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The professional insertion of graduates from a degree in computing and the challenges to retention in the teaching career

A inserção profissional de egressos da licenciatura em Computação e os desafios à retenção na carreira docente

La inserción profesional de los egresados de la carrera de informática y los desafíos de la retención en la carrera docente

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Abstract

This article is part of a doctoral research project conducted between 2018-2022, which aimed to analyze the professional insertion trajectories of graduates from teacher education programs for Professional and Technological Education (PTE). Focusing on the Computer Science Teacher Education degree program, this paper presents a subset of the findings from that research, with the objective of analyzing and understanding the conditions under which these professionals enter the teaching profession, while also exploring related aspects such as available occupations, challenges, and perceptions

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associated with this process. The study adopted a qualitative and descriptive approach and, regarding the findings presented here, involved the participation of five graduates from the aforementioned program. Research data were generated from information collected through a questionnaire containing both open-ended and closed-ended questions. The theoretical framework was based on studies investigating graduates of teacher education programs, teacher education and the teaching profession in Professional and Technological Education (PTE), and Computer Science Teacher Education programs. The findings reveal specific challenges and limitations in the professional insertion process of Computer Science teacher graduates. Among these are the low expectations regarding long-term permanence in the teaching profession, due to the limited availability of teaching positions, as well as the prevailing practice of hiring bachelor's degree holders and/or technical professionals from the field in place of licensed teachers specifically trained to work in Professional and Technological Education. The results highlight the need for the implementation of a comprehensive set of policies aimed at teacher education, professional recognition, and regulation of the teaching profession in Brazil. These policies include improving teacher salaries, strengthening teaching career structures, ensuring more dignified working conditions, and, in the specific context of Professional and Technological Education, regulating professional practice in ways that promote the professional insertion of graduates from teacher education programs into this educational modality.

Keywords: Professional and Technological Education. Professional insertion. Degree in Computing. Graduates.

Resumo

O presente artigo é parte de uma pesquisa de doutorado, realizada entre 2018-2022, que se destinou a analisar trajetórias de inserção profissional de licenciados para educação profissional e tecnológica (EPT). Com foco sobre a Licenciatura em Computação, apresentamos, neste trabalho, recorte dos achados dessa pesquisa, com o objetivo de analisar e compreender as condições de entrada na carreira docente destes profissionais, explorando aspectos outros como as ocupações disponíveis, os desafios e percepções desse processo. O estudo realizado foi de caráter qualitativo e descritivo e, no que aos resultados aqui expostos, contou com a participação de cinco egressos do curso em questão. Os dados de pesquisa foram construídos a partir de informações obtidas por um questionário, que continha perguntas abertas e fechadas. A pesquisa traz como fundamentação teórica estudos que investigam egressos de cursos de licenciatura, formação/profissão docente na Educação Profissional e Tecnológica (EPT) e Licenciatura em Computação (LC). Os dados da nossa pesquisa apontam para desafios e limitações singulares no processo de inserção profissional de licenciados em Computação, entre os quais, as baixas expectativas de permanência desses profissionais no magistério, dada a escassez de funções docentes e a cultura de contratação de bacharéis e/ou técnicos da área em questão, em substituição a profissionais licenciados para EPT. Nossos achados apontam para a necessidade de implementação de um conjunto de políticas de formação, valorização e regulação da docência no Brasil, dentre as quais: melhoria da remuneração docente, aperfeiçoamento das carreiras profissionais do magistério, condições de trabalho mais dignas e, no caso da EPT, regulamentação do exercício, de modo a favorecer a inserção profissional de egressos de cursos de licenciatura para esta modalidade de ensino.

***Palavras-chave**: Educação Profissional e Tecnológica. Inserção profissional. Licenciatura em Computação. Egressos.*

Resumen

El presente artículo forma parte de una investigación doctoral realizada entre 2018 y 2022, cuyo objetivo fue analizar las trayectorias de inserción profesional de egresados de programas de formación docente para la Educación Profesional y Tecnológica (EPT). Centrado en la Licenciatura en Computación, este trabajo presenta un recorte de los hallazgos de dicha investigación, con el propósito de analizar y comprender las condiciones de ingreso a la carrera docente de estos profesionales, explorando además aspectos como las oportunidades laborales disponibles, los desafíos enfrentados y las percepciones construidas en torno a este proceso. El estudio adoptó un enfoque cualitativo y descriptivo y, en relación con los resultados aquí expuestos, contó con la participación de cinco egresados del programa mencionado. Los datos de la investigación fueron construidos a partir de la información obtenida mediante la aplicación de un cuestionario compuesto por preguntas abiertas y cerradas. El estudio se fundamenta teóricamente en investigaciones sobre egresados de programas de formación docente, formación y profesión docente en la Educación Profesional y Tecnológica (EPT), así como en la Licenciatura en Computación. Los resultados de nuestra investigación evidencian desafíos y limitaciones particulares en el proceso de inserción profesional de los licenciados en Computación. Entre ellos destacan las bajas expectativas de permanencia de estos profesionales en la docencia, debido a la escasez de puestos de trabajo docentes, así como la práctica recurrente de contratación de profesionales con título de grado y/o técnicos del área en sustitución de docentes con formación pedagógica específica para actuar en la EPT. Nuestros hallazgos ponen de manifiesto la necesidad de implementar un conjunto de políticas orientadas a la formación, valorización y regulación de la profesión docente en Brasil. Entre ellas se destacan la mejora de la remuneración docente, el

