processes partially guided by its stages. In addition, the analysis reveals that the conceptual approach present in basic education as an organizer of the curriculum can influence the learning of science teachers in the study of

the FTA in formative processes. Not infrequently, teachers are influenced by the view that the curriculum should be organized around the conceptual content of science. At the same time, Bonfim and Gehlen's (2018) work suggests, in a way, how to address teacher understandings rooted in the conceptual approach. Still, it is imperative to advance research that seeks to understand the confrontation between teacher understanding, guided by a conceptual approach, and the structuring of school curricula. FTA in teacher education has also been shown to favor the development of interaction between higher and basic education. This interaction can be strengthened by spaces for permanent teacher education, Silva's thematic network (2004), and support from research groups. And, finally, as a possible gap to research in science teaching that relates FTA and teacher education research that has teacher educators as research subjects. Only two articles focused on the analysis of the understandings of those teacher educators. Research in this direction is relevant, as it can help demarcate key characteristics in the development of teacher education processes in the area, supported by the FTA. We understand that the professional development of teacher educators in science also deserves to be recognized as a research theme in the context of FTA in teacher education. Why not?

The analysis of the articles that composed the *corpus* signals a challenge to the processes of teacher education to advance in the organization of formative processes that collaborate to overcome the hegemonic understanding that the conceptual approach must be the unconditional structuring of school curricula. As a systematization of the results and conclusions of research on teacher education practices that include FTA in the area of science teaching, this work, obviously, does not propose to signal characteristics to these teacher education processes — which would be contrary — and does not have results that compare with those brought by the articles analyzed. However, we can say that the results explained here may have contributed to elucidate how works based on Paulo Freire's reference, with a cutout in his contributions to the thematic approach, may be contributing to the debate about teacher education in the area of Science Teaching, distinguishing, and to some extent complementing, the results of the bibliometric analysis presented by Jesus and Razera (2020) when investigating the citations to Freire in articles on teacher education in the area of Science Teaching in Brazil. It is also true that other analyses with *a priori* categories—based on Freire's own reference—or emerging or mixed from this *corpus* of analysis—even updated—can offer complementary understandings that contribute to the debate on how research and teacher education processes in the context of FTA can advance.

Therefore, the results and conclusions from research on teacher education practices that include FTA can inform the systematization of new formative proposals supported by this approach. In addition to the analysis of results and conclusions, other analyses can be carried out that focus on the methodologies adopted by these researches and their understandings of teacher education, including examining the coherence of the teacher education process with Freire's understanding of permanent teacher education. It is imperative that the teacher education actions that guide the research align with the educational bias advanced by Paulo Freire. On the other hand, it is known that a harmony between the methodological and theoretical frameworks adopted in research is necessary, although this does not always occur.

## NOTES

Translation by Maria Isabel de Castro Lima. Email: baulima@gmail.com

## REFERENCES

- Abreu, J. B., & Freitas, N. M. S. (2017). Proposições de Inovação Didática na Perspectiva dos Três Momentos Pedagógicos: tensões de um processo formativo. *Ensaio: Pesquisa em Educação em Ciências*, 19.
- Almeida, E. S., & Gehlen, S. T. (2019). Organização Curricular na Perspectiva Freire-CTS: propósitos e possibilidades para a Educação em Ciências. *Ensaio Pesquisa em Educação em Ciências*, 21.
- Assunção, J. L., Solino, A. P., & Gehlen, S. T. (2019). A Investigação Temática na elaboração de um projeto político-pedagógico humanizador. *Currículo sem Fronteiras*, 19(3), 1379-1409.
- Bernardi, L. S., Stuani, G. M., & Delizoicov, N. C. (2015). Um Projeto Interdisciplinar: abordagem temática Freiriana no estágio de docência do curso de licenciatura intercultural indígena. *Revista Pedagógica*, 17(34), 192-207.
- Bomfim, M. G., & Gehlen, S. T. (2018). Abordagem Temática Freireana: a superação de obstáculos gnosiológicos na formação de professores. *Revista Ibero-americana de Educação*, 76(2), 29-50.
- Britto, N. S., & Silva, T. G. R. (2015). Educação do Campo: formação em ciências da natureza e o estudo da realidade. *Educação & Realidade*, 40(3), 763-784.
- Cassiani, S., & Linsingen, I. V. (2009). Formação inicial de professores de Ciências: perspectiva discursiva na educação CTS. *Educar*, 34, 127-147.
- Centa, F. G. (2015). "Arroio Cadena: cartão postal de Santa Maria?" Possibilidades e desafios em uma reorientação curricular na perspectiva da Abordagem Temática [Dissertação de Mestrado, Universidade Federal de Santa Maria]. Repositório Digital da UFSM.
- Coelho, J. C. (2005). *A Chuva Ácida na Perspectiva de Tema Social: Um Estudo com Professores de Química em Criciúma (SC)* [Dissertação de Mestrado, Universidade Federal de Santa Catarina]. Repositório Institucional da UFSC.
- Delizoicov, D. (1982). *Concepção Problematizadora para o Ensino de Ciências na Educação Formal: relato e análise de uma prática educacional na Guiné-Bissau* [Dissertação de Mestrado, Universidade Federal de São Paulo]. Repositório da Produção USP.
- Delizoicov, D. (1991). *Conhecimento, tensões e transições* [Tese de Doutorado, Universidade de São Paulo]. Repositório da Produção USP.
- Delizoicov, D. (2008). La Educación en Ciencias y la Perspectiva de Paulo Freire. *Alexandria*, 1(2), 37-62.

