RBECT
Revista Brasileira de Ensino de Ciência e Tecnologia

Revista Brasileira de Ensino de Ciência e Tecnologia
ISSN: 1982-873X

https://periodicos.utfpr.edu.br/rbect

Working conditions, induction and engagement of beginning natural sciences teachers[1, 2]

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ABSTRACT

The beginning of a teaching career is marked by the clash between the expectations formed during initial training and the reality encountered in schools. Considering the need for further discussions and actions on this topic, the aim was to raise reflections among researchers in the field of science education on the importance of issues related to the induction, support, and retention of teachers from the very first years of their careers. To this end, we conducted a qualitative, bibliographic, exploratory, and interpretative research on Brazilian theses and dissertations available on the University of São Paulo's *Portal de Busca Integrada*, published between 2001 and 2022, addressing the beginning of teaching careers in Natural Sciences in Basic Education. We conducted the data analysis using Content Analysis, based on Laurence Bardin. As a result, we found that research on this topic is scarce, especially concerning science education in the early years of Elementary School. An implication of this study is the highlighted need for the systematization of programs and public policies that provide time and space for teachers to study educational practices for their effective induction, engagement, and retention in the teaching profession.

KEYWORDS: Science education. Beginning teachers. Elementary School.

1 INTRODUCTION

Establishing oneself professionally as a teacher is characterized by various factors, such as the quality of initial training, salary remuneration, working conditions, societal appreciation, among others (TARDIF; LESSARD, 2008; BECK, 2017). These factors, either individually or in combination, are considered by individuals before choosing a teaching degree so that during this initial training, they can assume their professional activity. It is certain that, at some point, this consideration reflects a concern that may be momentary and quickly overcome, but it can also be enduring, potentially becoming a decisive element that leads to complete discouragement and abandonment of the profession in the early years of practice, as considered in studies conducted by the Alberta Teachers' Association (ALBERTA TEACHERS' ASSOCIATION [ATA], 2011; 2018) and in the investigation by Gatti *et al*. (2019).

In particular, when addressing this issue in scientific education, a more detailed examination of official curricular documents, both those of schools, such as the National Common Curricular Base (BRASIL, 2018), and those of initial teacher training courses (BRASIL, 2019), reveals new demands. If these demands are implemented in schools, they could further reinforce traditional teaching conceptions and add new requirements for teachers. This situation is exacerbated when considering that these curricular enhancements are not accompanied by support from policies for initial and ongoing teacher training, which are essential for effective professional and educational development.

In addition to the demands listed earlier, early years teachers begin their teaching careers in Basic Education without a clear understanding of the existence of programs that facilitate their professional development, including factors that help integrate, support, and/or contribute to their engagement and retention in the profession.

In the context of natural science teaching, which is the focus of this article, several questions emerge or should emerge in research on the topic: What contributions do senior educational managers offer, such as public policies, in terms of programs and/or projects that support novice teachers and enable greater autonomy? If solutions to these issues are disregarded, would it lead teachers to reconsider their permanence in the profession? What actions have been employed to retain teachers in the profession and enhance their engagement, based on the literature in dissertations and theses over the past two decades in Brazil? Additionally, what considerations are presented regarding science teaching in the early years of Elementary School, with attention to novice teachers?

This article aims to provoke reflections among researchers in the field of science education on the importance of issues related to the integration, support, and retention of teachers from the early years of their careers. To this end, results were included from a survey conducted by the *Portal de Busca Integrada*/Águia of the University of São Paulo - Brazil, covering the period from 2001 to 2022. This survey focused on theses and dissertations that state (in the title, keywords, and/or abstract) that they address early-career teachers working in Basic Education in this country, in a purposeful and systematic manner

regarding how their integration, support, and retention in the profession have been occurring, with special attention to science teaching in the early years of Elementary School.

