

Teaching autonomy: what is researched in science teaching

ABSTRACT

The various changes that society has faced over the years have directly impacted the educational field, and, therefore, it is increasingly essential to think about teacher training. Therefore, the objective of this article is to analyze how teacher autonomy has been discussed in research in the area of Science Teaching in Brazil. Therefore, the present investigation is a qualitative research, based on a survey carried out in seven national periodicals classified by Qualis Capes 2013-2016 in A1 and A2 in the area of Teaching, namely Science & Education, Ensaio: Pesquisa em Educação em Ciências, Journal of Education, Sciences and Mathematics, Brazilian Journal of Research in Science Education, Brazilian Journal of Science and Technology Teaching, Investigations in Science Teaching, Journal of Science and Mathematics Teaching and the scientific event National Research Meeting in Science Education (ENPEC). The analysis of these articles was carried out using Content Analysis, and as a result we can identify that 81% of the research analyzed is empirical. Furthermore, we can see that José Contreras and Paulo Freire appear as the theoretical references most used by researchers. In relation to discussions about teacher autonomy in research, we can find notes about the concept, how the training process can contribute to the development of autonomy and issues that have affected the decrease in teacher autonomy. With this, we can highlight that teaching autonomy is a topic little discussed in Science teaching and, because it is so pertinent, it deserves more attention and investigations directed at it.

KEYWORDS: Teaching autonomy; Teacher training; Science teaching; Researches.

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Autonomia docente: o que se pesquisa no ensino de ciências

RESUMO

As diversas mudanças que a sociedade vem enfrentando ao longo dos anos vêm impactando diretamente o campo educacional, e, por isso, cada vez mais se torna imprescindível pensar na formação docente. Desta forma, o objetivo deste artigo é analisar como a autonomia docente vem sendo discutida nas pesquisas da área de Ensino de Ciências no Brasil. Portanto, a presente investigação trata-se de uma pesquisa qualitativa, baseada em um levantamento realizado em sete periódicos nacionais classificados pelos Qualis Capes 2013-2016 em A1 e A2 na área de Ensino, sendo eles Ciência & Educação, Ensaio: Pesquisa em Educação em Ciências, Revista de Educação, Ciências e Matemática, Revista Brasileira de Pesquisa em Educação em Ciências, Revista Brasileira de Ensino de Ciência e Tecnologia, Investigações em Ensino de Ciências, Revista de Ensino de Ciências e Matemática e Atas do evento científico Encontro Nacional de Pesquisa em Educação em Ciências (ENPEC). A análise desses artigos foi realizada mediante a Análise de Conteúdo, e como resultados podemos identificar que 81% das pesquisas analisadas são empíricas. Além disso, podemos perceber que José Contreras e Paulo Freire aparecem como os referenciais teóricos mais utilizados pelos pesquisadores. Em relação às discussões sobre a autonomia docente nas pesquisas, podemos localizar apontamentos sobre o conceito, como o processo formativo pode contribuir para o desenvolvimento da autonomia e questões que afetam a diminuição da autonomia docente. Com isso, podemos destacar que a autonomia docente é um tema pouco discutido no ensino de Ciências e, por ser tão pertinente, merece mais destaque e investigações direcionadas a ele.

PALAVRAS-CHAVE: Autonomia docente; Formação docente; Ensino de Ciências; Pesquisas.

INTRODUCTION

The various social, technological and environmental changes that have occurred recently have led the educational process in the 21st century to be marked by various reflections on the need for a more just, democratic, critical, scientific and social education, so that students can understand and position themselves in relation to the different social issues that may arise (Vieira & Santos, 2019). However, to achieve these goals, it is also essential to invest in the training process of the professionals who will work in the educational context, since teachers play a crucial role in the training of the subjects (Marcondes & Moraes, 2013; Campos & Guérios, 2017).

In this way, Campos and Guérios (2017, p. 37) reveal that the teacher training process has led to important debates in the educational field, since "most discussions about schooling converge on the figure of the teacher". Furthermore, in order for teachers to perform their role with quality, it is important that their training process provides them with support to put their knowledge and experience into practice. "The first years of a professional career are challenging and full of discoveries. This is the time when teachers want to put into practice the knowledge they have acquired during their academic training" (Carmo et al., 2021, p. 2). In light of this, "the teacher training process needs to be constantly rethought from different perspectives" (Campos & Guérios, 2017, p. 37).

In the field of education, teacher autonomy is built through collective interaction, through the exchange of experiences between individuals who share the same ideas and actions, since teacher autonomy is also considered social autonomy (Contreras, 2018). In addition, teacher autonomy is not only about defining what a teacher needs to have to be a good professional, but it is also related to the quality of teaching, that is, understanding teaching practice as a reflective action that explains the existing teaching knowledge needed to be a good teacher (Campos, 2013; Contreras, 2018).