- Delizoicov, D., Angotti, J. A., & Pernambuco, M. M. (2018). *Ensino de Ciências: Fundamentos e Métodos*. Cortez.
- Delizoicov, D., Delizoicov, N. C., & Silva, A. F. G. (2020). Paulo Freire e o ser humano em processo de formação permanente. *Retratos da Escola*, 14(29), 353-369.
- Demartini, G. R., & Silva, A. F. G. (2021). Abordagem Temática Freireana no Ensino de Ciências e Biologia: reflexões a partir da práxis autêntica. *Revista Brasileira de Pesquisa em Educação em Ciências*, 21, 1-30.
- Demos, T. V., & Gonçalves, F. P. (2024). Caracterização da inserção de docentes na educação profissional, científica e tecnológica: uma análise da literatura. *Acta Scientiarum. Education*, 47(1), e64572.  
<https://doi.org/10.4025/actascieduc.v47i1.64572>
- Fernandes, C. S., Marques, C. A., & Delizoicov, D. (2016). Contextualização na Formação Inicial de Professores de Ciências e a Perspectiva Educacional de Paulo Freire. *Ensaio: Pesquisa em Educação em Ciências*, 18(2), 9-28.
- Ferreira, M. V., Muenchen, C., & Auler, D. (2019). Desafios e Potencialidades em Intervenções Curriculares na perspectiva da abordagem temática. *Ensaio: Pesquisa em Educação em Ciências*, 21.
- Fonseca, E. M., Lindemann, R. H., & Duso, L. (2019). Articulações entre referenciais do movimento ciência-tecnologia e sociedade e pressupostos da Abordagem Temática Freireana: refletindo sobre possibilidades para a formação de professores. *Desenvolvimento Curricular e Didática*, 11(2).
- Fonseca, E. M., Tadeu, T. S. A., Maraschin, A. A., & Lindemann, R. H. (2021). Problematização das Situações-limite no Contexto do Ensino e Formação em Ciências: contribuições da Abordagem de Temas com viés Freireano. *Revista Brasileira de Pesquisa em Educação em Ciências*, 21, 1-32.
- Freire, P. (1992). *Pedagogia da Esperança: um reencontro com a pedagogia do oprimido* (4a ed.). Paz e Terra.
- Freire, P. (2021). *Pedagogia do Oprimido* (78a ed.). Paz e Terra.
- Freire, P. (2021). *Extensão ou Comunicação?* (23a ed.). Paz e Terra.
- Freitas, W. P. S., & Queirós, W. P. (2020). O Uso de Audiovisuais Problematizadores no Processo de Investigação Temática como meio para Obtenção do Tema Gerador. *Ensaio: Pesquisa em Educação em Ciências*, 22.
- Gehlen, S. T., Strieder, R. B., Watanabe-Caramello, G., Feistel, R. A. B., & Halmenschlager, K. R. (2014). A Inserção da Abordagem Temática em cursos de licenciatura em física em instituições de ensino superior. *Investigações em Ensino de Ciências*, 19(1), 217-238.