2 SOME LITERATURE POINTS

In the teaching of natural sciences, it is important for students to learn scientific concepts and think critically about them, considering aspects such as social justice, citizen empowerment, active participation, and the resolution of problems that affect society based on scientific knowledge (REIS, 2021). Moreover, it is essential for schools to help students overcome distorted views about science, technology, and the world around them, since this field is not static and undergoes new developments and discoveries over time (VILCHES *et al.,* 2007). These demands place a fundamental role on teachers responsible for natural science subjects at various educational levels.

However, educators "often feel overwhelmed, tired, or numbed by bureaucratic tasks, distancing them from reflection and decision-making". Instead of performing tasks uncritically, teachers need to actively participate in the teaching process, which requires solid, continuous, and strongly contextualized training (REIS, 2021, p. 4-5).

In the scope of early years Basic Education, significant initiatives by the Brazilian state include making higher education degrees mandatory for initial teacher training since the National Education Guidelines and Framework Law of 1996 (GATTI *et al.,* 2019), as well as various initiatives for continuous teacher training, managed by municipal administrations in public education. Teaching in the early years of Elementary School is mainly conducted by generalist teachers, whose training and practice cover various areas of knowledge, not specifically science education (BRICCIA; CARVALHO, 2016).

Gatti *et al.* (2019) provide a historical overview of teacher education courses in Brazil, noting that the Pedagogy course, which aims to train teachers for school management, early childhood education, and the early years of Elementary School, results in broad training with little focus, failing to meet the profession's challenges. Briccia and Carvalho (2016), in their analysis of the training and practices of beginning teachers, concluded that generalist teachers need to develop specific knowledge in science education during both initial and ongoing training, as this subarea has unique and essential didactic, conceptual, and methodological knowledge directly related to practice.

Regarding early-career teachers, Nono and Mizukami (2005) highlight the need to engage these professionals in expanding their knowledge since this is a complex phase of teaching that requires ongoing training processes. The field of science education training has undergone numerous changes over time, especially in the last forty years. Barolli and Villani (2015), discussing science teacher training, argue from a Bourdieusian social field perspective that teacher training is a contested field seeking to establish foundational guidelines. In this contested field, schools occupy the most constrained position among educational institutions. A professional organization proposal mentioned by the authors, based on Nóvoa (2009), is the creation, monitoring, and development of

communities of practice for teachers—collaborative and formative experiences developed by and for educators.

The Alberta Teachers' Association (ALBERTA TEACHERS' ASSOCIATION [ATA], 2018), in presenting research on the most relevant forms of support in a teaching career from the perspective of the teachers themselves, highlights professional learning communities as a significant ally in the integration of beginning educators. This is seen as a more effective way to enhance teacher training within schools because collaboration is not foreign to teaching practice and already occurs, particularly in the planning among teachers who teach the same subjects and in the moral encouragement or guidance provided by experienced teachers to newcomers to fill gaps in their initial training (TARDIF; LESSARD, 2008). Since the profession is characterized by isolation and individuation (TARDIF; LESSARD, 2008), developing communities would provide the necessary conditions for deeper and more supported cooperation among teachers.

This view is shared by Reis (2021), who asserts that developing communities has the potential to provide not only a support structure for teachers, combating their isolation and discouragement, but also to foster collective and individual development, thereby improving teaching for students in specific contexts.

3 METHODOLOGY

Given the above, this study aims to present research conducted on Brazilian theses and dissertations over the past two decades concerning the beginning of teaching careers, specifically focusing on the integration, support, and retention in the teaching profession. A qualitative, bibliographic, exploratory, and interpretative research approach was developed. From a documentary standpoint, it is based on dissertations and theses defended between 2001 and 2022, addressing early-career teaching in the early years of Elementary Education and natural science education in the final years of Elementary and High School.

Initially, a search was conducted using the "General Search" field on the USP *Portal de Busca Integrada*, which aggregates research from USP's digital collection, the Portal of Journals of the Coordination for the Improvement of Higher Education Personnel (Capes), and Open Access online publications, as these sources represent research from a substantial number of institutions. The search terms used were: "beginning of career," " beginning teacher," and " beginning teachers." Next, a pre-analysis was performed, and through a floating reading of titles, abstracts, and keywords, results that presented relevant information for this study—specifically those discussing novice teachers in Basic Education—were identified.

