Research Article

Digital skills shortages and curricula options in Brazilian PhD programs in education

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ABSTRACT

This study aims at presenting data and analyzing the technological training of university professors in Education, which are professors' mandatory education teachers. Our aim here is to demonstrate and evaluate the curricular structures of training programs for Brazilian university professors primarily based on digital skills and their connection to educational policies to encourage the incorporation of digital technologies in mandatory education. Data were collected from Brazilian public PhD programs in Education higher education and extensive documentary research was performed. The results demonstrated that technological training in the investigated PhD programs in Education is incipient, both in terms of specific training (subjects or topic-oriented) and general training involving knowledge of digital technologies.
Keywords: educational policies and digital skills; PhD programs in education; teacher training; digital technologies; graduate program curriculum

1. Introduction

This article presents the findings of a research project titled "Digital technologies, university teaching, and teacher training: effectiveness of Brazilian educational policies." The research was financed by Brazilian institutions: Fundação de Amparo à Pesquisa do Estado de Minas Gerais (FAPEMIG), Fundação Coordenação de Aperfeiçoamento de Pessoal de Ensino Superior (CAPES) and the National Council for Scientific and Technological Development (CNPq). The motivation behind the research was the lack of available data on the extent of digital technology training for university professors in PhD-level courses in Brazil.

The impact of digital advancements on society is widely discussed across multiple fields, highlighting the significance of technological transformations in areas such as production, income generation, and social relations. Additionally, the incorporation of digital technologies in formal education is increasingly important in today's world.

As a crucial institution for both preserving tradition and preparing individuals for contemporary social participation, reflecting on the integration of digital technologies in educational spaces is essential. In the 1970s, researcher Seymour Papert conducted studies on the inclusion of digital technology training in schools. His findings underscored the importance of considering the school as a place of transformation, where historical and societal changes are incorporated into the training of both teachers and students[1].

The school serves as a unique space that must balance tradition and innovation. Digital technologies bring with them a level of instability and rapid change, yet the school must also acknowledge and value long-established practices, teaching methods, and didactics.

This research aimed to investigate how the internal policies of graduate education programs at Brazilian public universities, as reflected in curricular definitions and internal discussions recorded in meeting minutes, demonstrate a lack of attention to the inclusion of digital technology training for future teachers.

These skills are essential for the productive sectors and for understanding the cultural changes that can influence political positions and ultimately the strength or weakness of democratic educational models. The Brazilian guidelines suggest that technologies should be integrated with other curriculum components, yet there is significant resistance to this, which leads to only 3% of initial teacher training programs providing adequate digital skills training to teachers[2].

Furthermore, Brazilian guidelines present deficiencies in clearly defining adequate training in digital skills. The language used in the guidelines is vague and does not define what a "digital skill" is. This results in gaps or even non-existent training in teacher training courses.

Eucidio Pimenta Arruda[3] conducted research on behalf of UNESCO to examine how member countries of the Organization for Economic Co-operation and Development (OECD) are integrating digital technologies into the curriculum of compulsory education schools, with the goal of comparing this to the Brazilian context. The findings demonstrate that many nations have extended digital teacher training and revolutionized the education of young people[4]. These reveal a concern for making schools a venue for democratizing access and perhaps lowering inequities in access and use.

Within the OECD, there is also an emerging trend towards new educational paradigms related to ICT, such as computational thinking and digital skills. Computational thinking refers to the ideas and concepts from the field of information technology and computing[5]. This has led to an increase in policy documents from European countries that focus on digital skills related to programming, understanding algorithmic logic, software development, and problem-solving through the creation of computational solutions. Digital skills, on the other hand, are related to problem-solving, and include information and data literacy, digital content creation, communication and collaboration, safety, and problem-solving.

This trend towards computational thinking and digital skills is a departure from past emphasis on technical knowledge in ICT, which focused on developing technical uses such as text editing, web browsing, document analysis, performing calculations using spreadsheets, and using digital maps. This earlier emphasis was primarily focused on consumption and access.

In Brazil, the Curricular Guidelines of 2019 and the Common National Curricular Base of 2018 prioritize technical knowledge in ICT[6]. This perspective prioritizes training young people for consumption and access rather than for the development and creation of computational solutions. While these documents address the importance of "critical, ethical, and transformative" training, the objectives and skills outlined do not specifically address the development of computational knowledge.

The main objective of this study is to investigate the curricular structures of the Brazilian doctorate program in Education that integrate digital technology as a transversal axis. These professionals, in Brazil, are mainly responsible for training teachers at undergraduate level.