fortalecimiento de las carreras profesionales del magisterio, la garantía de condiciones de trabajo más dignas y, en el caso específico de la Educación Profesional y Tecnológica, la regulación del ejercicio profesional docente, de manera que se favorezca la inserción laboral de los egresados de programas de formación docente destinados a esta modalidad educativa.

***Palabras clave**: Educación Profesional y Tecnológica. Inserción profesional. Licenciado en Informática.*

Introduction

Studies on the teaching profession indicate that completing a teacher education program does not mean the definitive emergence of a new teacher. Instead, professional development for teachers is an ongoing process, with much of their training occurring through the experiences gained in the profession. In this context, several factors influence the development of a teaching career, such as material working conditions, career paths, and salary levels (Gatti, 2009); the nature of employment ties within institutions and the circumstances surrounding the "choice" of workplace (Gatti & Barreto, 2009; Tartuce et al., 2010); access to continuing education policies that promote ongoing professional development (García, 2009; André, 2015); and professional induction policies that help novice teachers in dealing with a "reality shock" (García & Vaillant, 2017). Given these factors, it is crucial to gain a deeper understanding of the profession to effectively advance policies regarding teacher education and professional recognition.

In this context, it is essential to examine the professional trajectories of teachers' insertion to gain a deeper understanding of the challenges, possibilities, and specific characteristics inherent in the practice of the profession. This understanding is particularly relevant regarding graduates in fields historically sidelined in educational research, such as Professional and Technological Education (PTE). While studies addressing the entry and retention of teachers in historically well-established stages of Basic Education (BE) remain limited, research focused on professionals trained to work in PTE is even scarcer.

In Brazil, PTE has been highlighted by a shortage of licensed professionals qualified to work in the field. Since its inception in the country, instructors for technical subjects have been recruited from among professionals in the relevant fields, based on their technical knowledge or professional practice. Generally, these professionals lack the pedagogical training grounded in their teaching activities. Consequently, the methods they use in classrooms, workshops, and laboratories are from independent reading, improvisation, and knowledge gained through experience in other professional areas (Ferreti, 2010). Thus, it can be stated that teacher education for PTE is marked by a lack of consistent theoretical frameworks and comprehensive, sustained public policies (Machado, 2008), favoring the selection of professionals with strictly work-based experience, often acquired on the "factory floor" (Costa, 2016).

Thus, the understanding spread that *those who know how to perform a task are capable of teaching it* (Silva Júnior & Gariglio, 2014), suggesting that teacher education for the field of Professional and Technological Education (PTE) is unnecessary. The main result of this has been what authors in the labor and education fields call a *policy of non-training for teachers* in this area (Machado, 2008; Peterossi, 1992, 1994).

Analyzing the educational and professional trajectories of teachers in this education modality means revealing aspects inherent to the process of identity formation and career entry within a teaching context defined by specific historical, political, and pedagogical characteristics.

The historical marginalization of PTE has resulted in this educational modality being overlooked by researchers, impacting the body of research regarding teacher education in this field. A common gap identified in recent reviews of teacher education is the lack of studies on teacher education for PTE, especially when compared to research available on teachers in other areas of basic education (Sousa & Moura, 2019; Gariglio & Burnier, 2014). This situation shows the need for further research to better understand both initial and continuing teacher education initiatives for PTE in the country and the complexities involved in the professional entry for teachers qualified in this educational modality.

In this context, this article presents some findings from a doctoral study that sought to understand the professional entry trajectories of graduates in Computing and Electromechanical Science from the Federal Institute of Education, Science and Technology (IFB-*Instituto Federal de Educação, Ciência e Tecnologia* of Bahia). This study reported here focuses on the professional entry trajectories of five graduates from the Computing Science degree program.

The discussions presented here are shaped by the similarities and contrasts between stages of basic education, specifically elementary and high school, and the modality of Professional and Technological Education (PTE). Any comparison here is not intended to establish a competitive relationship between the educational contexts; rather, its purpose is to highlight the significant historical inequalities regarding the public attention and investment allocated to each of these educational fields. These disparities reflect distinct processes of institutional valuation, funding, and

public policy formulation, which can result in differing conditions for teacher education and practice across these various settings.