- Giovedi, V. M., & Nascimento, E. A. (2020). A Perspectiva Freireana na formação permanente de educadores/as. *Revista Retratos da Escola*, 14(29), 371-385.
- Gonçalves, F. P. (2020a). Considerações de natureza epistemológica acerca da análise textual discursiva. *Educação*, 43(1), p. 1-12.
- Gonçalves, F. P. (2020b). Análise textual discursiva como constituinte de um processo de comunicação. *Revista Pesquisa Qualitativa*. 8(19), 722-738.
- Gonçalves, F. P., & Marques, C. A. (2016). A Experimentação na Docência de Formadores da área de Ensino de Química. *Química Nova na Escola*, 38(1), 84-98.
- Gonçalves, F. P., Silveira, R. A., & Piaia, L. (2021). A Problematização do formador de professores de química no estudo da Abordagem Temática: uma análise constituinte de um processo de comunicação. *Revista Brasileira de Pesquisa em Educação em Ciências*, 21, 1-30.
- Halmenschlager, K. R., Stuani, G. M., & Souza, C. A. (2011). Formação Docente no contexto escolar: contribuições da reconstrução curricular via Abordagem Temática. *Alexandria*, 4(2), 83-107.
- Halmenschlger, K. R., Monano, G. D., & Stragliotto, M. (2017). Abordagem Temática na educação do campo: desafios no âmbito do estágio de docência [Apresentação de trabalho]. *X Congreso Internacional sobre Investigación en Didáctica de las Ciencias*, Sevilha, Espanha.
- Hunsche, S. (2015). *Docência no Ensino Superior: Abordagem Temática nas Licenciaturas da área de Ensino de Ciências da Natureza*. [Tese de doutorado, Universidade Federal de Santa Catarina].
- Hunsche, S., & Auler, D. (2012). O Professor no processo de construção de currículos: desafios no estágio curricular supervisionado no ensino de física. *Revista Electrónica de Enseñanza de las Ciencias*, 11(1), 1-20.
- Jesus, A. M. P., & Razera, J. C. C. (2020). Paulo Freire em Artigos sobre Formação de Professores na área Brasileira em Educação em Ciências [1996-2018]: uma análise de citações. *Investigações em Ensino de Ciências*, 25(3), 361-378.
- Lambach, M.; Marques, C. A. & Silva, A. F. G. (2020). Limites e Avanços no Uso da Concepção Freiriana em Curso de Formação de Professores de Química da EJA. *Revista Debates em Ensino de Química*, 6 (2), 65-81.
- Lima, J. A., Santos, J. S., Solino, A. P., & Gehlen, S. T. (2024). A Práxis na Construção de um Projeto Político Pedagógico Freireano: um olhar sobre a educação em ciências. *E-Curriculum*, 22, 1-30.
- Lucatto, L. G., & Talamoni, J. L. B. (2007). A Construção Coletiva Interdisciplinar em Educação Ambiental no Ensino Médio: a microbacia hidrográfica do Ribeirão dos Peixes como Tema Gerador. *Ciência & Educação*, 13(3), 389-398.