Research questions:
● Does the training of university professors in digital skills demand greater attention in terms of curricular changes?

- What types of inclusion of digital skills are present in the curricular structures of PhD in Education courses?

Research hypotheses:

PhD courses in Brazil invest little time in technological training in terms of teaching and research. This can impact the low rates of training in digital technologies found in Brazilian undergraduate courses.

The presence of digital technology training in PhD courses is directly related to the initiatives of professors who work directly with or are part of research groups that conduct research in this area.

2. Literature review

The incorporation of educational policies and ICT in education is a crucial topic of discussion. G. Cifuentes emphasizes the importance of considering the political dimension when examining the use of technologies in teacher training processes and suggests a university reform to align the university closer with social, economic, and cultural issues[7]. Digital skills for teachers should aim to reduce inequalities in society, with technological knowledge becoming a prerequisite for contemporary inclusion[8].

In Brazil, there are few changes in the organization of teacher training courses regarding the inclusion of digital skills in curricula[9]. Both authors note that the training provided is inadequate, with a lack of depth and a focus on teaching teachers how to use equipment, despite the fact that 100% of teachers use ICT well outside of the school setting [10].

During the COVID-19 pandemic, these gaps were highlighted, as reports were observed across the country about the difficulty teachers had using digital technologies in their remote education practices [1].

Therefore, it is not about incorporating specific training in ICT or integrating it into other subjects of the course, but rather analyzing how ICT transforms the social, cultural, and economic relations of teachers and students. This allows us to think about the school's contributions to the training offered that enables students to position themselves in a "digital" world.

Young people with more privileged access to digital technologies have a broader experience in obtaining content or practical information (aimed at solving problems)[11]. This study also shows that the most less advantaged students have greater skills to read and interpret digital documents, which enhances their positioning in the world they live in.

It is important to reduce the differences between the most and less advantaged in technology access to promote professional and civic development in a digital world[12]. The great challenge is to shift the focus from basic operational skills to appropriation that involves more complex skills.

This is a paradigm in which the development of abilities that equip young people to position themselves socially, critically and flexibly in a technological environment becomes more essential than the diary usage of technology.

The expansion of equipment in the classroom or more intense usage by teachers does not guarantee improved outcomes in student assessment in the Program for International Student Assessment (PISA)[3]. The data also suggests that the nations with the best PISA indices are those with the shortest usage of digital technology inside and outside the classroom.

At the same time as nations such as Japan, South Korea, China and Germany have little policies for the use of digital technology in schools, they are also ones that have stood out most in worldwide scientific and computational advancement.

These results suggest that it is important to tackle this issue with greater complexity and probably more

time for investigation, testing and debates. However, technological revolutions make it impossible to acquire more precise and recurring data, due to the pace with which equipment and software decay or disappear in society.

Brazil's data generated from CGI (Comitê Gestor da Internet) shows more than 90% of young students have access to computers, tablets or smartphones. Almost 100% of teachers in all age groups also have access to the Internet, which demonstrates that the dimension of access is not the only issue to be considered when examining the incorporation of ICT in education.

3. Educational policies and digital technologies: Dimension of professor raining

In terms of digital skills in teacher training in Brazil, the initiatives tend to focus on continuing education rather than starting teacher education. Efforts to integrate technology into the initial teacher training curriculum at universities are inadequate for learning[13]. In Brazil, less than 1% of the teaching load in teacher preparation curriculum addressed digital skills[14].

Eucidio Arruda, in a study carried out 10 years after, achieved similar results, in addition to assessing that law and curricular guidelines addressed little or nothing about the need of building a critical student in connection to digital technologies[3].

Therefore, it may be extrapolated that the regulations for beginning training include nothing about digital skills beyond generalities, such as "citizen training," or required knowledge in the knowledge society. There are a wide range of laws and public resources for continuing education, which, as previously indicated, were formed via the formation of programs targeted at providing technical training for teachers.

Thus, we aim to identify possible gaps in teacher training that help understand the little impact on contemporary technological development and the current role of schools in society, particularly in becoming a space for criticism and knowledge construction about the ways that technologies have been or will be adopted.

The work of Rafaela Godinho conducts a comprehensive literature review about Brazil, which concludes that ICT in the initial and continuing education of teachers is predominantly treated as "innovation." However, the term innovation is not directly related to digital technologies, but to broader contexts, with little possibility of further exploration[15].