The research is qualitative and descriptive, relying on data obtained through the administration of a semi-structured questionnaire. The study is structured as follows: the first section addresses the topic of graduates from teacher education programs, specifically those qualifying to teach in Professional and Technological Education (PTE), exploring the subject from a conceptual perspective and critically examining the issues involved; the second section offers insights into in Computer Science, highlighting specific aspects of this type of training; the third section details the methodological procedures used in the research; the fourth section presents subsections covering the data collected and the analyses derived from them; and the fifth and final section offers some preliminary considerations and conclusions regarding the study.

Studies on graduates for PTE: a gap topic

Research on graduates (Paul, 2015) shows that these individuals have significant information regarding the educational processes they experienced. They can provide analytical insights to better understand how their professional training has affected them, especially when considering the challenges in the labor market as a benchmark for evaluation. Paul (2015) notes that studies focusing on graduates have received limited attention in Brazil, even after the creation of the National Higher Education Assessment System (SINAES-*Sistema Nacional de Avaliação da Educação Superior*) in 2004, which identified graduate tracking as one of the key indicators for assessing higher education institutions. Simon & Pacheco (2017) confirm the absence of an explicit policy for the systematic tracking of graduates in the country, highlighting that these individuals are not yet viewed as potential contributors to the development of the nation's higher education system.

A significant body of research in the field of teacher education has examined, on the one hand, who chooses the teaching profession and, on the other, the characteristics of this professional group within the labor market. "However, little is known about the 'middle ground': which graduates of teacher education programs are actually entering the formal labor market in Brazil, whether in typical occupations, such as teaching, or otherwise" (Vieira, Paul & Barbosa, 2023, pp. 20–21). The importance of gaining a better understanding of this "middle ground" comes from the fact that higher education-based teacher education plays a central role in educational policies aimed at improving the quality and equity of classroom teaching. Although an academic degree alone is insufficient to assess teacher effectiveness, completing an undergraduate program aligned with the subject area taught is associated with recognized factors, such as content mastery and the use of effective teaching methods and resources, that drive positive student educational outcomes, particularly in public schools. Alongside these aspects, studies indicate that teachers who remain at the same school for longer periods (low turnover) can consolidate their professional experience and foster better student performance, as they can carry out more robust pedagogical work (Vieira, Paul & Barbosa, 2023; Carvalho et al., 2021).

Studies on graduates of teacher education programs have shown a gap between the completion of higher education teacher education and actual teaching practice. This gap not only affects the completion of the teaching workforce but also influences the professional entry and career paths of these individuals. In Brazil, similar to other Latin American countries, the teaching profession suffers from low social status and structural issues such as inadequate pay, limited career path, and poor working conditions. These factors drive away graduates, especially those with high-quality initial training (Vaillant, 2006; Louzano et al., 2010). The same factors lead many teachers to seek additional employment or work in multiple schools to make ends meet. This reality contributes to various forms of fatigue and professional disengagement, ultimately harming student academic outcomes (Elacqua & Marota, 2019). Also, because teaching is a predominantly female profession, decisions regarding professional entry strongly compete with other decisions that historically fall upon women and impact family life, such as family well-being and child-rearing responsibilities (Alves et al., 2016). Given this context, understanding the career paths of teacher education graduates can help inform the development of initial and continuing teacher education policies that strengthen professional commitment to teaching, potentially reversing the trends of teachers leaving the profession and the career's lack of appeal (Gatti & Barreto, 2009).

Regarding the initial teacher education for PTE, we observed a limited supply of degree programs in Brazil. In our doctoral research, we surveyed the teacher education programs offered by the Federal Network of Professional, Scientific, and Technological Education (RFEPCT-*Rede Federal de Educação Profissional Científica e Tecnológica*), established by Law 11.892/2008, which created the Federal Institutes of Education, Science, and Technology (IFs-*Institutos Federais de Educação, Ciência e Tecnologia*). Article 8 of this legislation mandates that the Institutes reserve 20% of their student places for teacher education degree programs and pedagogical training programs, particularly in the fields of Science, Mathematics, and Professional Education. At the time of the study, only 13 of the 38 institutions offered teacher education programs in technological fields (34%). Of these, 12 offered programs in Computing and Informatics, indicating a prevalence of this specific type of teacher education program compared to those aimed at other areas of PTE.

This survey revealed that, among the Federal Institutes (IFs), the provision of teacher education programs (*licenciaturas*) for the basic education curriculum "foundational subjects" was prevalent. These programs were offered on a more continuous and consistent basis than those for Professional and Technological Education (PTE). Almost all IFs provided one or more teacher-training programs aimed at basic education. This finding is surprising, given that even in institutions with a historical focus on PTE, teacher education programs for this specific modality play a secondary role in teacher education policies. Given their historical trajectory, these institutions could help address the long-standing deficit in teacher education policies for the PTE modality. However, the limited availability of such courses suggests that the RFEPCT continues to reinforce this policy, further diminishing the recognition of training initiatives in this area of teaching practice.