From this floating reading, 41 works were identified, consisting of 37 dissertations and four theses. This collection was then filtered to retain only those works focused on teaching practices in Science subjects throughout Elementary Education, as well as Physics, Chemistry, and Biology in High School. As a result, 26 dissertations and one thesis were selected, forming the analysis corpus for this manuscript. The dissertations are represented in the analysis by the codes D1 to D26, and the thesis by the code T1, arranged in chronological order by defense year in Table 1 in the next section.

Data analysis was conducted using Content Analysis (CA) proposed by Bardin (1977), where the researcher seeks to capture the meanings expressed in the examined text. For this study, the results and conclusions of all the theses and dissertations were read, along with excerpts from theoretical and methodology chapters, to understand how the research was developed and to better comprehend the presented results. Once the analysis *corpus* was established, a coding process was undertaken by identifying recording units and analyzing context units. Subsequently, the dissertations and theses were grouped into themes. Following the coding development, as described, categorization was carried out, resulting in two a posteriori categories: "Teacher Induction and Support in Early Years Teaching" and "Beginning Teachers in Natural Sciences", which will be discussed in the following sections.

4 RESULTS AND DISCUSSION

Following the pre-analysis and analysis of the material, the results were processed, and inferences and interpretations were made according to the adopted analysis methodology. This section highlights the recording units grouped into categories. Based on the methodology outlined, data from 27 studies on the beginning of teaching careers in Basic Education were organized and coded as shown in Table 1, listed in ascending order by year of defense, to guide the analyses conducted. As this is a bibliographic study, it also facilitates access to the bibliographic references and information.

Table 1 – Theses and Dissertations on Beginning Science Teachers in Basic Education

Year	Work	Author(s)	State	Title / Access Link
2004	D1	Soares, C. M. G.	PE	The Teaching Practice of the beginning teachers https://repositorio.ufpe.br/handle/123456789/4609.
2004	D2	Oliveira, S. M. M.	PA	Memories of Science and Biology Teachers at the Beginning of Their Teaching Careers: Conflicts and Tensions http://www.repositorio.ufpa.br:8080/jspui/handle/2011/1822.
2005	D3	Souza, D. B.	SP	Social Representations of Classroom Indiscipline Among Novice Teachers in the Municipal Network of Presidente Prudente - SP: Implications for Initial Teacher Education https://repositorio.unesp.br/handle/11449/92366.
2006	D4	Anjos, D. D.	SP	How Was It to Start Teaching? Stories of Female Teachers, Stories of the Teaching Profession http://repositorio.unicamp.br/handle/REPOSIP/252598.
2009	D5	Cancherini, Â.	SP	The Socialization of Novice Teachers: A Difficult Start http://biblioteca.unisantos.br:8181/handle/tede/172.