In terms of the international context, most of European countries are concerned with discussing ICT initiatives in compulsory education. However, there are many differences in how countries implement their policies. There is no consensus on when to start using ICT in compulsory education, ways to assess digital skills, whether the content is mandatory or not, and whether it is offered as a distinct subject or across other subjects[3].

To think about ICT in compulsory education is to recognize its historicity, that it relates to subjects, objects, and forms of appropriation. It is a complex object of study that cannot be understood without a deeper understanding of the relationships between policies, school culture, school subjects, and the development of digital technologies.

Dorit Maor and J Currie evaluated the probable contributions of employing TDIC in the process of advising doctorate and master's students, comprising eight supervisors (supervisors) and nine supervisees from the fields of teacher training, educational psychology and engineering education. Both supervisors and students had a high degree of technical proficiency and had already begun to integrate these tools into their supervisory process[16].

The study indicated that technology, when paired with participatory pedagogy, provide creative ways of forming research communities, providing students the chance to co-create knowledge.

Maria Reszka claims that both students and instructors are impacted by psychological suffering, with feelings like agony, anxiety, and frustration arising, and that permanent training spaces are important in the face of fast change and regulations for adopting the use of TDIC in institutions. Reszka tries to comprehend the changes that have happened in the connection between instructors and students in the face of digital technology[17].

This study adds to our reflections on the necessity of discussing the role of technologies in educational processes, considering the historicity and subjective issues outside of the technical order that arise from the insertion of technologies, their relationships with teaching professionalism, and the difficulties of creating forums for discussion and training that address current issues and gaps.

Given that many instructors indicate they first met the issue when they began teaching in higher education, our advice to broaden the discussions to the training given in postgraduate studies is in conformity with the necessity for structural and political readjustments.

What can be noticed in the literature reviewed is the emergence of a theme, whose data are imprecise and yet unstable from the point of view of being able to create solid findings that allow us to make conclusions about the use of digital technology in teacher training.

However, even if such statistics are unclear, we feel it necessary to comprehend the steps that PhD programs in education have made towards adding the technology component both in the training of university teachers and researchers at PhD level.

4. Methods

This work is based on Grounded Theory (GT), which originated in the studies of Glaser and Strauss in 1976 and aims to validate qualitative research as an appropriate and specific method to generate or verify a theory. We use the perspective presented that argues data and theories are constructed through our involvement and interactions with people, perspectives, and research practices, both past and present[17]. The author suggests that her approach offers an interpretive portrayal of the study's subject matter, rather than a faithful representation of it, therefore the meanings and expressions of the research participants are constructions of reality.

Although GT methods are based on examining data as a basis for formulating theories that are capable of explaining or understanding social problems. They also make significant contributions to research that aims to establish a conceptual order, that is, a high-level description as a way to generate knowledge, arrive at a set of results, and make contributions to the topic being studied, this is the case in this research[18].

The alignment between the theoretical framework, the research subject, and the objectives, allowed us to clarify the research process and outline the research trajectory that intertwines the literature review with the collection and analysis of data. This process led u to the following research steps:

Mapping of PhD programs in Education in Brazil: Extensive research on the Brazilian National Postgraduate System (SNPG) was conducted by the researcher, which is organized by the Coordination for the Improvement of Higher Education Personnel (CAPES), the main regulatory body for postgraduate studies in Brazil. At this stage, 76 PhD programs in education were identified.

Selection and data collection of programs: gathering information from webpages of the programs about the following elements: program regulations, course pedagogical project, curricular proposal, subject menus,

lines of research, and teaching links.

To achieve the research objective, we utilized several keywords to identify the incorporation of discussions on digital technologies in the formation of PhD students in Education, such as: digital information and communication technologies, information and communication technologies, technologies, cyberculture, media, hybrid learning, distance education, and pedagogical innovations.

5. Discussions

Dimension of digital technologies in educational graduate programs in Brazil.