This political reality runs counter to the challenges posed by the world of work, which requires solid professional training. It is a policy that persists over time, although "[...] expectations regarding the profile of vocational education teachers [are] higher today [...]"; after all, "The 'craftsmanship' model, where the workshop master served as the role model for the apprentice, is no longer sufficient [...]" (Machado, 2008, p. 15). This policy of non-training has long been perpetuated by public authorities, who employ legal mechanisms to maintain this dismal scenario, such as CNE/CEB Resolution No. 6 of September 20, 2012.

This Resolution defines the National Curriculum Guidelines for Technical Professional Education at the High School Level (EPTNM-*Diretrizes Curriculares Nacionais para a Educação Profissional Técnica de Nível Médio*), which is part of Professional and Technical Education (PTE), and establishes the following in Article 40, Title IV:

> Initial teacher education for secondary-level technical professional education is conducted through undergraduate degree courses, teacher education programs, or other modalities, in accordance with legislation and specific standards established by the National Council of Education (Brazil, 2012).

In other words, the entry into the teaching profession within EPTNM allows for undergraduate-level training without stipulating that such a degree must be a teaching degree, even though it specifies that this training may be undertaken through these programs. Over the years, it has generally come to be characterized as "[...] something special, emergency-based, lacking its own integrity, and devoid of a regulatory framework [...]" (Oliveira, 2010, p. 468).

Law 13.145 of February 16, 2017, is among the legal provisions running counter to the trend of deregulating teaching in Professional and Technological Education (PTE). This law recognizes *notorious knowledge* and authorizes professionals possessing such qualifications to teach subjects related to their educational background and/or professional experience within the technical and vocational training curriculum.

In 2022, CNE/CP Resolution 1 of May 6, 2022, established the National Curricular Guidelines for the Training of Teachers for Secondary-Level Technical Professional Education (EPTNMFormação). Article 3 of this Resolution stipulates that the initial training of teachers for this educational modality must take place at the higher education level, specifically identifying teaching degree programs in Item I. It can be inferred that teaching degree programs are prioritized. This highlights the need for a training policy for this modality, one that, in our view, must incorporate training mechanisms and methodologies capable of transcending the fragmented conceptions that permeate this field and tend to shape its teaching-learning processes.

The need for research on graduates of teacher education programs for technical and technological fields is evident. These programs are rare, and the few that exist continue to operate despite disinvestment and a lack of incentives for this type of training. By examining these graduates, who become teachers in Professional and Technological Education (PTE), we can better understand aspects of their professional lives, their perceptions of the training they received, and their prospects for professional development within the teaching career, among other issues. This enables a deeper understanding of how entry into the teaching profession unfolds within an educational context where the deregulation of the profession has persisted over time, standing as a defining element of this field of professional practice.

With this debate, we sought to understand the professional entry trajectories of teachers holding degrees in Computer Science, aiming to answer the following questions: How did the professional entry process unfold for these graduates? Did this entry occur in the field in which they had trained? Were these teachers able to enter the field of Professional and Technological Education (PTE)? What were the main challenges faced during the process of entering the teaching profession? What are these professionals' current occupations in the labor market? What are their perceptions regarding their professional entry experience?

Methodological procedures

This article is an excerpt from doctoral research conducted at the *Universidade Federal de Minas Gerais* (UFMG), which was approved by the Research Ethics Committee of the university. The study was carried out between 2018 and 2022, originally involving 39 participants, who were graduates of the Electromechanics and Computer Science degree programs, offered by the *Instituto Federal de Educação, Ciência e Tecnologia da Bahia* (IFBA) and who came from different campuses. However, this text focuses on five graduates of the Computer Science Degree program who have worked as teachers in their field of training.

The research used a semi-structured questionnaire for data collection. This instrument was created using Google Forms and comprised 26 questions, both open-ended and closed-ended. They covered various aspects to build the most comprehensive profile possible of the participants. During the questionnaire design process, whenever it became necessary to gain deeper insight into the participants' circumstances to meet the research objectives, participants were asked to provide justifications for their responses to certain questions.

The decision to use a questionnaire was driven by the context of the COVID-19 pandemic, which made in-person meetings unfeasible due to social distancing requirements. Also, the alumni resided and worked in various cities and locations across the state of Bahia. Thus, even under normal circumstances, this would have made conducting face-to-face interviews impractical. We acknowledge the limitations regarding the use of questionnaires highlighted by authors such as Gil (2002), particularly concerning potential interpretative constraints during data collection. However, the preliminary diagnostic survey helped mitigate these limitations, as the instrument was designed with a contextual depth level that allowed for the extraction of essential elements for a high-quality analysis, ensuring the validity of the investigation.