2010	D6	Pena, G. B. O.	MG	The Beginning of Teaching: Experiences, Knowledge, and Conflicts of Chemistry Teachers https://repositorio.ufu.br/handle/123456789/17319.
2011	D7	Leone, N. M.	SP	Training Needs of Early Years Teachers in Their Entry into Teaching https://repositorio.unesp.br/handle/11449/90200.
2012	D8	Marques-dos-Santos, B.	SP	The Investigation of a Novice Teacher's Own Practice Through the Lens of Recontextualization Theory https://repositorio.unesp.br/handle/11449/90959.
2013	D9	Cassão, P. A.	SP	Novice Teachers: Marks of Otherness in the Constitution of Teaching Professionalism https://repositorio.unesp.br/handle/11449/90135.
2013	D10	Reis, M. A. S.	SP	Weaving the Threads of the Beginning of Teaching: The Constitution of the Novice Teacher http://repositorio.unicamp.br/handle/REPOSIP/250815.
2014	D11	Duarte, S. M. C. A.	DF	Becoming a Teacher: The Beginning of the Career and the Process of Constituting the Specificity of Teaching Action https://repositorio.unb.br/handle/10482/16501.
2014	D12	Lopes, M. F.	RS	The Pains and Loves of Becoming a Teacher: My Memories as a Novice Teacher https://lume.ufrgs.br/handle/10183/107987.
2015	D13	Felix, C. F. F.	SP	Professional Teacher Identity: Weaving Stories http://repositorio.unicamp.br/handle/REPOSIP/253985.
2015	D14	Lobato, A. C.	MG	How classroom discourse is constituted by early career teachers https://repositorio.ufmg.br/handle/1843/BUBD-A3FJEJ.
2015	D15	Morais, J. S.	RN	The Pedagogical Practice in the Daily Lives of Novice Female Teachers: Weavings and Challenges of Learning to Teach http://repositorio.ufrn.br/handle/123456789/20460.
2015	D16	Santana, M. S. S.	BA	The Pibid and Professional Teacher Initiation: A Study with Teachers Graduated from the Program https://repositorio.ufba.br/ri/handle/ri/18407.
2015	D17	Zerbin, F. M. S.	OPO (PT)	The Shock with Teaching Reality, the Novice Teacher, and Literacy https://repositorio-aberto.up.pt/handle/10216/83053.

2016	D18	Amorim, A. D.	SP	The Process of Constituting the Teaching Identity of Novice Teachers: Graduates from the Pedagogy Course at UNESP/Bauru https://repositorio.unesp.br/handle/11449/148699.
2016	D19	Cavalcante, E. R. C.	DF	Between Formative Life and Professional Life: Subjective Production on Entering the Public School Teaching System in DF https://repositorio.unb.br/handle/10482/22071.
2016	D20	Rocha, D. R.	DF	The Political Meanings Attributed to School Education by Novice Teachers: Continuity, Utopia, Resistance, and Revolution https://repositorio.unb.br/handle/10482/21981.
2016	T1	Marcato, D. C. B. S.	SP	Reflections of Novice and Experienced Teachers on Teacher Initiation and School Inclusion https://repositorio.unesp.br/handle/11449/136422.
2016	D21	Moura, T. A.	SP	Literacy Practices of Novice and Experienced Literacy Teachers in the 1st Year of Elementary School https://repositorio.unesp.br/handle/11449/137843.
2016	D22	Vargas, A. R.	DF	School Management in the Process of Inserting Novice Teachers into Teaching Work https://repositorio.unb.br/handle/10482/20093.
2017	D23	Constantin Jr, J. C.	SP	Novice Teachers in the State of São Paulo: The SEE/SP Training Proposal for New Teachers https://repositorio.unesp.br/handle/11449/150086.
2017	D24	Jonsson, P. V. M.	PR	The Pedagogical Practice of Novice Teachers in the Municipal Education Network of Ponta Grossa/PR https://tede2.uepg.br/jspui/handle/prefix/2363.
2018	D25	Beatriz, A. B. T.	PR	Contributions of the Pedagogue to the Pedagogical Practice of Novice Teachers: A Study on the State Professional Education of Ponta Grossa - PR https://tede2.uepg.br/jspui/handle/prefix/2601.
2018	D26	Scos, J.	PR	The Process of Producing Pedagogical Practice Among Novice Literacy Teachers https://tede2.uepg.br/jspui/handle/prefix/2642.

Fonte: Dados da Pesquisa (2024).

The data are organized into two categories: "Teacher Induction and Support in the Early Years of Elementary School" and "Beginning Teachers in Natural Sciences" presented in more detail in the following subsections. For the analysis,

subsections 4.1 and 4.2 address the first three questions posed in the introduction of this article, which can be translated into the following directions: conditions of integration, reasons for leaving the profession, and actions employed to retain novice teachers and enhance their engagement. At the end of this section, in subsection 4.3, a synthesis of the analysis is sought, and considerations regarding the fourth question from the introduction, specifically about novice science teachers in the early years of Elementary Education, are made.

