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Connecting knowledge in teacher education: the curricularization of digital technologies in computer science teaching

Conectando saberes na formação docente: a curricularização das tecnologias digitais no ensino de computação

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ABSTRACT

This article examines the importance of integrating extension projects into the curriculum, focusing on the project 'Computing Education and Teacher Training: Connecting Knowledge' at the Federal University of Paraná (UFPR). This project aims to strengthen the training of computer science teachers by incorporating digital technologies into the curriculum. We discuss the historical and legislative context of curriculum integration, highlighting the guidelines of the Pedagogical Project of the Computer Science Degree Program at UFPR. We explore the innovative objectives and methodologies of the project, as well as the challenges and opportunities of integrating digital technologies into education. We emphasize innovative pedagogical strategies as essential tools for meaningful and engaging learning. We underscore the importance of empowering teachers to tackle the challenges of the 21st century, contributing to a promising future in computer education.

Keywords: Curricularization. Digital technologies. Teacher training.

RESUMO

Este artigo analisa a importância da curricularização de projetos de extensão, com foco no projeto "Educação em Computação e Formação Docente: Conectando Saberes" da Universidade Federal do Paraná (UFPR). Este projeto visa fortalecer a formação de professores de computação ao incorporar tecnologias digitais no currículo. Abordamos o contexto histórico e legislativo da curricularização, destacando as diretrizes do Projeto Pedagógico do Curso (PPC) da Licenciatura em Computação da UFPR. Exploramos os objetivos e metodologias inovadoras do projeto, assim como os desafios e oportunidades da integração das tecnologias digitais na educação. Destacamos as estratégias pedagógicas inovadoras como ferramentas essenciais para um aprendizado significativo e engajador. Enfatizamos a importância de capacitar os professores para enfrentar os desafios do século XXI, contribuindo para um futuro promissor na educação em computação.

Palavras-chave: Curricularização.Tecnologias digitais.Formação docente.

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INTRODUCTION

In contemporary computer education, the integration of digital technologies has emerged as a pressing need. In this dynamic scenario, teacher training stands out as a crucial component in ensuring the effective incorporation of these technologies into the educational process. Rapid technological evolution has triggered profound transformations in society, exerting a direct influence on education, particularly in the field of computing. In this constantly changing context, it is essential to rethink pedagogical approaches and effectively integrate digital technologies into the context of teaching and learning (BOCCONI, 2018).

This article aims to examine the importance of incorporating extension projects into the curriculum, with emphasis on the project entitled “Computer Education and Teacher Training: Connecting Knowledge” within the undergraduate degree program in Computer Science at the Federal University of Paraná (UFPR). This project represents an innovative initiative that aims to strengthen the training of computer science teachers by incorporating digital technologies into the curriculum. Its purpose is not limited to introducing such technologies into the curriculum structure, but also to developing pedagogical skills for their effective application in the school environment.

In the following topics, we will begin a detailed analysis of the integration of digital technologies in computer science education. First, we will examine the historical context of this curricularization, followed by an immersion in the national legislation that governs it. Subsequently, we will specifically address the legislation that deals with curricularization at the Federal University of Paraná (UFPR). In addition, we will provide an overview of the guidelines of the Pedagogical Course Project (PPC) for the Bachelor's Degree in Computer Science. Finally, we will explore the innovative objectives and methodologies that guide the project “Computer Science Education and Teacher Training: Connecting Knowledge.”

With a magnifying glass in hand, we will analyze the challenges and opportunities that this integration offers, unveiling the transformative potential of digital technologies in education. Carefully crafted innovative pedagogical strategies will be presented as essential tools for building meaningful and engaging learning.

Throughout this journey, we will reflect on the importance of rethinking computer science education and the need to empower teachers to face the challenges of the 21st century. With this work, we seek to contribute to building a promising future for computer science education, where technology is intertwined with knowledge and teacher training becomes the key to our students' success.

BRIEF CONTEXTUALIZATION OF THE CURRICULARIZATION OF EXTENSION IN HIGHER EDUCATION COURSES

Extension in Brazilian Higher Education is an activity integrated into the curriculum and research organization, constituting an interdisciplinary and political-educational process. It promotes interaction between higher education institutions and society, applying knowledge in conjunction with teaching and research (BRAZIL, 2018; ARANTES, et al, 2023).