In this way, teacher autonomy means, therefore, a dynamic activity of "defining and personally constituting who we are as professionals, and the awareness and reality that this definition and constitution cannot be carried out within the framework of one's professional reality" (Contreras, 2018, p. 103). Bearing in mind that autonomy is related to the critical and social formation of the subject, it is important to point out that, therefore, "it is by understanding the relationship between both parties, by understanding the different ways in which they relate to and influence professional and social spaces and competences, that we must think about the constitution of a professional identity" (Contreras, 2018, p. 103).

What we see, however, is that teachers are often only told what to do and what not to do. They are held hostage by textbooks and a curriculum defined by the school, which is usually constructed by agents who do not share the social context in which the school is inserted and "end up making the curriculum a particular scholastic version" (Sacristán, 1998, p. 128).

And this finding only reinforces the difficulty that teachers have in developing their autonomy in the school context in relation to this pre-established form of teaching, which only prioritizes the structure of curricular

content present in textbooks. In addition, it does not contribute to a more complex relationship and understanding of social problems through a scientific perspective, confirming "an excess of content covered in class, without sufficient time for students to elaborate concepts and appropriate knowledge properly" (Lara & Duarte, 2018, p. 188).

Thus, the importance of the teacher's role in the educational process is increasingly evident, and this profession needs to be better recognized and valued, both socially and economically. It is also emphasized that being a teacher requires adequate training because being a teacher, like any other profession, is also a profession, which is why it is necessary to have greater autonomy in its exercise (Cericato, 2016).

What can be seen, however, is that the autonomy of Brazilian teachers is currently being reduced. This is due to several factors, including the difficulty for the state to consider teaching as a profession because it is licensed, regulated and supervised by the state itself. This is not the case with other liberal professions, such as medicine, engineering and law, which, despite being regulated by the state, have a code of ethics and are managed and supervised internally by their members, giving them greater autonomy (Nóvoa, 2003; Cericato, 2016).

In this sense, Nóvoa (1989) points out that this exclusive subordination to state agents, without intermediate regulation by its members, ends up strangling teachers and their professional development. And that teacher autonomy must go beyond "the traditional autonomy of the classroom, teachers must acquire greater margins of autonomy in the management of their profession and a stronger link with local educational actors (municipalities, communities, etc.)". (Nóvoa, 1989, p.25).

It is important to point out that in the field of education, state supervision should be focused on ensuring social equity and quality of services, playing its role of monitoring and regulatory evaluation, and not on prescriptive logistics and regulatory bureaucracy because this form of supervision can lead to unavoidable challenges for the teaching professional, thus inhibiting teachers and educational organizations from working creatively (Nóvoa, 1989).

Oliveira (2013), when analyzing the historical roots and lack of prestige of Brazilian teachers, points out that the tendency to reduce the professional autonomy of teachers is reinforced by public policies that tend to separate the actors who plan curricula from those who implement them pedagogically. Another issue discussed by the author is that the system is more concerned with quantity than with the quality of education, which leads to an enormous overload of activities for professionals, causing them to struggle to cope with the demands placed on them and, as a result, to lose relevant collective skills.

In addition, the "proletarianization" that the teaching profession has undergone over the years in the Brazilian educational scenario has made it extremely difficult to consider the teaching profession as autonomous. This is because, throughout the history of education in Brazil, there has been "an expansion of schools that has recruited numerous professionals without the necessary academic and pedagogical qualifications," which has given rise to the idea that teaching is easy and that anyone can do it (Oliveira, 2013, p. 84-29).

Despite the difficulties teachers face in practicing their profession, they continue to seek more qualified training, renew their practice, and investigate teaching methodologies to promote quality teaching. For this reason, our aim in this research is to analyze how teacher autonomy has been discussed and understood in research published in national journals in the field of teaching and in articles published in the minutes of ENPEC.

METHODOLOGY

This research is qualitative (Lüdke & André, 1986), with a bibliographical approach (Gil, 2002), and aims to map and discuss articles published in journals and scientific events in the field of Science Teaching in Brazil that present discussions on teacher autonomy. To achieve this, we conducted a survey of science teaching journals classified as Quális A1 and A2 according to the Quális-Periódicos of the Coordination for the Improvement of Higher Education Personnel (CAPES), in the quadrennium 2013-2016, and present on the Sucupira platform "because they are the most relevant journals [...], according to the CAPES evaluation criteria" (Mól et al. 2020, p. 1) and in the minutes of the National Meeting for Research in Science Education (ENPEC), the most relevant national event in the field. To select the journals, in addition to meeting the criteria of being Qualis A1 and A2, they were national titles that, in their scope and editorial focus, addressed research in the field of science education and teacher training and, from a first search, presented at least one article related to teacher autonomy in science education: A1) 1-Ciência & Educação (CE); 2-Ensaio: Pesquisa em Educação em Ciências (EPEC). A2) 1-Revista de Educação, Ciências e Matemática (RECM); 2-Revista Brasileira de Pesquisa em Educação em Ciências (RBPEC); 3-Revista Brasileira de Ensino de Ciência e Tecnologia (RBECT); 4-Investigações em Ensino de Ciências (IENCI); 5-Revista de Ensino de Ciências e Matemática (REnCiMa).