Once the necessary preparations were completed, searching for relevant documents was proceeded. then the web pages of all 76 PhD programs in education in Brazil were accessed, 70% of the educational program from public institutions and 30% from private institutions, as we can see in the **Figure 1**.
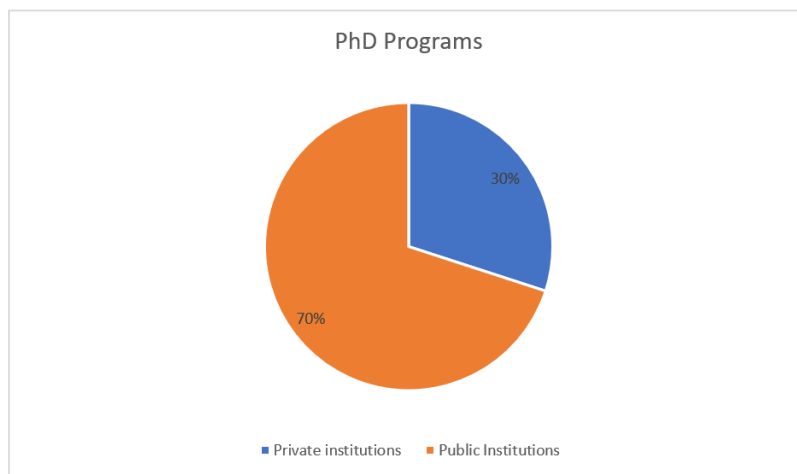

Figure 1. PhD programs in Brazil

39 PhD in Education programs (51% of the total) are in the wealthiest region of Brazil, the Southeast region, which includes the states of São Paulo, Rio de Janeiro, Minas Gerais, and Espirito Santo as we can see in the **Figures 2** and **3**. This is also the region that receives the most public funding for graduate studies, has the largest number of public higher education institutions, and accounts for approximately 64% of all PhDs graduated in Brazil.
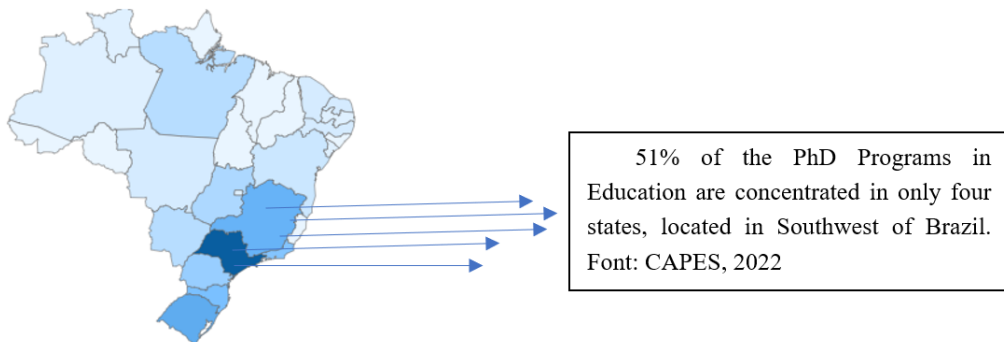

Figure 2. Distribution of PhD programs in Education by states in Brazil.
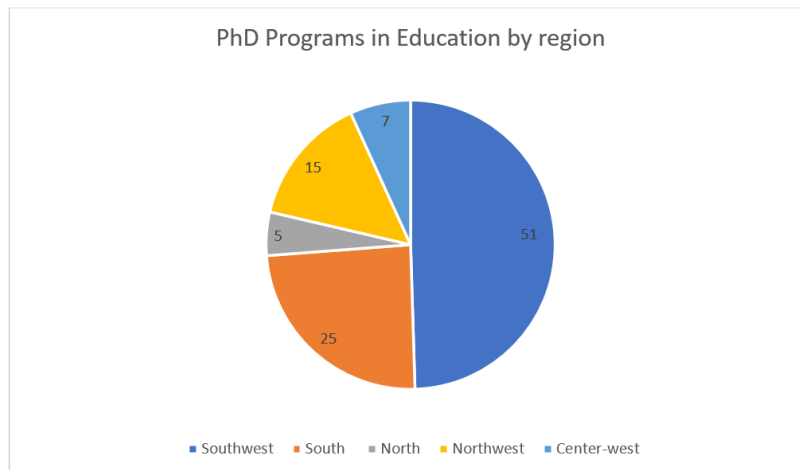
Figure 3. PhD programs. Elaborated by the author.

Based on these preliminary data, we turned to the analysis of educational portals for PhD in Education programs, which are understood as hypermedia used as a means of presenting and retrieving information and must always be updated and prioritize the quality of their content.

During the general mapping of the 76 programs, whose addresses were provided on the CAPES platform, we encountered several obstacles arising from the organization of these educational portals that made it difficult or even, in some cases, prevented access to the necessary information. Examples include outdated addresses provided by the program on the CAPES platform, broken links, or links that did not lead to the intended information, poorly arranged information, menus with various terminologies used for the same information, incomplete and outdated information, among others.