The questionnaire remained available for approximately three months, allowing participants to access it and submit their responses within a flexible timeframe. The information obtained was organized into units of meaning, which subsequently gave rise to categories of analysis, understood as headings under which content elements with similar meanings are grouped, enabling the systematization and deepening of the qualitative analysis (Dionne & Laville, 1999, p. 219).

Key research findings

The findings presented in this section of the research significantly address the guiding questions posed at the beginning of this study. It was possible to understand how graduates of the Computer Science program enter the teaching profession, and to analyze the specific challenges they face when entering the field of Professional and Technological Education (PTE). Also, the study highlighted the experiences encountered along this journey. The research also identified these professionals' roles in the labor market and provided insight into their perceptions regarding their experiences during the process into the profession.

The data obtained in our research provided a solid basis for the analyses developed throughout the study, enabling the achievement of the proposed objectives. However, it is important to emphasize that the results presented here must be understood based on their historical and social context. Transformations occurring in the field of education, public policy, and teaching conditions may, over time, alter the interpretations and meanings attributed to the phenomena analyzed. Thus, the findings of this study should not be viewed as definitive, but rather as a situated contribution to understanding the professional entry of Computer Science education graduates, one open to review and further exploration by future research.

We begin our discussion by presenting the profiles of the five graduates participating in our study: four men and one woman. At the time of data collection, three were aged between 20 and 30, and two were between 30 and 40. This group enrolled in the Computer Science (CS) degree program between 2010 and 2013 and graduated between 2016 and 2017. One of them worked in higher education, teaching subjects within their field of specialization, while the others taught at the elementary and middle school levels (covering both early and final years of Elementary School. The CS program's Pedagogical Project (PPC) at IFBA provides for teaching at these stages of basic education.

The educator with the least experience had only one year of teaching service and taught in the final years of elementary school. The others had at least two years of teaching experience and an equal amount of time working in their respective settings (higher education and the early years of elementary school). This finding suggests that these respondents did not have diverse teaching experiences, having worked at the same level of basic education since entering the profession.

Professional teaching practice field

Four among the group of five graduates worked in basic education (three in the early years and one in the final years), were affiliated with both public and private institutions (four in public institutions and one in a private one), and taught the Basic Informatics (BI) course. One teacher worked in higher education but reported having previously taught in basic education, specifically teaching the aforementioned subject to students in the final years of elementary/middle school. This commonality prompts a few observations.

According to Matos (2013), the BI course is a component, a tool for promoting citizenship. For Lacerda (2012), given the frequent presence of technology in daily life, basic informatics has become indispensable:

> [...] we need knowledge of software for life in society. [...] bank terminals and mobile phones increasingly require skilled users to operate them. [...] we see the need to integrate information technology into the educational context across various subjects to build knowledge regarding the use of diverse tools and languages, both within the school environment and in daily life (Lacerda, 2012, p. 4).

However, this subject is not regularly offered in basic education, particularly within the public-school system, which means there is no guarantee that Computer Science graduates will secure this educational setting as a venue for professional practice, as Castro & Vilarim (2013) point out. These authors highlight the inconsistent availability of Basic Informatics (IB) and note that, even when the subject is offered, "[...] it is still rare to find a Computer Science graduate teaching it" (Castro & Vilarim, 2013, p. 21), because IT technicians are often hired to teach the course instead of qualified graduates. Also, Basic Informatics is not among the mandatory curricular components stipulated by the National Common Curricular Base (BNCC-Base Nacional Comum Curricular).

In Bahia, the state where the qualified teachers in question were trained and resided, Digital Education is not yet a mandatory subject in high school or middle school curricula (at least not in public institutions), as indicated by the Bahia Reference Curriculum Document (DCRB-Documento Curricular Referencial da Bahia) (Bahia, 2022) in the volumes addressing these stages of basic education. The DCRB discusses digital culture in the development of young people and adolescents, presenting it as an integrative theme and highlighting the importance of digital school; however, it does not guarantee the provision of specific subjects in this area.

4.2 Perceptions of teaching work in the context of computer science education

We asked participants how they felt about the educational level at which they taught, offering the following response options: *very satisfied, satisfied, somewhat satisfied, and dissatisfied*. Two participants reported being *very satisfied or satisfied*, while the remaining three were *somewhat satisfied*. In our study, very satisfied meant contentment and fulfillment with their work; *somewhat satisfied* implied a state of resignation, accepting the situation while acknowledging that conditions could be better; and *dissatisfied*, in contrast to the first two categories, represented discontent or unhappiness with their work. By inviting participants to provide justifications, we sought further insight into the reasons behind their stated feelings. Three factors were identified as causes for dissatisfaction with the educational level taught at the time of the study: insufficient planning time (due to a large number of classes and a heavy workload); a lack of infrastructure and teaching materials for Computer Science education; a lack of professional recognition for qualified Computer Science educators; and a lack of opportunities to work within the context of Professional and Technological Education (PTE).