- Magoga, T. F., & Muenchen, C. (2020). A Abordagem Temática caracterizada por pesquisadores da área de ensino de ciências. *Revista Brasileira de Pesquisa em Educação em Ciências*, 20, 315-343.
- Milli, J. C. L., Solino, A. P., & Gehlen, S. T. (2018). A Análise Textual Discursiva na Investigação do Tema Gerador: por onde e como começar? *Investigação em Ensino de Ciências*, 21(1), 200-229.
- Moraes, R., & Galiazzi, M. C. (2007). *Análise Textual Discursiva*. Ed. Ijuí.
- Muenchen, C. (2006). *Configurações Curriculares mediante o Enfoque CTS: desafios a serem enfrentados na EJA* [Dissertação de Mestrado, Universidade Federal de Santa Maria]. Repositório Digital da UFSM.
- Muenchen, C., & Auler, D. (2007). Abordagem Temática: desafios na educação de jovens adultos. *Revista Brasileira de Pesquisa em Educação em Ciências*, 7(3).
- Neres, C. A., & Gehlen, S. T. (2018). Investigação Temática na Formação de professores: Indicativos da pesquisa em educação em ciências. *Revista Brasileira de Pesquisa em Educação em Ciências*, 18(1), 239-267.
- Novais, E. S. P., Fonseca, K. N., Solino, A. P., Sousa, A. P., Silva, R. M., & Gehlen, S. T. (2017). O Processo de Redução Temática na Formação de Professores em Iguai-BA. *Alexandria*, 10(1), 77-103.
- Razera, J. C. C., Matos, C. M. S., & Bastos, F. (2019). Um Perfil Métrico das Pesquisas que destacam a Formação de Professores na área Brasileira de Educação em Ciências. *Investigações em Ensino de Ciências*, 24(1), 200-222.
- Rocha, A. L. F. (2013). *A Possibilidade de uma Abordagem Crítica no Ensino de Zoologia: das situações-limite à práxis pedagógica* [Dissertação de Mestrado, Universidade Federal de Santa Catarina]. Repositório Institucional da UFSC.
- Roso, C. C., Santos, R. A., Rosa, S. E., & Auler, D. (2015). Currículo Temático fundamentado em Freire - CTS: engajamento de professores de física em formação inicial. *Ensaio: Pesquisa em Educação em Ciências*, 17(2), 372-389.
- Santos, A., Santos, P., Archanjo Jr., M. G. & Gehlen, S. T. (2024). O modelo fractal dos Três Momentos Pedagógicos em um processo formativo de professores de Ciências e Matemática. *Investigações em Ensino de Ciências*, 29(2), 32-56.
- Saul, A. M., & Saul, A. (2016). Contribuições de Paulo Freire para a formação de educadores: fundamentos e práticas de um paradigma contra-hegemônico. *Educar em Revista*, 61, 19-35.
- Schwan, G., & Santos, R. A. (2020). Investigação Temática Freireana e o enfoque CTS no Ensino de Ciências: currículos e práticas no ensino fundamental. *Olhar de Professor*, 23, 1-17.

- Silva, A. F. G. (2004). *A Construção do currículo na perspectiva popular crítica: das falas significativas às práticas contextualizadas* [Tese de Doutorado, Pontifícia Universidade Católica de São Paulo]. Repositório PUC-SP.
- Silva, J. M., Oliveira, D. J., & Muenchen, C. (2023). Estágio Supervisionado em Ensino de Física e Abordagem Temática: uma pesquisa com integrantes e ex-integrantes do GEPECiD. In *Anais do XIV Encontro Nacional de Pesquisa em Ensino de Ciências*. Realize Editora.
- Silva, L. F., & Carvalho, L. M. (2009). Professores de Física em Formação Inicial: o ensino de física, a abordagem CTS e os temas controversos. *Investigações em Ensino de Ciências*, 14(1), 135-148.
- Silva, L. F., Tavares, S. S., Watanabe, G., Halmenschlager, K. R., Strieder, R. B., & Hunsche, S. (2019). Elementos da Abordagem Temática no Ensino Médio: sinalizações para formação de professoras e professores. *Ciência & Educação*, 25(1), 145-161.
- Silva, O. B., & Queiroz, S. L. (2016). Mapeamento da Pesquisa no Campo da Formação de Professores de Química no Brasil. *Investigações em Ensino de Ciências*, 21(1), 62-93.
- Silva, R. M., & Gehlen, S. T. (2016). Investigação Temática na Formação de Professores de Ciências em Pau Brasil-BA: compreensões acerca de um Tema Gerador. *Ensaio: Pesquisa em Educação em Ciências*, 18(2), 147-169.
- Silva, R. M., Solino, A. P., Sousa, P. S., Fonseca, K. N., Novais, E. S. P., & Gehlen, S. T. (2016). Situações-limite na formação de professores de ciências na perspectiva Freireana: da percepção da realidade à dimensão pedagógica. *Investigações em Ensino de Ciências*, 21(3), 127-151.
- Silveira, R. A., Piaia, L., & Gonçalves, S. P. (2020). A Problematização da Abordagem Temática na Formação Inicial de Professores de Química. *Química Nova*, 43(10), 1529-1537.
- Solino, A. P., Sousa, P. S., Silva, R. M., & Gehlen, S. T. (2021). O Tema Gerador na formação de pedagogas do Alto Sertão Alagoano: da escuta sensível ao planejamento de ciências. *Revista Brasileira de Pesquisa em Educação em Ciências*, 21, 1-30.
- Sousa, P. S., Bastos, A. P. S., Figueiredo, P. S., & Gehlen, S. T. (2014). Investigação Temática no Contexto do Ensino de Ciências: Relações entre a Abordagem Temática Freireana e a Práxis via Tema Gerador. *Alexandria*, 7(2), 155-177.
- Stoeberl, F., & Brick, E. M. (2021). Projeto Comunitário com Jovens Camponeses: a construção de uma proposta de ensino a partir da realidade. *Revista Espaço do Currículo*, 14(2), 1-19.
- Stuani, G. M. (2016). *Abordagem Temática Freireana: uma concepção de formação permanente dos professores de ciências* [Tese de Doutorado, Universidade Federal de Santa Catarina]. Repositório Institucional da UFSC.