We were able to obtain, irregularly, access to minutes of program meetings and resolutions. Also, it is possible to detect a lack of information about the curricular programs of most of the PhD Programs.

Data synthesis:

26% of 20 PhD programs have meeting minutes posted on their web pages, which are irregularly published (**Figure 4**).
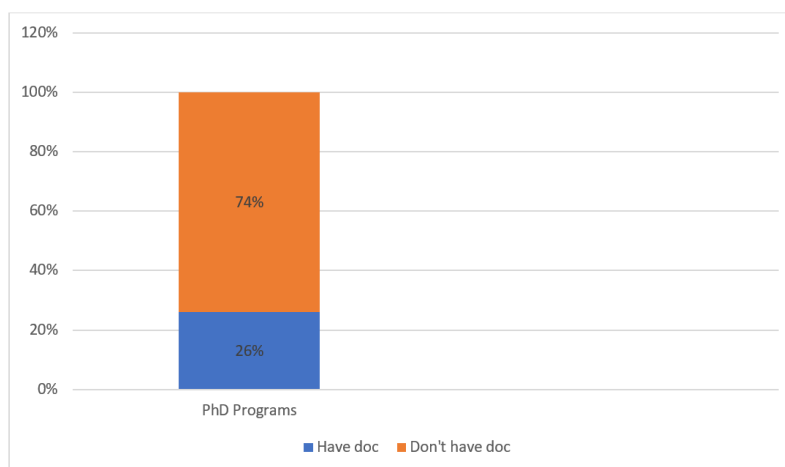

Figure 4. Documentation about PhD program in Education. 2019.

56 programs have an updated curriculum structure that only includes the names of the subjects, without additional information (**Figure 5**).
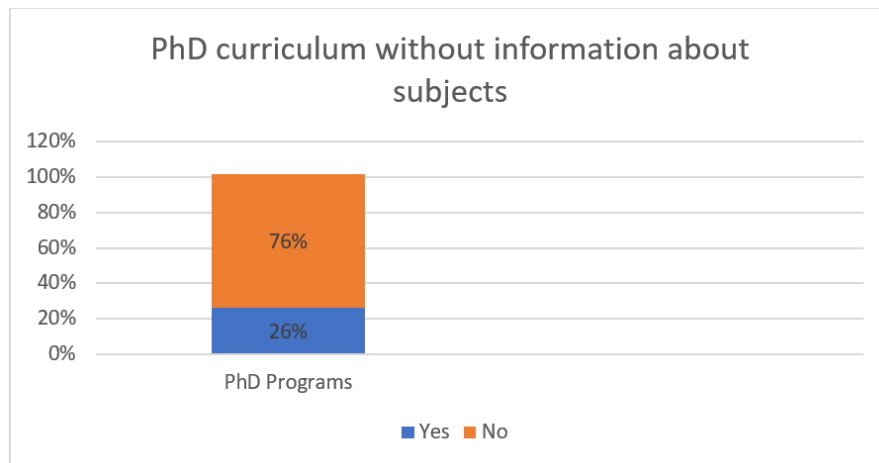
Figure 5. PhD program and curriculum. 2019.

All programs have research lines in technology, but it is impossible to determine the frequency of updates to the menus posted on their websites.

It is important to note that the information present on an educational portal can be diverse. As such, we focused on specific items that helped us map and characterize the programs, and primarily locate the curricular matrix, including the course menu, workload, characteristics of curricular components, and bibliographic references.

Through these official websites of the higher education institutions, we searched for public archive documents containing curricular information, matrices, or Pedagogical Political Projects (PPP). We used keywords such as technology, ICT, cyberculture, digital media, pedagogical innovations, hybrid learning, virtual learning environments, and digital culture.

These documents allowed us to survey the number of curricular components that discuss technology-mediated education offered in each program, and classify them as mandatory, elective, or optional. Additionally, we were able to locate menus and bibliographies when available.

The goal of our research was not simply to identify subjects that relate to digital technology, but rather to examine how digital technology is problematized throughout the training proposals of the analysed courses. In the documentation we searched for inferences, indications, problematizations, and any other elements that demonstrate a concern for the technological training of the PhD students in education, both in the teaching and researcher dimensions, as they cannot be thought of separately.

Among the curricular matrices we located, around eight were organized using acronyms and nomenclatures specific to the higher education institutions, and were only available on academic pages with specific denominations. We were able to locate these matrices due to our experience working in this pedagogical area at a federal university. In seven programs, we found information on curricular components through the specific academic calendars of the research period.