4.1 Teacher Induction and Support in the Early Years of Elementary School

The first category of analysis concerns the published studies related to novice teachers working in Basic Education who hold a degree in Pedagogy, some of which also include teachers with degrees in other areas. In these studies, a lack of characterization of the polyvalent teacher regarding the subject they teach in the early years of Elementary Education was detected. That is, the studies concern teachers of the early years without making distinctions regarding the teaching of science in particular. Possibly, this is because such research characterizes teachers by their polyvalent training rather than by the subject they teach.

Observations from these teachers' reports reveal that the need for integration is not being met. For example, study D1 states that the school, despite playing a central role in professional teacher development, does not implement interventions for this purpose, nor does it have a clear understanding of its formative role. D20, on the other hand, advocates the creation of a program to welcome beginning teachers. Related context units are listed below.

> - It is necessary for the school to move beyond the idea of readiness regarding novice teachers and create conditions to support and guide them (D1, p. 197).
>
> - As important as investing in integrating undergraduates into the school routine is the creation of programs to welcome novice teachers within schools and educational institutions (D9, p. 144).
>
> - Faced with the difficulties encountered, teachers feel abandoned to their fate, yet they must manage to solve the problems and demands of their class (D24, p. 125).

Some studies (D16, D20, D23) show that courses and programs developed by public authorities have limitations, especially in two areas: the range of various aspects of the teaching profession and the number of teachers covered. Regarding the first factor, it is evident that the projects may satisfactorily cover some aspects of the profession but do not adequately encompass others. Regarding the second factor, existing programs have limited spots, and participation opportunities are not equal for all teachers entering the profession. It is also noteworthy that a significant portion of the existing professionals in schools does not collectively adhere to these programs.

> - These data reveal that the course has not ensured accessibility to all novice teachers in the public education system, even though it is mandated by law (D20, p. 58).

> - Unfortunately, there is still difficulty in establishing a solid partnership between most teachers and their coordinators or with the management team as a whole (D16, p. 150).

Regarding teacher attrition, studies D3, D7, D13, D18, and D22 mention that the initial phase of teaching is marked by teachers' reflections, during which they decide to stay in the profession based on their experiences. Concerning actions to retain teachers and enhance their engagement, the *corpus* analyzed lacks reports of such interventions. This reinforces the previously mentioned idea of individuation (TARDIF; LESSARD, 2008), that is, the lack of collaborative work, exchanges, and sharing of the profession's "heavy loads" (BECK, 2017).

Furthermore, T1, the only thesis in the *corpus*, addresses the beginning of the teaching career concerning school inclusion, that is, the inclusion of students with specific needs. It highlights the need not only for support for teacher integration in general aspects of daily life but also for knowledge specific to this area of special education, emphasizing "co-teaching," that is, teacher cooperation, to address the difficulties of beginning a teaching career.

In this sense, the analyzed research and highlighted context units indicate that novice professionals face the challenges of teaching in isolation. School management, when noting deficiencies in teaching performance, does not accompany teachers in resolving the problems encountered, and existing initiatives are not comprehensive enough. Additionally, studies D7, D16, D17, D18, and D22 emphasize the need for more investigations into the beginning of teaching careers to deepen discussions on this topic.

4.2 Beginning Teachers in Natural Sciences

This category analyzed publications related to science subjects in the early years of Elementary Education and other natural sciences disciplines at different levels of basic education. The research *corpus* contained few dissertations and no theses specifically focused on novice teachers in natural sciences, especially in Elementary Education.

Research D2, focusing on the memories of graduates from a licentiate program in Northern Brazil, reveals personal difficulties with the school environment and the prevailing educational system.

> - Some teachers [...] feel more prepared and can face the 'reality shock' more calmly, making decisions that allow them to build professional knowledge more readily (D2, p. 78).

> - The beginning teacher encounters situations that seem absurd to them, requiring them to quickly establish themselves to develop well in their profession (D2, p. 78).