The intensification of teaching workloads, along with other factors that make the profession less attractive, such as unsatisfactory working conditions and low salaries, has led to the severe precarization of the teaching profession. A heavy workload, manifested in a significant number of classes to teach, places an excessive burden on the professional. This results in increasingly limited time for lesson preparation and negatively impacts both quality of life and work quality (André, 2015). Consequently, teachers struggle to meet the demands and specific learning needs required of them.

The lack of infrastructure and the absence of teaching materials, also identified as factors contributing to dissatisfaction with work in basic education, reinforce the precarious conditions affecting the teaching profession. According to Castro & Vilarim (2013), Computer Science graduates may face such issues. The authors describe this lack of infrastructure as the absence of equipment and resources essential to professionals in the field, such as internet access, computers, and licensed software and applications, as well as the lack of teaching materials for facilitating the delivery of subject-specific content.

This point also draws attention to the difficulties that graduates may face regarding the teaching of content in the classroom. Didactic transposition, which entails the "work" of transforming an object of *knowledge to be taught into an object of teaching* (Chevallard, 1991), becomes even more complex. While mastery of the content is indispensable, as is mastery of the didactic-methodological dimension, the lack of materials to support the teacher, and especially the student, in understanding the subject matter addressed in the classroom significantly compromises learning.

During the process of entering the teaching profession in their field, participants reported facing difficulties regarding the recognition of the teaching role of Computer Science graduates. According to one of the educators: *People assume that, simply because they use computers, these professionals are qualified for any task involving activities such as image or video editing, the use of office software, and technical support.* In other words, despite being hired to perform a teaching role, they are often mistaken for technical staff in the field and are required to handle tasks unrelated to actual teaching, alongside their pedagogical duties.

The professional socialization processes that new teachers experience when entering the career are significant. According to Garcia (2009), when a new teacher joins a school culture, they face various situations that help them internalize key aspects of the teaching profession, particularly as they recognize their identity as a teacher in a specific subject area. Positive peer relationships enhance their connections to the work, the profession, and their colleagues, fostering a safe, welcoming, and enjoyable environment for novice teachers. In contrast, negative experiences can weaken their initial bonds with the profession and diminish their relationship with the work environment, potentially making it feel undesirable.

This lack of professional respect can create a crisis in the profession, forcing these teachers to struggle, at an early stage, with the dilemma of whether to remain in or abandon their careers. The inclination to leave the profession is a recurring issue during the initial years of work, due to multiple factors such as inadequate training, limitations imposed by poor working conditions, demeaning pay, isolation caused by pedagogical individualism, and the absence of policies to support professional induction.

This aspect relates to the following question asked of the participants: "Would anything make you give up this career?" Three of the five survey participants answered affirmatively, citing financially attractive job opportunities in other professions and the difficulty of dealing with precarious working conditions. These responses suggest that Computer Science graduates, despite working in a field that appears innovative and promising, face situations similar to those of teachers in other areas and disciplines, as they are exposed to the general devaluation of the teaching profession. The failure to recognize the unique nature of their work within schools seems to exacerbate this devaluation. This is concerning since, according to Castro & Vilarim (2013, p. 21), "the work of Computer Science graduates is not restricted to classroom teaching; the educational role of these professionals is much broader." The authors mean that these professionals can engage in developing educational software and learning objects, as well as working in multidisciplinary teams within both formal and non-formal educational settings. Consequently, there is potential for professional entry into other work environments, which raises a red flag: the risk of losing qualified professionals capable of teaching Computer science across the various educational levels and modalities where subjects related to the field are offered. This situation is compounded by the limited availability of teaching positions within the PTE sector, a factor cited by graduates as a source of dissatisfaction regarding the educational level at which they were working. We discuss this aspect in greater detail in the following section.

Perspectives on teacher integration into PTE

In the previous section, graduates who were dissatisfied or only slightly satisfied with the level of education at which they were teaching cited the lack of opportunities to work in Professional and Technological Education (PTE) as one of the reasons. This implies that, up to that point, there was frustration regarding their failure to enter the PTE sector, which perhaps represented an unrealized life goal, influencing their professional practice at the time the research was conducted. This issue is linked to the question posed to the group regarding their prospects for a teaching career in PTE, with the following response options: *excellent, good, fair, discouraging, and unable to assess*. The group was divided. Two respondents considered the prospects excellent, two others viewed them as discouraging, and one respondent selected the good option.

For those who viewed the prospects for professional integration as excellent or good, the reasons cited pointed to the presence of technology in everyday social life as a trend driving investment in digital education. As one graduate stated: "Skilled people are needed to instruct individuals on its use and creation."