Out of the 76 PhD program in Education programs registered with CAPES, we were able to find evidence of ICT training in 35 programs, with 106 subjects, as shown in the **Figure 6**:
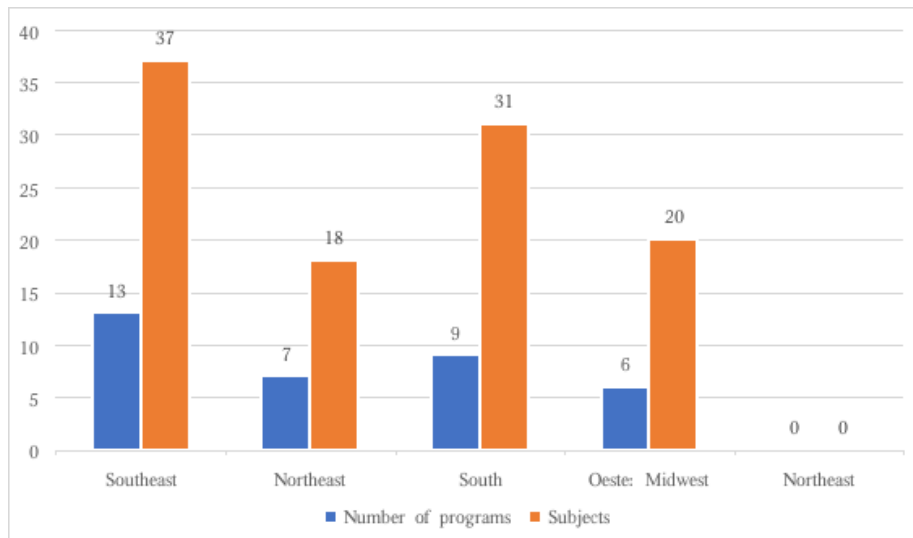
Figure 6. PhD Programs in Education with evidence of technological training. 2019.

Our research found that about 70% of subjects in postgraduate programs in Education had incomplete information, lacking descriptions of the curriculum, bibliographic references, or information on whether the subject was mandatory or elective. Additionally, we found that most curricular components were not mandatory, suggesting that they reach a limited number of students.

During our analysis of the official websites of Higher Education Institutions (HEIs), we encountered difficulties in locating and accessing relevant information, due to a lack of updating, unclear organization of information, and missing data. These challenges underscored the importance of HEIs improving the quality and accessibility of their online repositories.

Our hypothesis that digital technologies are closely linked to the initiatives of professors working directly with these technologies or in research groups focused on this area is supported by further analysis that showed that 46.2% of curricular components were directly linked to the research lines of professors working with digital technologies.

The process of coding in grounded theory (GT) is divided into two main phases. The first phase involves identifying and naming each individual data point, such as a word, sentence, or segment of information. The second phase is more focused and selective, using the most significant or frequently occurring codes to classify, synthesize, and organize the large amount of data collected.

In this study, we utilized GT technique to evaluate the curricular components of PhD programs in Education. We studied through the menus of each component line by line, seeking for analytical concepts that would help us comprehend the existing attitudes and methods towards technology-mediated education. Unlike standard quantitative approaches that apply pre-determined categories or codes to data, GT methodology depends on identifying patterns and themes in the data to generate codes.

From a quantitative standpoint, less than half of the tabulated courses were determined to be concerned with the technological training of students, since they offered subjects in this area. However, the difficulties facing society today demand individuals who can comprehend and negotiate an unstable and continuously changing environment, where digital technologies play a fundamental role in social, economic, and cultural upheavals. It is also crucial that researchers acquire training in technology so that they have the skills and information necessary to comprehend the function of technology in their profession and in higher education.

The initial analysis presents intriguing data, with discussions on technology present in nearly half of the