Another point of investigation was ENPEC, described by Nardi (2014) as one of the most important milestones for the consolidation of the field of science education in Brazil, since it was the first event in this field. This event has been held every two years since 1997, but for this study we will analyze the articles published in the proceedings of the event from 2011 to 2019, as they present more recent research results in the field.

To locate the articles on the websites/platforms of the journals analyzed, we used the words "autonomy," "teacher autonomy," and "teacher empowerment" as key search terms. After this initial search to locate the articles that discussed autonomy, we read these studies to ensure that they included discussions of teacher autonomy. From the reading, we identified a total of twenty (20) articles distributed among the seven journals analyzed that discussed teacher autonomy, however, six (06) of them were aimed at mathematics teachers.

Since our aim in this research is to investigate how teacher autonomy has been discussed in research in the field of science education, these six (06) articles were not included in the analysis and only fourteen (14) articles were analyzed. Table 1 shows the journals analyzed and the number of articles selected for analysis in each of them.

Table 1

Data from the articles in the journals selected for analysis.

| Magazine | Period of operation | Total number of journal publications during the period of operation. | Articles related to teacher autonomy. | Year of publication |
|----------|---------------------|--|---------------------------------------|---------------------|
| CE | 1998-2021 | 995 | 3 | 2000, 2016, 2018 |
| EPEC | 1999-2021 | 486 | 2 | 2010, 2021 |
| RECM | 2011-2021 | 267 | 1 | 2013 |
| RBPEC | 2001-2021 | 579 | 2 | 2011, 2011 |
| RBECT | 2008-2021 | 554 | 2 | 2020, 2021 |
| IENCI | 1996-2021 | 654 | 3 | 2011, 2017, 2019 |
| REnCiMa | 2010-2021 | 759 | 1 | 2018 |
| TOTAL: | 1998-2021 | 4294 | 14 | 2000-2021 |

Source: The authors (2022).

Table 2 shows the data from the articles in the ENPEC Proceedings selected for analysis. This selection was made by searching for key terms, as was done when selecting the articles from the journals, and then reading the texts because in some cases, when we only use the word "autonomy", articles related to student, curricular or school autonomy may appear, not addressing teacher autonomy, which is our focus in this investigation. The articles related to teacher autonomy found in the ENPEC proceedings can be seen in Table 2.

Table 2

Data from the ENPEC articles selected for analysis.

| Event | Year | Total of articles | Articles related to teacher autonomy |
|------------|-----------|-------------------|--------------------------------------|
| VIII ENPEC | 2011 | 1235 | 2 |
| IX ENPEC | 2013 | 1019 | 1 |
| X ENPEC | 2015 | 1272 | 2 |
| XI ENPEC | 2017 | 1335 | 5 |
| XII ENPEC | 2019 | 1249 | 3 |
| TOTAL: | 2011-2019 | 6110 | 13 |

Source: The authors (2022).

All the articles found were analyzed using content analysis (Bardin, 2011). This method of analysis is used to systematize the data and, according to Bardin (2011), content analysis is organized in three stages: i) pre-analysis, ii) exploration of the material and iii) treatment of the results, which consists of inference and interpretation of the data obtained. For a deeper understanding of the subject and to differentiate between the works studied and to discuss the references used, we will use the following codifications in the research we analyzed. For an article originating from ENPEC, we will use the word *ata*, followed by the acronym of the event and the year in which it was held, for example: *Atas ENPEC 2019*. And when discussing data from journal articles, these will be coded by their initials, followed by the year of publication, for example: *RECM 2017*.

According to Bardin (2011), categories of analysis can be defined a priori or a posteriori. In the case of this research, they were defined a priori and refer to: a) the type of research; b) the theoretical frameworks adopted by the researchers; and c) how teacher autonomy has been discussed in science education research. The results and discussion section below deals with the categories mentioned in this study.

RESULTS AND DISCUSSION

In this section, we will discuss how teacher autonomy has been discussed in research in the field of science education, based on our analysis of the articles published in journals and in the proceedings of ENPEC.