This view is reinforced by França & Tedesco (2015), who see the inclusion of technology in schools to develop computational thinking, noting that Computer Science graduates have contributed significantly to this task. According to the authors:

> Interest in the dissemination of computational thinking within the school environment is growing, involving researchers and educators from various countries, including Brazil. [...] [Thus,] teaching computational thinking in Brazilian basic education will require the training of specialized teachers to work in schools (França & Tedesco, 2015, pp. 1465–1467).

Therefore, teaching in the field of computing is not merely about "[...] understanding the machine, but also about creating computational thinking" (Wing, 2006, cited in Matos, 2013, p. 27), a task that requires teachers with excellent theoretical, didactic, and pedagogical training.

Graduates who expressed a *discouraging* view were unanimous in pointing out the lack of market opportunities for those with teaching degrees. When asked the reason for their failure to enter the field of Professional and Technological Education (PTE), the lack of opportunities in the area once again emerged.

This issue in Professional and Technical Education (PTE) has persisted for a long time. One possible explanation is the lack of specific teacher education for this educational modality. As a result, it has become an open field for professionals who hold bachelor's degrees. The entry of these professionals is limited by the differences in teaching roles between basic education stages, specifically elementary and high school, and PTE. A brief analysis of schools in Brazil shows the following: out of a total of 6,410 institutions dedicated exclusively to Integrated Secondary-Level

Technical Professional Education, 1,388 are state-run, 542 are federal, and 184 are private, according to the 2019 Basic Education School Census (Brazil, 2020). In the state of Bahia, where this research is focused, there are a total of 409 establishments, which include 31 in the federal network, 161 in the state network, and 27 in the private network.

The total number of basic education institutions, encompassing both elementary and high school levels, reveals a vast disparity compared to Professional and Technological Education (PTE), where the number of institutions is vastly smaller. A cursory analysis shows that the 16,682 basic education institutions offering elementary and high school education far outnumber PTE institutions. This institutional gap roughly mirrors the disparity in enrollment figures for the sector. The 2019 School Census (Brazil, 2020) reports a total of 47,382,074 basic education enrollments across various educational stages and modalities. Of this total, only 2,152,506 enrollments are in professional and technological education nationwide. Focusing on the state of Bahia, the Technical Summary for the State of Bahia (Brazil, 2019) indicates that total enrollment in professional education grew by 28.7% between 2017 and 2021, reaching 158,562 students. While significant, this figure remains low when compared to the number of institutions, enrollments, and, consequently, teaching positions associated with elementary and high school education.

These figures indicate that teaching roles have generally more opportunities within Basic Education than in Professional and Technological Education (PTE). Basic Education, specifically Elementary Education, is a mandatory offering, while PTE is viewed as a highly strategic sector for the country's economic and social development. However, the reality is that PTE remains in a state of sluggish growth, resulting, directly or indirectly, in low absorption rates for teachers graduating from programs such as the CS.

It is important to emphasize that Professional and Technological Education (PTE) is a national development project initiative aimed at establishing sovereignty, sustainability, and inclusiveness. PTE must not only adapt to the evolving demands of the job market but also contribute to improving the educational levels of workers. Thus, a broader understanding of PTE reveals that this modality encompasses educational and investigative processes for generating and adapting technical and technological solutions, processes of fundamental importance for national development and for meeting social and regional demands. This, in turn, requires a workforce of educators with qualification standards suited to the current complexity of the world of work (Machado, 2008). In this context, regulating the teaching profession in this field is an urgent policy decision.

Selection processes for teaching positions in Professional and Technological Education (EPT) lack regulations that prioritize licensed professionals, especially where specialized training programs exist, such as the CS degree, while treating the hiring of professionals with pedagogical training as a secondary option. A policy decision of this nature would increase the intake of qualified teaching professionals in the field and reduce the presence of unlicensed staff, significantly enhancing the quality of training for future technicians. As Machado (2008, p. 14) points out:

> To build the workforce required by the technological dynamics spreading worldwide, a [...] teacher profile is needed, one capable of developing pedagogies for independent and creative work, fostering students' progressive autonomy, and participating in interdisciplinary projects.

It is important to highlight that the landscape for entering the field of Professional and Technological Education (PTE) is characterized by a shortage of public civil service examinations for school systems, which restricts the hiring of graduates from teacher education programs in the area. Our research found that in the State of Bahia, hiring processes generally take place under the Special Administrative Law Regime (REDA-*Regime Especial de Direito Administrativo*). This hiring mechanism was established by specific state legislation (Law 6,403 of May 20, 1992) designed to regulate and meet the demand for fixed-term personnel based on temporary needs of exceptional public interest.

REDA contracts are valid for two years and can be, and commonly are, renewed for another two. A quick search of the Bahia State Government's education portal reveals recruitment processes for secondary-level technical professional education held in 2015, 2016, 2017, and 2022. Given the intervals between these selection rounds, the hiring of new teachers under this model may occur only every four years, yet the provision of secondary-level technical vocational courses remains consistent. This implies that other professionals, possibly those without teaching certification, take on teaching roles in this field, perpetuating the history of uncertified professionals in technical professional education and reinforcing a policy that lacks teacher education for this educational modality.