courses. However, a closer examination reveals fewer promising results. Out of the total number of subjects found (106), only two were mandatory, as we can see in **Figure 7**. Unlike undergraduate courses where students follow a set curriculum, postgraduate courses allow students to tailor their education to their specific research interests.
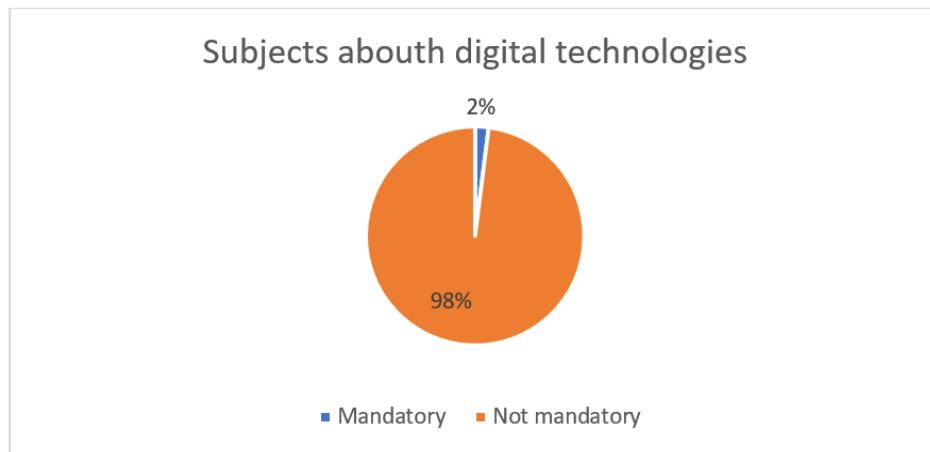

Figure 7. Mandatory subjects about digital technologies in curriculum of PhD Programs.

This means that technological training is present in courses where there are research lines that focus on digital technologies. The only institution where mandatory subjects with this theme were found also had a research line focused on this area.

One possible explanation for this is that technological training is less a result of a professional training policy and more a result of individual and collective initiatives of professors. In other words, technological training is linked to the capacity and initiative of professors in PhD courses to create research lines and specific disciplines in this area.

It is worth noting that all courses where disciplines were linked to ICT also had research lines in the same area. Understanding the training policy of graduate programs requires considering the development of a training path that the collective of professors in the program deems essential for professional development of graduates.

The initial analysis of the data revealed that while digital technology is present in almost half of the courses, many of the subjects are not mandatory. This suggests that students are not required to take classes related to digital technology in their postgraduate education. Furthermore, the lack of availability of subject menus and bibliographic references raises concerns about the transparency and dissemination of information by the institutions.

Upon further analysis, it was found that most subjects related to digital technology are linked to the research lines of professors who work in that field, rather than being a part of the formal training curriculum. This suggests that the incorporation of digital technology in postgraduate education is driven more by individual and collective initiatives of professors, rather than a comprehensive training policy.

Additionally, it was found that compulsory subjects, except for the two previously mentioned, do not address the use of technology in the training of researchers and university professors. This highlights the need for a more comprehensive approach to incorporating digital technology in postgraduate education.

It is important for institutions to improve their dissemination of information by making subject menus and bibliographic references readily available, in order to provide society with a better understanding of the

training of scientists and to offer more informed choices for students. Furthermore, it is crucial for institutions to review their training policies and consider incorporating digital technology as a mandatory aspect of postgraduate education.

We found that, on average, each program had only two compulsory subjects that were related to our research objective. The other subjects were generic and varied in nomenclature, making it difficult to compare them.

From a quantitative perspective, all programs offered subjects on research methodologies, while 90% of the courses offered subjects on concepts in education.

It is important to note that the consistency of similar themes in compulsory subjects can help us identify similarities in the training objectives and possibly the guidelines of the regulatory body (CAPES) for graduates.

Our research objective is to understand the relationship between these disciplines and technological training that goes beyond the teaching aspect and is linked to all contemporary scientific production.

Today, virtually all actions of scientists require digital skills to participate in funding processes, publications in journals, and international scientific cooperation. In the field of scientific analysis, numerous instruments and procedures have emerged that allow the development of research through the use and appropriation of software, hardware, and digital applications. With clear analytical facilitation, these tools bring with them the need to understand their scope and impact on scientific production results.

It is believed that training in information and communication technology (ICT) is crucial for educators to effectively address current societal issues. This training extends beyond the scope of just schools and encompasses all aspects of higher education, including research, outreach, and management. Therefore, it is important for discussions about digital technologies to be included in training programs, either through specific disciplines or through a focus on the topic across various disciplines. This will help to produce graduates who are equipped to engage critically with technological developments. Based on our analysis of available course materials, it appears that there is currently a lack of courses that specifically address digital technologies in their training objectives for graduates. In summary, our findings indicate a lack of substantial curricular changes aimed at developing digital competencies among university professors.

The data collected raises concerns about the objectives of Brazilian postgraduate programs. These programs are intended to produce highly skilled professionals who possess intellectual independence and can contribute to the scientific, technological, economic, and social progress of Brazil. However, if fundamental elements such as ICT are not included in their training, it can be inferred that there are significant deficiencies in the education of Brazilian PhD of Education graduates.