Thus, based on the data in Figure 1 and Figure 2 of this research, we can see that despite the significant amount of research published in the journals analyzed over the years and in the five editions of ENPEC, there is little research that discusses teacher autonomy in science education. Of the 6,110 articles presented during the five editions of ENPEC, only 13 articles (0.21%) discuss the topic. And in the journals, only 14 articles (0.33%) refer to the topic analyzed, out of a total of 4,294 articles published in the seven journals analyzed from their existence to the current period, which only reinforces the need to discuss how teacher autonomy has been presented in research in this area of knowledge. The data of the analyzed articles are presented in Table 3 below.

Table 3

Papers analyzed

| Source | Author | Article title |
|--------|---|--|
| CE | Almeida, M. J. P. M. | Expectations of physics teacher performance and possible consequences for their representations. |
| CE | Leite, F. A.; Zanon, L. B. | Thinking styles of physics teachers and the process of shared autonomy. |
| CE | Scarinci, A. L.; Pacca, J. L. A. | General objectives of a teacher professional development program. |
| EPEC | Archanjo, M. G.; Gehlen, S. T. | Social technology in the programming of a critical-transformative curriculum in science education. |
| EPEC | Monteiro, M. A. A.; Monteiro, I. C. C.; Azevedo, T. | C. Arantes Macedo de. Visions of teacher autonomy and their influence on pedagogical practice. |
| RECM | Santos, S. R. M.; Costa, P. M. D. | On didactics and specific didactics: what is at stake in teacher training? |
| RBPEC | Figueirêdo, K. L.; Justi, R. | A proposal for continuing education for science teachers seeking innovation, autonomy, and collaboration based on integrated references. |
| RBPEC | Monteiro, I. C. C.; Monteiro, M. A. A. | ReAção Program: an analysis of the contributions of collaborative research with teachers to improving science teaching. |
| RBECT | Schubalski, J. A.; Schubalski, K. G. | Teacher narrative in times of pandemic. |
| RBECT | Tetzener Junior, A. F.; Et Al. | Reflections on working with a simulated jury on a social science topic with future physics teachers. |

| Source | Author | Article title |
|------------|--|--|
| IENCI | Langhi, R.; Nardi, R. | Interpreting future physics teachers' reflections on their professional practice during initial training: the quest to build teacher autonomy. |
| IENCI | Razera, J. C. C.; Matos, C. M. S.; Bastos, F. | A metric profile of research highlighting teacher training in the Brazilian field of science education. |
| IENCI | Lima, V. M. R.; Santos, M. Z. M. | Continuing education processes: the science teacher has his say. |
| REnCiMa | Lopes, N. C.; Carvalho, W. L. P. | The constitution of free associations for working with socio-scientific issues in teacher training. |
| VIII ENPEC | Fernandes, H. L.; Jojima, C. L.; Santiago, J. C. C. | Adolescence, sexuality, and teacher training: reflection and non-directiveness for building autonomy. |
| VIII ENPEC | Marcolan, S. G.; Costa-Beber, L. B.; Maldaner, O. A. | Curriculum production for secondary education: learning during initial training. |
| IX ENPEC | Camargo, C. P.; Silva, S. C; Oliveira, O. M. M. | Beginning teaching in Chemistry and the knowledge needed for educational practice: initial reflections based on the Pedagogy of Autonomy |
| X ENPEC | Mello, A. C. R.; Higa, I. | Supervised internship and teacher autonomy in science teacher training. |
| X ENPEC | Monteiro, M. A. A.; Marques, F. F. | Alterity and teacher autonomy. |
| XI ENPEC | Frison, M. D.; Duarte, N.; Wzykowski, T. | Interdisciplinarity as a potentializing action in the development of science teachers. |
| XI ENPEC | Leal, M. L.; Et Al. | Teaching in Science Education: a look at neoliberal policies. |
| XI ENPEC | Santos, R. M.; Selles, S. E. | Performativity Culture and the Tensioning of Teacher Autonomy. |
| XI ENPEC | Silva, M. F.; Feitas, N. A. O.; Souza, E. R. S.; Lima, J. P. | Science Teaching and Teacher Autonomy: reflections on research published in ANPED. |
| XI ENPEC | Vasconcelos, A. R. A.; Ritter, J; Maldaner, O. A. | Collective authorship in the production of an Interdisciplinary Curriculum: a teacher training process. |
| XII ENPEC | Lacerda, N. O. S.; Strieder, R. B. | Contributions of CTS Education to the development of teacher autonomy. |
| XII ENPEC | Santos, T. S.; Silva, E. L.; Andrade, T. S. | Continuing education and critical-reflective autonomy: epistemic transformations in a Guided Reflection Process. |
| XII ENPEC | Toledo, E. J. L.; Coutinho, H. N.; Galdino, A. S. | Mental Health in a Chemistry Degree Course: the crisis at the University. |

Source: The authors (2022).