According to Resolution No. 7, dated December 18, 2018, the guidelines for extension in Higher Education are structured based on the following principles: i) dialogical interaction between the academic community and society, exchanging knowledge and participating in complex issues present in the social context; ii) citizen training of students, experiencing their knowledge in an interprofessional and interdisciplinary way, integrated into the curriculum; iii) production of changes in higher education institutions and society, building and applying knowledge, in addition to other academic and social activities; and iv) articulation between teaching, extension, and research, in a unique and interdisciplinary pedagogical process (BRAZIL, 2018).

In this context, national legislation guides the formulation and practice of extension guidelines in undergraduate courses, incorporating them as integral elements of the curriculum, in accordance with the student training objectives outlined in the Institutional Development Plans (PDIs) and Institutional Political Projects (PPIs) of educational institutions. These initiatives are shaped in line with the graduate profile described in the Course Pedagogical Projects (PPCs) and other relevant regulations, with a broad and engaged approach to university extension that transcends the mere transmission of academic knowledge (Brazil, 2018), as follows:

- **Contribution to the comprehensive education of students:** extension programs aim not only to communicate knowledge, but also to cultivate skills and attitudes that enable students to become critical and responsible citizens, prepared to face the challenges of society;
- **Constructive and transformative dialogue with different sector of society:** by establishing open and productive dialogue with different segments of society, extension promotes the exchange of experiences and perspectives, enriching the educational process and contributing to the construction of a more inclusive and diverse society;

- **Promotion of social initiatives:** higher education institutions are encouraged to become actively involved in issues of social relevance, such as communication, culture, human rights, the environment, health, technology, and labor, demonstrating their commitment to the well-being and development of the community;
- **Ethical reflection on the social dimension of teaching and research:** university extension encourages critical reflection on the ethical implications of the knowledge produced and disseminated by academia, ensuring that scientific progress is aligned with ethical and social values;
- **Encouraging the academic community to address social issues:** higher education institutions are encouraged to mobilize resources and knowledge for the economic, social, and cultural development of society, actively collaborating to solve problems and promote collective well-being;
- **Support for ethical principles:** university extension programs must be guided by ethical principles that reflect the social commitment of higher education institutions, ensuring that all activities carried out are in accordance with moral and social values.

Thus, extension activities are not only aimed at generating academic knowledge, but also at its practical application in solving social issues, promoting the sustainable and equitable development of Brazilian society (FÉLIX; COELHO, 2024).

Extension activities must represent at least 10% (ten percent) of the total course load of undergraduate programs and must be incorporated into their respective curricular structures (BRAZIL, 2018).

CURRICULARIZATION IN THE CONTEXT OF UFPR

At UFPR, curricularization was established in 2020 by the Teaching, Research, and Extension Council (CEPE) through Resolution No. 86/2020-CEPE. This measure is supported by the Federal Constitution of 1988, the Guidelines and Bases for National Education, the National Education Plan Law (PNE), the Guidelines for Extension in Brazilian Higher Education, the UN Sustainable Development Goals, the National Curriculum Guidelines for Initial Teacher Training, the UFPR Institutional Development Plan, the standardization of extension activities at the university, and the

need to regulate the accreditation of extension activities in the curricula of UFPR undergraduate courses (BRASIL, 2019a).

This resolution establishes Extension Curriculum Activities (ACE) as mandatory components of UFPR's PPCs, representing 10% of the total course load. The objective is to emphasize the importance of extension activities in promoting the inseparability of teaching, research, and extension at the university.

According to the guidelines established in Resolution MEC/CNE/CES No. 7/2018 and Resolution No. 57/2019-CEPE, extension activities are defined as interdisciplinary, political-educational, cultural, scientific, and technological processes that promote transformative interaction between higher education institutions and society, contributing to the production and application of knowledge in conjunction with teaching and research (, BRAZIL, 2019a; BRAZIL, 2019b).

As provided for in Law No. 13,005 - PNE - Goal 12, Strategy 7, ACEs must be linked to extension programs and projects focused on areas of great social relevance, ensuring the autonomy and full exercise of citizenship of social subjects and aligned with the sustainable development goals of the United Nations (UN) (BRASIL 2014a, 2014b, MARQUES, 2019).

ACEs must be registered in the UFPR Academic Management System and comply with the specific rules for university extension. Their respective workloads can be credited in various modalities, such as introductory courses, participation in extension programs or projects, mandatory internships, participation in events, among others, as established in the resolution (BRAZIL, 2019c).