D2 characterizes conflicts and tensions resulting from factors such as the novice teacher's confrontation with the reality of their practice versus their initial memories constructed about their former teachers. From the participants of D2's research, it is inferred that the identified tensions need to be swiftly addressed to foster professional development. This urgency aligns with Nono and Mizukami's emphasis on the need for continuous training for novice teachers, a critical career phase. Additionally, D2 highlights a participant's expressed insecurity about

natural sciences content due to insufficient training. While D14 pointed out that teacher induction projects allow for the sharing and overcoming of anxieties, D2 identified other novice teachers who felt insecure about developing in their field (the school) due to a lack of certainty and mastery over their class and subject choices.

> - She was aware that she lacked specific content to feel comfortable in the teaching profession (D2, p. 78).
>
> - By participating in these projects, licentiate students have the opportunity to reflect on the difficulties faced and the possibilities of overcoming them, supported by the training institution (D14, p. 122).

Thus, the importance of initial career training is highlighted as a means to foster a new teaching culture, potentially rectifying the conditions of isolation and individuation in the profession and addressing the gaps in initial training noted by Tardif and Lessard (2008). In D14's research with Chemistry licentiate students, inspiration and preparation for teaching work stem from the students' experiences in a teaching induction project developed before professional insertion, integrating theory and practice, according to the following registration unit:

> - Initial training is, therefore, the moment of problematizing pedagogical practice, a place of knowledge production. [...], we argue that the idea that it is necessary to study theory before practice is probably not the best way for licentiate students to appropriate this knowledge (D14, p. 105-106).

In D14's research specifically, students' experiences in projects focusing on professional development during their licentiate degree have a direct impact, including engaging them to remain in the teaching profession, specifically in Chemistry, but potentially extendable to other licentiate areas, including Pedagogy.

D14 and D24 affirm that the formative process initiated during the undergraduate course is essential for triggering professional development, but the latter (D24) demonstrates the difficulties in interactions with experienced teachers in schools.

> - There is a need to include practical training from the beginning of the initial training degree to reduce early career insecurities that can be overcome when accompanied and discussed, showing a good opportunity for reflection on teaching practice (D14, p. 15).
>
> - [...] the practice of novice teachers is determined by the knowledge built during initial training, and the difficulties encountered in their practices are related to interactions with other teachers in the school and the organizational climate of institutions (D24, p. 6).
>
> - In the Municipal Education Network, head teachers are responsible for Social and natural sciences content, in addition to various school projects. However, besides the difficulty related to the range of content, head teachers are called to take over classes when a teacher is absent (D24, p. 112).

D24 reports that novice science teachers in the early years seek theoretical and methodological elements to overcome obstacles in teaching this subject,

related to the need for training beyond initial education as advocated by Briccia and Carvalho (2016). It is evident from D24's findings that teachers needed to bridge the gap between initial training and professional practice, sometimes relying on more experienced colleagues but maintaining autonomy to address emergent teaching practice needs. This reveals challenges, such as difficulties in understanding specific subject content and the need to cover for absent teachers in other classes. D24 also emphasizes the need for continued research on this topic of novice teachers.

To address these demands, the development of communities, such as those conceptualized by Reis (2021) and Nóvoa (2009), is highlighted. In particular, the concept of professional learning communities, as studied by the Alberta Teachers' Association (2018), holds potential

4.3 A synthesis of the analyzed research and considerations regarding beginning science teachers in the early years of Elementary Education

Based on the *corpus* of analyzed productions, the description of obstacles and challenges in this stage of teaching profession stands out prominently. Specifically, from the work of D7, it is noted that there is a clear need for a structured composition of actions to support preparation during initial training, expanding to commitments of support programs for novice teachers, which can be related to Tardif and Lessard (2008), Beck (2017), Gatti *et al.* (2019), and Reis (2021). Additionally, perspectives from D3, D11, and D17 identify novice teachers affected by high work intensification and exhaustion, akin to findings in Beck (2017) and Alberta Teachers' Association (ATA, 2011, 2018), as they claim sole responsibility for many classroom demands. D7, D9, D14, D16, D20, and D24 represent research from different contexts, all unequivocally suggesting the indispensability of programs that consider entry into the profession, a notion supported by Nono and Mizukami (2005).