In the following subsections, we will discuss in more depth what these studies present in their constitution, in relation to the nature of the research, the references adopted, and the conceptions reached by the authors after the investigation.

A) NATURE OF THE RESEARCH

When analyzing the type of research, i.e., whether the study carried out by the authors was theoretical or empirical, we found a predominance of empirical research, corresponding to 22 studies analyzed, or approximately 81% of the articles in percentage terms. Theoretical research accounted for five (05), or 19% of the articles.

In relation to empirical research, Nardi and Almeida (2007), when interviewing relevant researchers in the field of science education, point out that research in the field of science education is characterized by investigative work, with research related to classroom situations, new ways of organizing content, and proposals that present defined methodologies and delimited objectives.

Santos and Greca (2013), in their study of the methodology of science teaching research in the main journals of the field in Latin America, found that 80.6% of the research in the field is empirical. According to these authors, it can be observed that a significant part of the research carried out in the area of science teaching is more concerned with "observing, describing and critically analyzing situations, teachers' and students' attitudes, textbooks, and teaching materials" than with "testing" or evaluating their effectiveness, making the amount of theoretical research less significant in terms of the number of articles published (Santos & Greca, 2013, p. 22).

In a more recent study, Razera et al. (2019) also found a predominance of empirical research in science education. After a survey, the authors noted that "this predominance has become even stronger since 2007," indicating that productions in the field focus more on analyzing practice than on building theories (Razera et al., 2019, p. 204).

Because of the data presented above, we can see that the tendency to conduct empirical research in science education is not unique to the subject under study here, but is a characteristic of the field. Moreover, this predominance of empirical research has increased over the years. Figure 4 below shows the development over the years of the empirical and theoretical research analyzed.

Table 4

Development of theoretical and empirical research on teacher autonomy over the years.

| Year of publication | Number of empirical articles | Number of theoretical articles |
|---------------------|------------------------------|--------------------------------|
| 2000 | 0 | 1 |
| 2010 | 1 | 0 |
| 2011 | 5 | 0 |
| 2012 | 0 | 0 |
| 2013 | 1 | 1 |
| 2014 | 0 | 0 |
| 2015 | 1 | 1 |
| 2016 | 1 | 0 |
| 2017 | 4 | 2 |
| 2018 | 2 | 0 |
| 2019 | 4 | 0 |
| 2020 | 1 | 0 |
| 2021 | 2 | 0 |
| Total | 22 | 5 |

Source: The authors (2022).

From the data in Table 4, we can see that the number of studies on teacher autonomy has increased over the years, as has the difference between the number of empirical and theoretical studies.

Regarding the empirical studies analyzed, we found that most of them were carried out with undergraduates in chemistry, science and physics, mainly during the disciplines of these courses. These studies seek to analyze how participation in curriculum production, participation in the Institutional Teaching Initiation Scholarship Program (PIBID), participation in research groups, training programs and continuing education projects contribute to teacher training. In addition to these, we also found studies in the Proceedings of ENPEC and the National Association of Graduate Studies and Research in Education (ANPED) that sought to understand how the supervised internship contributes to the development of teacher autonomy and how teacher autonomy appears in research in science teaching, respectively, in line with what is pointed out by Santos and Greca (2013) and Razera et al. (2019).

In relation to the theoretical articles found in the Proceedings of ENPEC 2015, Proceedings of ENPEC 2017, Proceedings of ENPEC 2017, EC 2000 and RECM 2013, the authors have discussed issues about the representations of the role of the teacher conceptually, bringing the following discussions: the methodological, epistemological and political dimensions of pedagogical practice on didactics in teacher training; how public education policies affect the teaching professional; and alterity and teacher autonomy, focusing on concepts.

According to Lima and Martins (2013, p. 3), the terms "empirical" and "theoretical" are used to indicate the researcher's interest in research that is more related to "classroom practices and the conceptions of teachers and/or graduate students and education professionals, to better understand the possibilities and limitations of these approaches in training spaces". Therefore, as

pointed out by Sousa and Gehlen (2017, p. 8), "it is not understood that there is a dichotomy between empirical and theoretical studies, but rather a dialectical relationship between them in research". In this way, all the discussions that have taken place have contributed significantly to the development and expansion of the field.