Provided that they meet the requirements set forth in Article 5 of the PPC for the Bachelor's Degree in Computer Science (BRAZIL, 2019c), course loads may be allocated in the following ways, according to the specific characteristics of each course:

- I - ACE I: Introductory course on the fundamentals of Extension, lasting up to 30 hours, which is either mandatory or optional;
- II - ACE II: Compulsory subjects, including compulsory internships, and/or optional subjects that allocate part or all the course load to participation in Extension Programs or Projects;
- III - ACE III: Student participation in UFPR Extension Programs or Projects;
- IV - ACE IV: Student participation as a member of the organizing team and/or instructor of courses and events, or participation in service

provision activities, all linked to Extension Programs or Projects, as defined in paragraphs 1 and 2 of Article 3 of this Resolution;

- V - ACE V: Student participation in Extension Programs or Projects at other Higher Education Institutions (HEIs) through partnerships established in accordance with the standard procedures of the Office of the Vice President for Planning and Finance (PROPLAN).

CURRICULARIZATION IN THE PPC OF THE COMPUTING DEGREE COURSE

ACEs are an essential part of the curriculum structure of the Bachelor's Degree in Computing. Their primary purpose is to foster transformative interaction between higher education institutions and various segments of society through the production and application of knowledge, maintaining a continuous connection with teaching and research (BRAZIL, 2018).

They represent a multifaceted process that aims to promote transformative interaction between higher education institutions and society. These activities are governed by the principles of social impact, dialogic interaction, multidisciplinarity, the inseparability of teaching, research, and extension, and the impact on student training. They are mandatory for all students and categorized into different modalities, such as participation in extension programs or projects, internships, and activities at other higher education institutions.

In this course, ACEs represent 12.6% of the total workload, or 405 hours, and their purpose is: i) to integrate teaching and research with social demands, promoting the engagement of the university community and contributing to the comprehensive education of students; ii) to share academic knowledge through constructive and transformative dialogue with various sectors of society; iii) to stimulate the development of social and political awareness, as well as ethical reflection on the social role of teaching and research; iv) to participate in initiatives aimed at regional, economic, social, and cultural development, reflecting the social commitment of the Federal University of Paraná (UFPR); and v) to contribute to improving and implementing curricular practices at UFPR, aiming at the systematization of the knowledge produced.

In order for student participation in these activities to be recognized, it is essential that they be linked to extension programs and projects focused on areas of social relevance, promoting autonomy and full citizenship, aligned with the UN Sustainable Development Goals and related to the training and professionalization of undergraduate courses, as established in Law No. 13,005/2014, Goal 12, Strategy 7. These activities must be supervised by the course's Collegiate Body (BRAZIL, 2019c).

It is the student's responsibility to prepare a detailed report of the ACEs carried out and submit it to the course coordinator, with the respective supporting documents, for analysis and validation.

CONTEXT OF CURRICULUM DEVELOPMENT IN COMPUTER SCIENCE EDUCATION

The context of curricularization in computer science education is an area of growing interest and relevance within contemporary education. Curricularization refers to the process of integrating specific themes, concepts, and practices into a formal educational curriculum (BATES, 2019). In the case of computer science education, curricularization involves the inclusion of content related to computer science, programming, digital technologies, and digital skills in general in teaching programs, from elementary to higher education (BUNDY, 2007).

The growing importance of curricularization in computer science education can be attributed to several factors. First, rapid technological evolution and the ubiquity of computing in modern society have made this knowledge increasingly essential for contemporary citizens (SELWYN, 2016). In addition, the demand for qualified computing professionals is constantly growing, both in the labor market and in areas of research and innovation (ZAGAMI et al., 2018).

It is also aligned with global initiatives and educational policies, which recognize the importance of promoting digital literacy and computational thinking from an early age (VOOGT et al., 2015). For example, countries such as the United Kingdom, the United States, and Australia have implemented policies to include computing in their school curricula as part of efforts to prepare students for the digital world of the 21st century (ALMEIDA; VALENTE, 2019).

In addition, the inclusion of computer science in the curriculum can help reduce educational disparities and promote digital inclusion by providing all students, regardless of their socioeconomic or geographic background, with access to technology and computer science learning opportunities (PEREIRA JR., 2023).