Final considerations

The research data analyzed in this article reveal a complex situation regarding the professional entry of teachers who graduated from the SC program. The findings indicate a set of unique professional dilemmas and challenges. Their entry was not into the field of Professional and Technological Education (PTE), and they expected to teach in other areas of basic education, such as the early and final years of elementary and middle school. Although these graduates did enter the teaching profession, the process was marked by difficulties. There were limited teaching positions available for this specific type of qualification, given the long-standing prevalence of IT professionals holding bachelor's degrees or technical diplomas working as teachers in this field.

Beyond the challenges of entering the teaching profession, participants reported dealing with disrespectful situations from a lack of understanding regarding the unique role of a Computer Science education graduate in K-12 schools. In other words, these graduates feel concerned by the lack of recognition of the distinctive value of their training in the education of children and adolescents at the elementary and high school levels. This lack of recognition is somewhat attributed to shortcomings in their initial teacher education, specifically in their ability to handle the demands of teaching in the field, due to inadequate training in subject-specific pedagogy.

We have found that this issue is strongly linked to perceptions expressed by our research participants, who point out the lack of pedagogical training among the teachers involved in their own education—a common occurrence in Professional and Technological Education (PTE). Graduates highlighted the need to consider recruitment strategies for teachers in degree programs for this educational track, prioritizing professionals with pedagogical training and experience in teacher education. This presents a challenge for Federal Institutes regarding investment in in-service professional development policies for their teacher educators, ensuring they possess the pedagogical knowledge required to teach in these programs.

The context of professional entry for graduates of the Computer Science degree program shares similarities with teachers in other fields and/or educational levels, such as inadequate material working conditions, remuneration disproportionate to the social responsibility of the teaching profession, unattractive career paths, and precarious employment contracts. However, we believe that additional factors make the entry into and practice of the teaching profession even more difficult and complex for these graduates, particularly when considering the lack of instructional materials for the field of computing, such as textbooks for teaching the subject matter, and the competition with other professionals for the few available positions in the labor market.

This entire scenario places the CS degree on the same level as other teacher education programs regarding their lack of appeal. This issue is particularly concerning within the context of Professional and Technological Education (PTE), given the growth of secondary-level technical professional training courses in Brazil, whether integrated, subsequent, part of Youth and Adult Education (EJA), or in the form of continuing or technological education. This expansion is driven by the need to meet productive sector demands through the training of specialized workers (Castro & Vilarim; Vilarim, 2013; Matos, 2013).

Computer Science graduates play a crucial role in national development projects by helping to upskill the workforce. This enhancement improves the quality of work performed by companies, resulting in benefits that ultimately return to society. Excluding these graduates from the context of Professional and Technological Education (PTE) undermines a national vision that relies on workforce training as a key driver of development.

We believe the State must develop policies regulating the practice of teaching in Professional and Technological Education (PTE), a field currently shaped almost exclusively by the interests of the production sector and the hiring practices of private schools. These sectors are generally averse to the legal frameworks governing teacher education and professional practice within education systems. It is imperative and urgent, at the very least, to enforce the provisions of Law 9.394/96 (LDB) regarding the requirement of higher-education-level pedagogical training as a prerequisite for teaching in Basic Education. Otherwise, the selection of teachers will continue to be driven by the logic of notorious knowledge or the maxim that *knowing how to perform a task equates to the ability to teach it*.

Research data indicate an urgent need to deepen the political-pedagogical debate on teacher education and work in the Professional and Technological Education (PTE) field, including within the pedagogical community. It is

necessary to reverse the historical pattern of neglect regarding teacher education for this educational modality. Establishing a training policy for the field is essential, particularly within the context of the Federal Institutes, which have a tradition of offering this type of education and have consistently, albeit modestly, provided teacher education for PTE.

We believe that the professional entry of CS graduates into teaching relies on comprehensive political action across several areas. This includes a state policy dedicated to monitoring graduates within education systems, policies regulating the practice of teaching in Professional and Technological Education (PTE), prioritizing the hiring of qualified teaching professionals, enhancing initial teacher education programs, and developing initiatives to improve the pedagogical training of teacher educators and, last but not least, the institutionalization of professional induction policies to foster the full professional development of novice teachers, strengthening their ties to the profession and career. We view the opening of these avenues of action as essential to making the teaching career, especially in PTE, more attractive, rewarding, and socially respected, while simultaneously mitigating rates of professional rejection and career attrition.

Thus, we consider that our research findings, presented here in an updated form compared to the initial report, can contribute both to the theoretical and practical expansion of the field of teacher education for Professional and Technological Education (PTE) and to the development of policies regarding teaching within this modality.

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