B) THEORETICAL REFERENCES ADOPTED

When we examined the theoretical references adopted by these researchers, both in the journal articles and in the texts published in the ENPEC Proceedings, to discuss teacher autonomy, we found that the book "La autonomía del profesorado" (Teacher Autonomy) by José Contreras, in its 2002 and 2012 editions, appeared in 16 of the studies analyzed, or approximately 59.3% of the articles. This is quite a significant number, considering that we analyzed 27 studies on the subject. In this author's view, teacher autonomy occurs through a critical process and interaction between two or more individuals, in which the teacher has a critical and reflective view of his or her role as an educator and responsibility as a social agent, since the social and educational environment must be linked in the process of building autonomy. In this way, the concept of teacher autonomy includes the need for the teacher to develop a social conscience, since autonomous teaching action involves deliberation, the development of teaching strategies, knowledge, and decisions (Contreras, 2002).

As a reference, we also identified that six (06) studies, 22.2%, used Freire's book "Pedagogy of Autonomy: knowledge necessary for educational practice" to discuss the subject. According to this author's definitions, autonomy is constituted through education, since it is through education that individuals develop and become capable of resolving issues and making decisions consciously and, for this reason, it is necessary to understand the importance of training autonomous professionals (Freire, 1996).

It is worth noting that most of the articles use the concept of more than one author to discuss teacher autonomy, which is why the sum of the percentages exceeds one hundred percent, such as the research located in EC 2018 and RBECT 2021, which use Contreras (2002) and Freire (1996 and 2011) as references to discuss teacher autonomy.

Among the studies found in the ENPEC 2017 Proceedings, two are based on Freire's (2007) concepts, emphasizing that autonomy is built through relationships of freedom and authority at respectful levels between individuals in the school context. Another study is based on Giroux (1997), who discusses the importance of teacher autonomy and argues that its construction must go beyond the social function of teachers as transforming intellectuals. Three others refer to Contreras (2002), who discusses autonomy in the light of teacher professionalism, considering the educational and political nature of the social function of the teacher.

Based on the analysis, we were able to find other references that presented discussions on teacher autonomy, such as Call Rogers (2002), Giroux (1997), Claude Lessard (2006) and Almeida (1992). Each of these authors was cited only

once in the studies analyzed, corresponding to 3.7% each, except Giroux (1997), who was cited in two studies, corresponding to 7.4%.

As a result, it can be seen that the most used references to discuss teacher autonomy are Contreras and Freire, authors from areas of knowledge such as psychology, pedagogy, and education. According to Razera et al. (2019), this indicates that the field of science education still relies on theoretical references from other fields of knowledge, and the low number of theorists discussing this topic in the field of science education may reflect the low amount of epistemological research on this topic in the field. Therefore, we share the same questions raised by Razera et al. (2019, pp. 204-205), namely:

Is this a characteristic of the field or specific to the subject? What are the causes and consequences? Why don't we do more theoretical research? Does the focus on empirical and practical objects indicate a concern to bring research and reality closer together? If so, what kind of dialogues between theory and practice are proposed? Are there efforts to ensure that the emphasis on studying practice does not obscure the importance of building and using theory?

We believe that these questions deserve to be researched and discussed in the future to contribute to the field of knowledge.

C) HOW TEACHER AUTONOMY HAS BEEN DISCUSSED IN RESEARCH IN THE AREA OF SCIENCE TEACHING

When analyzing the discussions on teacher autonomy, we can find various discussions and notes on the concept, how the training process can contribute to the development of autonomy, issues that affect the reduction of teacher autonomy, as well as notes and suggestions on how collaborative work and participation in research projects and programs influence this process.

For example, in the Proceedings of ENPEC 2015, when discussing teacher autonomy, the authors report that the concept of autonomy incorporates the idea of social responsibility by requiring commitment from those who participate in the decision-making process to issues that go beyond their interests. For this reason, an autonomous attitude must be combined with a sensitivity capable of understanding others and a willingness to seek social consensus.

In an article published in EC 2018, the authors Leite and Zanon (2018), when investigating the concept of autonomy in a training context in which teachers at different levels of training share their experiences and reflections on teaching science, identify two meanings of autonomy, one more unilateral and authoritarian (conservative) and the other directed towards a sense of collectivity and sharing (transformative). This shows the need to invest in training that helps develop autonomy and collective interactions to contribute to the broader development of teachers.

In addition, it is necessary for teachers to reflect on their practice, and this characteristic should be worked on during the training process because only by having the resources to be autonomous will they be able to train autonomous people. And this should go beyond the possibility for the future teacher to make decisions or indicate what to do within their training course, but refers to the

formation of critical and reflective subjects who engage in and reflect on their actions and experiences (Scarinci & Pacca, 2016; Toledo et al., 2019).

In the article published in EC 2000, the author reveals that the development of autonomy is present in the process and not just in the results achieved. In this way, it is important for teachers to reflect on their practice, and not just limit themselves to research because the problems that permeate the construction of teacher autonomy cannot be solved exclusively within the scope of research in the area of teaching, nor can they be addressed in a single discipline.