However, while there are many benefits associated with mainstreaming computer science education, there are also challenges to be addressed. These include a lack of resources and training for teachers, the need to develop flexible curricula that can adapt to rapid technological changes and ensuring that curricularization is approached in an interdisciplinary and contextualized manner (ZULATO, LISBÔA, ROSA, 2023).

In summary, the context of curricularization in computer science education reflects the growing importance attached to the inclusion of computer science skills in educational curricula, in response to the demands of contemporary digital society. This trend represents a significant opportunity to promote computer science education in a broader and more accessible way, preparing students for the challenges and opportunities of the digital world.

EXTENSION PROJECT: A BIAS TOWARDS DEVELOPING CURRICULUM DEVELOPMENT

In view of modality 4 of the ACEs mentioned above, we set out to develop the extension project "Computer education and teacher training: connecting knowledge," which aims to improve the training of teachers in Computer Science, enabling them to effectively incorporate Digital Information and Communication Technologies (TDIC) in the educational context.

The field of computing plays a crucial role in contemporary society, driving technological advances, innovation, and transformations in various areas of knowledge. It is therefore essential to train skilled and qualified professionals in this field who can contribute significantly to the scientific, technological, and socioeconomic development of the country (LISBÔA; ROSA, 2019; FERREIRA; LISBÔA, 2022).

Furthermore, we recognize that the training of these professionals should not be restricted to technical mastery of content but should also include the ability to share knowledge in a clear, attractive, and effective manner. The development of teaching skills is essential for future professionals in the field, as they will be responsible for

sharing their knowledge with colleagues, collaborators, students, and society in general (CANDAU, 1997).

The integration of supervised internships and teaching is an innovative approach that provides students with an enriching experience, allowing them to experience the practice of education and develop essential pedagogical and practical skills (PIMENTA; LIMA, 2012). Supervised internships provide students with the opportunity to apply their knowledge in a real teaching and learning context, interacting with students and teachers, understanding the challenges faced in the classroom, and improving their communication, leadership, and content adaptation skills (PIMENTA, 2004).

By acting as teachers, students have the opportunity to plan and teach classes, develop innovative teaching activities, and assess student progress. This challenges them to deepen their knowledge of the content, improve their teaching skills, and develop pedagogical strategies that promote student engagement and learning. In this way, they become more well-rounded professionals, capable of mediating knowledge more effectively and promoting a stimulating and inspiring learning environment (VENTURI; LISBÔA, 2023). In addition, by establishing partnerships with schools and educational institutions, the project contributes directly to the training of basic education teachers, sparking their interest in computing and exact sciences, and promoting digital inclusion. This has a positive impact on society by expanding access to quality education and stimulating the development of skills necessary for the digital age.

OBJECTIVES AND METHODOLOGY

The methodology adopted in this project is based on methodological procedures that aim to meet the proposed objectives, in addition to following the principle of integration between teaching, research, and extension, as established in Resolution 57/19-CEPE (BRAZIL, 2019b). To this end, the activities to be developed follow the details and actions described below:

1) Survey of needs and partnerships: conduct a survey of the needs of the academic and local community in relation to computer education. Establish partnerships with schools and educational institutions to carry out the project activities;

2) Teacher training and education: promoting specific training and education in public schools, with the aim of disseminating knowledge about teaching computing, addressing topics such as teaching methods, teaching methodologies, lesson planning, development of teaching materials, learning assessment, among others. In addition, continuing education courses in MOOC format will be made available to teachers in Palotina and the surrounding region. This will allow for a wider audience to be reached and make access to knowledge more flexible, promoting teacher training and updating in a convenient manner adapted to their individual needs (LISBÔA, 2022). These activities encourage digital inclusion and the development of critical thinking.

3) Supervised internship: provide students with the opportunity to experience teaching practice through supervised internships at partner schools. During this period, students will assist and collaborate with teachers in classes, practical activities, exercise correction, and other teaching-related activities;

4) Development of teaching materials: students will be encouraged to develop relevant and attractive teaching materials, such as lesson plans, practical activities, tutorials, explanatory videos, among other resources, that promote the learning of computing and exact concepts in a clear and interesting way;

5) Monitoring and feedback: throughout the project, students will receive support from supervising teachers, who will provide ongoing pedagogical guidance, monitoring, and feedback. Regular meetings will be held for discussions and exchanges of experiences between students and teachers, encouraging reflection on teaching practice and continuous improvement.

6) Outreach events: promote outreach events, such as lectures, workshops, and science fairs, with the aim of sharing the project results with the academic and local community. These events will be opportunities for students to present the teaching materials developed and share their experiences as teachers.