There are also contrasting perceptions regarding teacher induction within the *corpus*. On one hand, D19 mentions the need for teachers to take responsibility for contributing to the construction of the school environment during novice teacher integration, i.e., the need to adapt to the school. On the other hand, D20 stresses the importance of schools welcoming teachers through programs and public policies, advocated by Gatti *et al.* (2019).

Therefore, by advocating for projects in initial training focused on teacher induction, it is impossible to outline all conditions for successful early career performance because school dynamics continuously change. However, the preparation licentiate students receive in integrating theory and practice is unlikely to be sufficient when they assume work in a school environment that is rarely the same as where they trained or developed a project. Thus, consideration should be given to Science teachers, for example, regardless of the school they find themselves in.

Furthermore, it is essential that teachers have support in terms of specific subject knowledge, as scientific and technological knowledge is marked by constant changes and new discoveries. It is important that their practice reflects an appropriate understanding of the nature of science, avoiding simplifications and distortions (VILCHES *et al.,* 2007). In this way, it is hoped that student

knowledge also shares this understanding, aiming to provide students with the necessary foundations for their active participation in solving scientific and technological problems in their surroundings (REIS, 2021).

D2's work highlights unique perceptions and experiences in the early career of teaching, marked by feelings of insecurity and nervousness, which, not disconnectedly, can stimulate the creation of new knowledge, corroborating Briccia and Carvalho (2016). This knowledge can be equally particular, especially because it characterizes the learning derived from full-time professional practice in science education.

Regarding science teachers in the early years of Elementary Education, in reference to the fourth question presented in the introduction of this text, the lack of characterization of these professionals in the *corpus* is notable. Considering the gaps in the broad and inadequate initial training of teachers at this level of education, as well as the fact that science subjects are endowed with unique conceptual and methodological knowledge (BRICCIA; CARVALHO, 2016; GATTI *et al*., 2019), it is important that research on early career focuses on the specific aspects of teaching science, to address these needs. However, no research was found that definitively addressed these points.

This lack of research is understood as a reflection of the lack of formative initiatives by responsible bodies that address the specificities of early teaching in this discipline. That is, the few existing formative considerations address general aspects of early career teaching in the early years of Elementary Education, without delving into the specific needs of Science education, analogous to generalist initial training.

Therefore, the idea is reinforced that actions should be promoted not only during initial training, nor solely in the early years of teaching natural sciences in Basic Education. The analyzed research underscores that the existence of a project during training does not negate the need for other projects to integrate professionals into schools and vice versa. One way to develop such activities is through professional learning communities, which provide the perspective that teachers, as learners, can organize themselves in collaborative actions aimed at their professional development, integration, and support for new professionals, as well as addressing gaps in initial training, aiming for better teaching practices.

5 FINAL CONSIDERATIONS

Teaching natural sciences is a complex task, requiring students not only to grasp concepts and theories but also to develop critical thinking about them, aiming for a better understanding of the world around them. Therefore, it is essential to provide teachers with continuous training and adequate support so that their classroom practices meet these demands.

The objective of this article was to provoke reflections among researchers in science education about the relevance of issues concerning the insertion, support, and retention of teachers in the teaching profession from the early years of their careers. Regarding the three questions posed in the introduction, it is clear that for novice teachers, there is a need for programs and/or projects to support their professional development at the beginning of their careers. Furthermore, the research conducted showed that contributions are partial and

mainly come from school administrators, hence localized, and occur without substantial contributions from public policies, with few exceptions. This impacts teachers' autonomy and creates obstacles to teaching, especially in science education, which is the focus of this article.