Therefore, the authors of the article published in the Proceedings of ENPEC 2017 report that what is expected of a teacher is that they have the autonomy to be able to update themselves in the constantly changing world of teaching. Teachers who develop their autonomy have greater security to make conscious decisions and think of more appropriate solutions to problems that interfere with the quality of training and the dynamics of the classroom and school.

However, according to the authors who had their work published in the 2015 ENPEC Proceedings and the 2017 ENPEC Proceedings, the autonomy of Brazilian teachers is reduced and this has contributed to the bureaucratization and devaluation of teaching, since they have not found an understanding of the school teacher as a critical and reflective subject.

According to the research analyzed in RBECT 2021, this situation has worsened over time due to the current Covid-19 pandemic scenario and the rapid adoption of remote means to conduct classes and activities. This has led educators to increasingly systematize the content prepared by the state, due to the increasing activities they must carry out in order to hold classes remotely, and this demand and accumulation of duties has contributed to the loss of teaching autonomy. About this problem, Schubalski and Schubalski (2021, p. 66) emphasize that "there are no different options for teachers who have to manage their subjects remotely, without being able to put into practice the process they were used to pedagogically doing in face-to-face classes".

Based on the previous quote, we would like to point out that 2020 and 2021 were atypical years for the educational scenario, due to the pandemic scenario faced. Several problems were triggered, among which we can highlight: the need to adapt quickly to the way of teaching through digital platforms; the increased demand from the state and society for a return to classes, and the lack of infrastructure to carry out these classes (which, in our opinion, education has suffered in these last two years of the pandemic, which will hardly be remedied), since not all students can afford digital equipment or Internet access, and teachers do not have spaces in their homes dedicated solely to holding classes.

Despite all the difficulties, it can be seen that the teachers worked hard to propose different teaching alternatives and methodologies that best fit the scenario they faced. They reinvented themselves and sought training, researched new ways of teaching, looked for interactive platforms in the classroom, created teaching materials and showed solidarity with other teachers. In addition to various livestreams, debates, roundtables, scientific events, all of this to propose new discussions about the educational field, its limits and potential.

With this, we highlight that, despite having many obstacles to overcome and challenges to advance in the recognition of teachers' work, due to the pandemic scenario, we realize that it is not the loss of autonomy, quite the contrary because of the current scenario, we perceive an increase in teacher autonomy. This situation has served to show the importance of the teaching professional in society, and the extent to which these individuals reinvent themselves and work collectively to provide meaningful, quality teaching.

In the articles published at IENCI 2011 and in the Proceedings of ENPEC 2017, it is emphasized that teacher autonomy is necessary because it is related to the recognition and social value that is attributed to teachers in a political and social context. Therefore, it is important to provide collective moments during initial training for students to be able to hold discussions about teaching practice so that they have subsidies to act in the classroom and continue reflecting on their role as educators.

Therefore, it is necessary to invest in and recognize teaching professionals because, as the RECM 2013 article points out, the demand for autonomy in education would not only be a requirement for educators, but for the good of education in general, since they are the ones who discuss and transform the prescribed curriculum to make it socially relevant. It is therefore essential that these professionals are given due recognition and participate in all the decisions that permeate the educational field.

However, according to the articles in EPEC 2010 and RBPEC 2013, most teachers have not had training aimed at developing autonomy, finding new teaching methodologies and reflecting on and improving their practice. For this reason, it is necessary to invest in initial and continuing training courses that enable collaborative and reflective work between subjects. In addition, it is necessary to devise strategies that enable teachers to investigate their practice to develop their autonomy and improve their teaching.

In addition, the articles in the Proceedings of the ENPEC 2011, Proceedings of the ENPEC 2013, Proceedings of the ENPEC 2017, and the EPEC 2021 show that participation in teaching programs and projects during the training process can contribute to the development of teacher autonomy.

In the Proceedings of the ENPEC 2011 and the Proceedings of the ENPEC 2017, the authors propose building a curricular proposal called a Study Situation (SE) based on social themes and which, according to the authors, helps to develop teaching autonomy, as the undergraduates come into contact with university professors and primary school teachers to reconfigure the curriculum in a critical and contextualized way. As a result, undergraduates can gain the confidence to begin their teaching activities with greater autonomy.

In the ENPEC 2013 Proceedings, it is mentioned that the PIBID can contribute to the formation of more reflective teachers, as it takes place in a broader context where experiences are possible that allow for a more complex exercise of educational practice. This enables these individuals to critically appropriate this knowledge, seeking to develop a humanistic view of teaching and the teaching profession itself, thus contributing to the development of autonomy.