Finally, collaboration with schools and educational institutions is essential to strengthen the relationship between the university and the community (CARNEIRO, FIGUEIREIDO; LADEIRA, 2020). This promotes digital inclusion and arouses the interest of basic education teachers in the field of computing, contributing to the formation of a society that is more skilled and prepared for the challenges of the 21st century.

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CHALLENGES AND OPPORTUNITIES OF DIGITAL TECHNOLOGIES IN EDUCATION

The integration of digital technologies into computer science education brings with it a series of challenges that must be addressed to ensure effective and meaningful adoption. One of these challenges relates to the technological infrastructure in educational institutions, including access to high-quality internet and the availability of suitable devices for all students and teachers. In addition, the lack of teacher training in the pedagogical use of digital technologies represents another significant challenge, as many teachers may not be familiar with the tools and strategies needed to integrate them effectively into their teaching practices.

However, despite the challenges, digital technologies in computer education also offer a range of opportunities and potentialities. One of these is the ability to personalize learning, allowing students to advance at their own pace and receive immediate feedback on their progress through MOOC courses, enabling ubiquitous learning (OLIVEIRA, 2023). In addition, digital technologies can facilitate collaboration between students and teachers, promoting collective construction of knowledge, and the development of teamwork skills.

Another important opportunity is the possibility of accessing high-quality educational resources, such as interactive simulations, explanatory videos, and educational applications, which can enrich the teaching and learning process in computer science. In addition, digital technologies can help overcome geographical and economic barriers, allowing students in remote areas or with limited resources to access quality education in computer science.

While the integration of digital technologies into computer science education presents significant challenges, it also offers exciting opportunities to improve the quality and accessibility of teaching and learning in this field. Identifying and addressing these challenges, while taking full advantage of the opportunities offered by digital technologies, is critical to ensuring effective and inclusive computer science education.

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INNOVATIVE TEACHING STRATEGIES AND THEIR IMPACT ON TEACHER TRAINING IN THE EXTENSION PROJECT

Innovative teaching strategies play a crucial role in promoting computer science education, offering dynamic and effective approaches to drive meaningful learning among students. Among the most notable strategies are the use of active learning methods, such as project-based learning and problem solving, which allow students to apply theoretical concepts in practical and relevant contexts.

In terms of the impact on teacher training, the adoption of innovative teaching strategies can have profound effects on teachers' professional development. By exploring new approaches to teaching and learning, educators have the opportunity to improve their pedagogical and didactic skills, as well as expand their repertoire of educational practices. In addition, the integration of digital technologies in the educational context can help teachers stay up to date with labor market trends and demands, preparing them to face the challenges of teaching in the 21st century.

As part of the “Computer Science Education and Teacher Training: Connecting Knowledge” project, a series of innovative strategies are proposed to promote integration between academia and society, strengthening teacher training in computer science education and the use of digital educational technologies.

The continuing education program aims to offer in-person and online courses with interactive and practical teaching materials adapted to the needs and realities of teachers. At the same time, the creation of computer and technology learning labs in schools will provide an environment conducive to the development of practical and experimental projects by students, under the guidance of trained teachers.

The establishment of a mentoring and ongoing support program for teachers, combined with regular meetings to exchange experiences, will contribute to the sharing of best practices and the resolution of challenges encountered in the teaching-learning process.

Furthermore, the formation of interinstitutional partnerships with universities, research institutions, and companies in the technology sector will enable the promotion of workshops, lectures, and seminars, enrich knowledge and update teachers' pedagogical practices.

The implementation of a pilot project in schools in the region, promoting events to disseminate good practices in computer education, completes the set of proposed strategies, aiming not only to strengthen teachers' training in computing and technology, but also to promote social and digital inclusion, contributing to the social and economic development of the region through education.

In summary, innovative pedagogical strategies play a crucial role in promoting computer science education, providing opportunities to engage students effectively and promote their cognitive and socio-emotional development. At the same time, such strategies have the potential to positively impact teacher training, enabling teachers to become facilitators of the learning process, prepared to face the challenges and opportunities of the digital world.

FINAL CONSIDERATIONS

In conclusion, the project “Computer education and teacher training: connecting knowledge” emerges as a promising initiative to drive the advancement of computer education. Its objectives, focused on the curricularization of digital technologies and the pedagogical training of teachers, are fundamental to meeting the demands of an increasingly digitized society.