This highlights the extent of the gap in the technological training of university professors, as the data collected suggests that the training of professionals at the PhD level in the field of education is at a critical juncture in terms of recognizing the significance of technological development in the academic training of these professionals.

Failing to prioritize the technological dimension in training processes can result in strategic errors that not only affect the education of teachers at other levels, but also the entire field of education research.

The data obtained from this research provides a foundation for ongoing efforts to improve postgraduate education in terms of academic excellence and the professional development of university professors, who must be attuned to the needs and demands of Brazilian higher education.

6. Conclusions

There is an increasing emphasis on technology education considering contemporary economic, political, and social trends. However, research at a worldwide level reveal that schools' opinions on how to tackle this are still immature. When they do exist, they tend to focus more on technical elements, such as the utilization of software and hardware, rather than on professional, social, and political ramifications. One of the key faults may be the ongoing search for linkages between technology and advances in school indices, which recent study has not shown and is not the primary purpose of schools.

Digital technology can generate autonomous, thoughtful, and critical decision-making that influences every area of existence. Therefore, schools' approach to technology education should be matched with this paradigm, which promotes transformations above technical advancements. The former can be learnt and encourage teaching and student roles, whereas the latter will always produce a sense of obsolescence, as it functions in a continuously changing world of software and hardware.

In this sense, the present research aimed to understand how training courses for educators, specifically PhD program in Education courses, reflect or imply pedagogical practices related to the technological dimensions of knowledge production and to understand the potential connections between gaps in basic education, as taught by educators at this level, and gaps in higher education, as seen in the quality, excellence, and contemporaneity of academic and school knowledge production.

The classification of the study corpus reveals distinct notions and approaches to technology. While it is encouraging to see these discussions present in curricula, the gap in training for developing digital skills persists, not due to the absence of discussions about technologies, but to how curricula are organized with mostly nonmandatory components, which do not allow for universal access for graduates.

The classification of data also showed diverse approaches in curricular components, including theoretical and conceptual elements and technical and/or practical dimensions. The prevalence of theoretical-conceptual thoughts on ICT, its linkages with education, curriculum, and its influence on society were detected in all investigated programs and most curricular components. Therefore, it is proposed that starting with conceptual foundations can serve as a framework for developing other aspects, by combining debates on the conceptual and practical foundations of technologies and articulating them with other curricular materials.

We argue for explicitly outlining which indications or descriptors of digital competence need to be gained and in which contexts they might be developed along the training course. As such, the development of digital competence should not be relegated to elective or optional curricular components, but rather be incorporated as a training axis that includes diverse curricular components with new learning choices.

The data demonstrated that there is still much work to be done, since programs do not have a technological foundation, except in circumstances where there are research lines relevant to this sector. Even in these circumstances, technical training is generally seen as an individual initiative rather than a training policy of the graduate program. This is proven by data that show that fewer than 50% of programs offer any form of ICT training through topics, and that practically all institutions offer it through elective or optional activities.

Concern about the scant evidence of technological integration in curriculum documents and the predominance of the instructional dimension—often mentioned in relation to the structure and working methods for teachers in training—are recurring themes in the works. The instructional dimension is also infrequently found as one of the intended learning outcomes.

Knowing that there are opposing viewpoints on education and technology is reassuring, and Linda Castañeda and Neil Selwyn's survey of the International Journal of Educational in Teaching Superior highlights

how developing students' and teachers' information-use skills has been a recurrent theme in recent studies.

The survey demonstrates, from a gap viewpoint, that academic products directed at the integration of technologies in higher education fail to problematize how they are inserted in the PhD curricula and how they affect the quality of the training provided in these programs. This has an impact on professionals who plan and design educational policies, initiatives, and programs, as well as professors who teach in higher education[19].

It is obvious that there is a lack in the knowledge of the function of digital technology among university professors and education researchers in their work and practices, as well as in the learning of students. This lack of understanding can be ascribed to the poor training offered in these areas. To solve this issue, it is vital to re-evaluate and update the training strategies of these programs, with an emphasis on forging a tighter link between technological growth, the advancement of research, and university-level education.

Furthermore, it is necessary to have a critical viewpoint towards technology, rather than rejecting it completely. This may be done by bringing technology into academic discourse and undertaking extensive analysis and evaluation, which will allow for the formation of alternative views and eventually lead to the realization of substantial societal objectives.

Conflict of interest

The author declares no conflict of interest.

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