In the EPEC 2021 article, the authors emphasize that the formative work based on social technology and its relationship with Freirean assumptions

contributes to the development of teacher autonomy, since teachers are ahead of the prescriptive curricular organization and will be able to critically reflect and decide on the necessary aspects for organizing and preparing activities, as well as enabling collaborative actions between the participating subjects during the activities developed.

From the articles analyzed, we can see that they all have the common point of highlighting the importance of collaborative work between subjects, based on reflection and exchange of experiences between the individuals who participate in the proposed activities, regarding the construction of curricula or teaching proposals based on themes and social experiences. And this only emphasizes what José Contreras (2002), who appears in our research as the most used reference for the discussion of the subject, highlights when he emphasizes that teacher autonomy is built collectively and not individually.

In addition, Lopes and Carvalho (2018) point out that the collaborative work between teachers during the reconstruction of a curriculum, which allows dialogues, reflections, and the exposure of different points of view, shows an achievement of autonomy. Since these are spaces they don't usually occupy, and moreover, most of the time, training and educational policies limit teachers' participation.

For Lima and Santos (2017, p. 76), "professional autonomy is understood as the ability of teachers to organize their work proposals independently, making conscious choices in line with their pedagogical conceptions". And this autonomy can be observed in different ways, such as in the teaching situations proposed, in the way the teacher mediates in the teaching-learning process, and in the evaluation of his or her practice after the lesson.

This is why there is so much emphasis on the need to invest in initial and in-service teacher training so that teachers are not just consumers of pre-established curricula, but can critically reflect on their practice, adapt where necessary, and propose improvements to the teaching process, and have the freedom to do so.

FINAL CONSIDERATIONS

The discussion of teacher autonomy, based on what has been analyzed, is not an easy task, nor is it frequent in science education, and this was evidenced by the quantity of research located on the subject. Despite the small number of studies on the subject, they have helped us to get an idea of how the subject is discussed in the field of science education in Brazil, making it possible to achieve the objective of this research and, based on this analysis, to make some considerations.

The first concerns the nature of the research found. As has already been pointed out, there is a strong tendency in the field of science education to produce more empirical research than theoretical research, and this is a characteristic of the field of education itself, and not only of the topic studied here. What we want to emphasize is that all research is important for strengthening the field, but it would be extremely enriching if the field invested more in theoretical productions produced by its researchers.

Our second consideration concerns the theoretical references adopted by the researchers. We can see that the most cited references when it comes to teacher autonomy in science education research are José Contreras with his book "The Autonomy of Teachers" and Paulo Freire with his book "The Pedagogy of Autonomy", both renowned theorists in the field of education, but with backgrounds apart from science education. As a result, we can see that there is a lack of theorists in the field to discuss teacher autonomy, and this is an aspect that still needs to be explored.

Therefore, we would like to highlight some questions to be considered and investigated by researchers interested in this topic, namely: What factors could be related to the low number of theoretical research studies in the area of science education? Why isn't there more theoretical research in this area in quantitative terms? Does the low number of theories hinder discussions in the field? And what needs to be done to achieve greater equivalence in the type of research conducted in the field of science education?

Our questions are posed with the aim of contributing to an already consolidated field of knowledge that has grown considerably over the years. In relation to our third consideration, we can see that different aspects of teacher autonomy are discussed, from its concept to the ways that can contribute to its acquisition. What we can see, however, is that in order to be an autonomous teacher today, these characteristics do not appear overnight, but must be worked on continuously from the initial training process.

Therefore, although we found different conceptions of teacher autonomy, we believe that there is no single definition to emphasize what an autonomous teacher is, but we believe that it is an individual characteristic, but one that is developed collectively. As observed in the research, this collective work is essential for discussions, reflections, exposure of social and professional experiences in order to develop strategies that are appropriate to the social context in which the school is inserted. But teachers should also have this freedom of choice, since they are the individuals who know the context best, the potential and the limitations of the school and its students, and should therefore be prepared during their training process to innovate and look for the best possible alternatives to develop their work.

AGRADECIMENTOS

We thank the Bahia State Research Foundation (FAPESB), the members of the Research Group on Curriculum and Teacher Training in Science Education (GPeCFEC) and the Universidade Estadual de Santa Cruz (UESC) for the support.

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Received: 17 jan. 2022

Approved: 01 mar. 2024

DOI: <https://doi.org/10.3895/actio.v9n1.15123>

How to cite:

Santana, Kelly de Santana, & Massena, Elisa Prestes. (2024). Teaching autonomy: what is researched in science teaching. *ACTIO*, 9(1), 1-22. <https://doi.org/10.3895/actio.v9n1.15123>

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