By effectively integrating Digital Information and Communication Technologies (DICT) into the curriculum and promoting teacher training, the project aims to prepare professionals who are better equipped to deal with the challenges of the 21st century. Collaboration between educational institutions, the development of continuing education programs, the creation of teaching materials aligned with curriculum guidelines, and the promotion of digital inclusion are key strategies for achieving this goal.

By strengthening the relationship between universities and communities and sparking the interest of elementary school teachers in the field of computing, the project not only contributes to the advancement of computer education, but also to the construction of a society that is better equipped and prepared to face the challenges of the digital world. Thus, its implementation represents an important step in the pursuit of

quality, inclusive education that can keep pace with the rapid technological and social transformations of our time.

REFERENCES

ALMEIDA, M.E.B.; VALENTE, J.A. Pensamento Computacional nas Políticas e nas Práticas em alguns Países. **Revista Observatório**. Vol. 5, n. 1, janeiro. 2019. ISSN nº 2447-4266.

ARANTES, M. K. et al. Contribuições da extensão na formação de discentes dos cursos de graduação da UFPR Setor Palotina. **Revista Extensão em Foco**. Palotina, n .30, p.84-103, jan./jun. 2023.

BARKER, L.J.; GARVIN-DOXAS, K. Making the Case for Computing: Lessons Learned from Mathematics and Science Education. **ACM Transactions on Computing Education** (TOCE), v. 18, n. 2, p. 1-26, 2018.

BATES, T**. Teaching in a Digital Age**: Guidelines for Designing Teaching and Learning. 2ª ed. Vancouver: Tony Bates Associates Ltd., 2019.

BOCCONI, S. et al. **The digital skills gap: are Europeans ready for the future**? Luxembourg: Publications Office of the European Union, 2018.

BRASIL. **Lei n.13.005, de 25 de junho de 2014. Aprova o Plano Nacional de Educação – PNE e dá outras providências**. Diário Oficial da União, Brasília, DF., 26 jun 2014. 2014a. Disponível em: <https://www.planalto.gov.br/ccivil_03/_ato2011-2014/2014/lei/l13005.htm>.

BRASIL. **Ministério da Educação. Planejando a Próxima Década. Conhecendo as 20 Metas do Plano Nacional de Educação**. Ministério da Educação/Secretaria de Articulação com os Sistemas de Ensino (MEC/Sase): Brasília, DF., 2014b.

BRASIL. Ministério da Educação. Conselho Nacional de Educação. Câmara de Educação Superior**. Resolução nº 7, de 18 de dezembro de 2018. Estabelece as Diretrizes para a Extensão na Educação Superior Brasileira e regimenta o disposto na Meta 12.7 da Lei nº 13.005/2014nº 13.005/2014, que aprova o Plano Nacional de Educação- PNE2014-2024 e dá outras providências**. Brasília- DF, 2018

BRASIL. UNIVERSIDADE FEDERAL DO PARANÁ- UFPR. Conselho de Ensino, Pesquisa e Extensão. **Resolução nº 57/19. Dispõe sobre as atividades de Extensão na Universidade Federal do Paraná.** Curitiba, 14 de dezembro de 2019. 2019a Disponível em: https://palotina.ufpr.br/wp-content/uploads/2017/10/Resolução-57-19-CEPEatividades-de-extensão1484.pdf. Acesso em: 19 mai, 2023

BRASIL. Ministério da Educação. **Parecer CNE/CP nº: 22/2019 Define as Diretrizes Curriculares Nacionais para a Formação Inicial de Professores para a Educação Básica e institui a Base Nacional Comum para a Formação Inicial de Professores da Educação Básica (BNC-Formação)**. 2019. 2019b. Disponível em: https://abmes.org.br/arquivos/legislacoes/Parecer-cne-cp-22-2019-11-07.pdf Acesso em: 08.03.2020

BRASIL. Universidade Federal do Paraná. Curso de licenciatura em computação. **Projeto Político Pedagógico**. Palotina, 2019c

BRASIL. Universidade Federal do Paraná. Conselho de Ensino, Pesquisa e Extensão CEPE. **Resolução nº 86/2020-CEPE. Dispõe sobre a creditação das Atividades Curriculares de Extensão nos currículos plenos dos cursos de graduação da UFPR**. Curitiba-PR, 2020. Disponível em: http://www.proec.ufpr.br/download/extensao/2022/creditacao/RESOLUcaO-N-86-2020-CEPE.pdf. Acesso: 05 jan.2024

BUNDY, A. **Information and Informatics Literacy**: A Set of Competencies for Lifelong Learning and Higher Education. Paris: UNESCO, 2007.