- Torres, J. R., Gehlen, S. T., Muenchen, C., Gonçalves, F. P., Lindemann, R. H., & Gonçalves, F. J. F. (2008). Ressignificação curricular: contribuições da Investigação Temática e da Análise Textual Discursiva. *Revista Brasileira de Pesquisa em Educação em Ciências*, 8(2).
- Paniz, C. M., Centa, F. G., Araújo, L. B., & Muenchen, C. (2018). Os Três Momentos Pedagógicos como Estruturantes de Currículo: o estudo da realidade e os temas geradores na Educação em Ciências. *Reflexão e Ação*, 26(2), 249-266.
- Paniz, C. M., & Muenchen, C. (2020). O Estudo da Realidade e os Temas Geradores no Ensino de Ciências: reflexões sobre um processo vivenciado no contexto do PIBID. *ENCITEC*, 10(1), 56-72.
- Pimenta, S. G., & Lima, M. S. L. (2021). *Estágio e Docência* (8a ed.). Cortez.
- Pinheiro, E. B., & Brick, E. M. (2023). Da Denúncia ao Anúncio: movimento de um planejamento Ético-crítico inspirado na investigação temática Freireana. *Revista Espaço do Currículo*, 16(2), 1-25.
- Umpierre, A. B., Ritter, J., & Vasconcelos, A. R. A. (2017). Formação inicial e continuada de professores: saberes para um ensino interdisciplinar na área de ciências da natureza [Apresentação de trabalho]. *X Congreso Internacional sobre Investigación en Didáctica de las Ciencias*, Sevilla, Espanha.
- Watanabe-Caramello, G., Strieder, R. B., & Gehlen, S. T. (2012). Desafios e possibilidades para a abordagem de temas ambientais em aulas de física. *Revista Brasileira de Pesquisa em Educação em Ciências*, 12(1).
- Watanabe, G., & Kawamura, M. R. D. (2017). Abordagem temática e conhecimento escolar científico complexo: organizações temática e conceitual para proposição de percursos abertos. *Investigações em Ensino de Ciências*, 22(3), 145-161.

**Received:** Dec. 5th, 2025

**Approved:** Mar. 10, 2026

**DOI:** <https://doi.org/10.3895/actio.v11n1.21316>

**How to cite:**

Rosa, G. M. D. & Gonçalves, F. P. (2026). Thematic approach based on Paulo Freire and research on teacher training in science education *ACTIO*, 11(1), 1-25. <https://doi.org/10.3895/actio.v11n1.21316>

**Copyright:** This article is licensed under the terms of the Creative Commons Attribution 4.0 International Licence.



**Recebido:** 05 dez. 2025

**Aprovado:** 10 mar. 2026

**DOI:** <https://doi.org/10.3895/actio.v11n1.21316>

**Como citar:**

Rosa, G. M. D. & Gonçalves, F. P.. (2026). Abordagem temática pautada em Paulo Freire e pesquisas em ensino de ciências sobre formação docente. *ACTIO*, 11(1), 1-25. <https://doi.org/10.3895/actio.v11n1.21316>

**Direito autoral:** Este artigo está licenciado sob os termos da Licença Creative Commons-Atribuição 4.0 Internacional.