Another aspect worth noting is that retention in the profession was highlighted in five out of the 27 analyzed studies, but it appears amidst many other issues. Based on the analyzed studies, it is hypothesized that retention in the profession occurs after overcoming numerous obstacles and demands to engage in teaching. Different arguments are presented for developing actions to support novice teachers, but there is minimal evidence that these actions are underway. Regarding the teaching of science in the early years of Elementary Education, particularly concerning novice teachers, this curriculum segment is immersed in numerous demands placed on teachers, and there are few specific studies on this subject.

Therefore, it is emphatically asserted, based on the survey and exploration conducted through Content Analysis, that the discipline of Science has been relegated to a peripheral condition in the research from 2001 to 2022, as identified by the method described in the methodology section. While this database may be considered a limitation, the neglect of science education in the early years of Elementary Education urges the community of teachers and researchers to continue studying and strategizing to overcome this condition. Thus, we echo a realization observed in the analyzed studies: there is a need for more research on the beginning of teaching careers. It is hoped that these discussions will be expanded, especially regarding teachers of natural sciences disciplines.

It is evident that Science education is partially or completely overlooked within the immediate demands of primary schools and in Pedagogy degrees that train teachers for this school level, according to the analyzed studies. Therefore, the loss of status and marginalization occurs due to a combination of factors: gaps in training during the Licentiate degree that the teacher completed, schools' reluctance to fully comply with curricular norms, particularly the need to teach science, and few initiatives from public bodies that reach schools comprehensively and effectively.

For the community of researchers in science education, focusing on Basic Education, contributions and public policies are desirable, especially those stemming from the convergence between the two categories highlighted in this article. In other words, it is crucial to consider the intersection between the categories of insertion and support of teachers in early teaching and novice teachers in teaching Natural Sciences, to empower teacher training in schools to support those starting their careers and to effectively teach Science.

Therefore, this text emphasizes the establishment of cooperative learning environments and training within Basic Education institutions, such as professional learning communities. These communities should aim to construct programs or projects in initial and continuing training for in-service teachers teaching science in the early years of children’s schooling.

WORKING CONDITIONS, INDUCTION AND ENGAGEMENT OF BEGINNING NATURAL SCIENCES TEACHERS

ABSTRACT

The beginning of a teaching career is marked by the clash between the expectations formed during initial training and the reality encountered in schools. Considering the need for further discussions and actions on this topic, the aim was to raise reflections among researchers in the field of science education on the importance of issues related to the induction, support, and retention of teachers from the very first years of their careers. To this end, we conducted a qualitative, bibliographic, exploratory, and interpretative research on Brazilian theses and dissertations available on the University of São Paulo's *Portal de Busca Integrada,* published between 2001 and 2022, addressing the beginning of teaching careers in Natural Sciences in Basic Education. We conducted the data analysis using Content Analysis, based on Laurence Bardin. As a result, we found that research on this topic is scarce, especially concerning science education in the early years of Elementary School. An implication of this study is the highlighted need for the systematization of programs and public policies that provide time and space for teachers to study educational practices for their effective induction, engagement, and retention in the teaching profession.

KEYWORDS: Science education. Beginning teachers. Elementary School.

NOTES

1. This article was presented at the scientific event VII National Symposium on Science and Technology Teaching (SINECT 2022) in the oral presentation format. Selected by the organizers for publication in this journal's special edition, it underwent revisions and detailed elaboration.

2. Contributions from all authors are equivalent in: research, analysis, and writing of the paper.

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Received: May 22nd, 2023.
Approved: May 14th, 2024.
DOI: 10.3895/rbect.v17n2.17015
How to cite: ROMAGNOLLO, B. D.; DIGNER, V.; ALVES, J. A. P.; OLIVEIRA, S. M. Working conditions, induction and engagement of beginning natural sciences teachers. **Brazilian Journal of Science Teaching and Technology**, Ponta Grossa, v. 17, Special Edition, p. 1-19, 2024. Available at: <https://periodicos.utfpr.edu.br/rbect/article/view/17015>. Access on: XXX.
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