CANDAU, V. M. Universidade e formação de professores: que rumos tomar? In: CANDAU, V. M. (Org.). **Magistério: construção cotidiana.** Petrópolis: Vozes, 1997. p. 30-50

CARNEIRO, A. P.; FIGUEIREDO, I. S. S.; LADEIRA, T. A. A importância das tecnologias digitais na Educação e seus desafios**. Revista Educação Pública**, v. 20, nº 35, 15 de setembro de 2020.

FÉLIX M. E.; COELHO D. J. S. C. S. Perspectivas da inserção curricular da extensão universitária na educação jurídica, análise de métodos e discussão de conceitos. **Revista Extensão em Foco**. Curitiba, n. 32, p. 78-96, jan./jun. 2024.

FERREIRA, J. C. S.; LISBÔA, E S. Estágio Supervisionado em Docência de Computação: um breve relato. In: V Simpósio de Licenciaturas em Ciências Exatas e em Computação: Educação em tempos de cultura digital. V SLEC,2022, Pontal do Paraná, **Anais...** Matinhos: UFPR. ISBN: 2594-9837.pp 64-72

LISBÔA, E. S.; ROSA, V. (Orgs**). As tecnologias digitais e o ensino de ciências e de computação na sociedade contemporânea**. Palotina: Booknando Livros, 2019.

LISBÔA, E. S. MOOCs e REAs: uma alternativa para formação de professores. In: MACHADO, Raimunda Nonata da Silva; BIANCHINI, Angelo Rodrigo (orgs). **A residência Pedagógica na Formação Docente: os saberes da práxis remota no período de 2020 a 2022**. São Luís: EDUFMA, 2022

MARQUES, M. F. C. **Agenda 2030: objetivos do desenvolvimento sustentável (ODS) da ONU: desafios ao desenvolvimento tecnológico e à inovação empresarial**. Lisboa: Instituto Superior de Engenharia de Lisboa, 2019.

OLIVEIRA, P. P. M. As TDICS como ferramentas de aprendizagem ubíqua numa perspectiva de educação omnilateral. Mal-Estar e Sociedade, v. 13, n. 1, 2023.

PEREIRA JR. C. X. et al. Compreensões acerca da Curricularização da Extensão emCursos de Computação do Centro-Oeste. **Revista de Sistemas e Computação, Salvado**r, v. 13, n. 3, p. 55-64, set./dez. 2023.

PIMENTA, S, G.; LIMA, M, S. L. Estágio e docência. São Paulo: Cortez, 2012

PIMENTA, S.G. (org.). O estágio e a docência. São Paulo: Cortez, 2004.

SELWYN, N.. Digital technology and the contemporary university: degrees of digitization. Abingdon, Oxon: Routledge, 2016.

VENTURI, T.; LISBÔA, E. S. Estágio Supervisionado na Pandemia: análise das percepções e dos conhecimentos mobilizados por licenciandos em Ciências Biológicas. In: Revista Insignare Scientia- RIS. Vol. 6, n. 2. 2023. Disponível em: https://periodicos.uffs.edu.br/index.php/RIS/article/view/13555/8835. Acesso em: 19 mai, 2023

VOOGT, J. et al. Teacher learning in collaborative curriculum design. **Teaching and Teacher Education**, v. 47, p. 120-130, 2015. Disponível em:

https://www.sciencedirect.com/science/article/pii/S0742051X11000850. Acesso em 20 abr.2024

ZAGAMI, J. et al Creating Future Ready Information Technology Policy for National Education Systems. **Technology, Knowledge and Learning** (2018) 23:495–506.

ZULATO, G. M.; LISBÔA, E. S.; ROSA, V. Formação de Professores de Matemática em Tecnologias Digitais: criação e validação de um instrumento avaliativo com base no modelo TPACK. **Revista EducaOnline**. Volume 17 – Nº 3 – Setembro / Dezembro de 2023. ISSN:1983-2664.2023. Disponível em: https://revistaeducaonline.eba.ufrj.br/edi%C3%A7%C3%B5es-anteriores/2023-3. Acesso em 20 marc.2024.

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