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Innovación Educativa en la era de la IA: repensando la universidad

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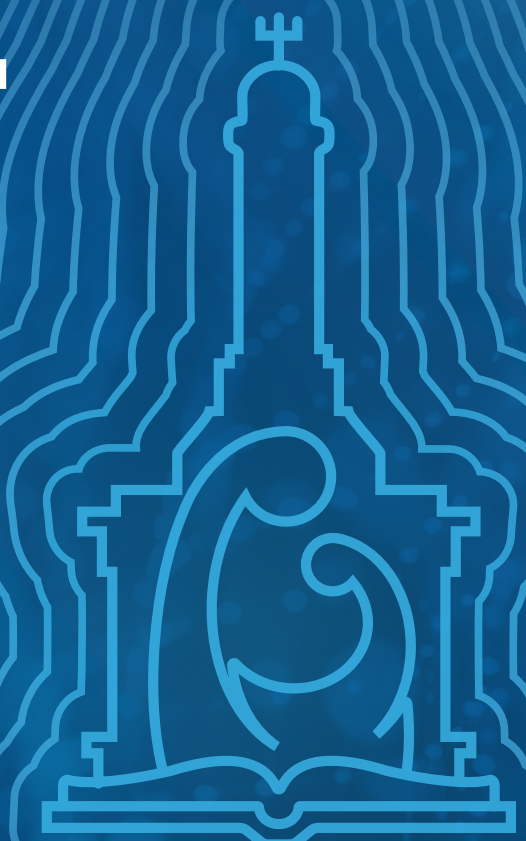

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Índice

DEVELOPMENT OF COMPUTATIONAL THINKING SKILLS TO IMPROVE THE LEARNING OF PROGRAMMING LANGUAGES IN VOCATIONAL EDUCATION

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Summary

The study analyzes the development of computational thinking in students of the 1st year of the Professional Technical Course of Informatics-Systems, exploring the potential of digital platforms Code.org and Tinkercad. These tools, based on block programming and text, prove to be effective in promoting the gradual learning of programming languages, while encouraging autonomy, creativity and problem-solving. The research adopts the qualitative Design-Based Research (DBR) methodology, which combines flexibility and scientific rigor, allowing the integration of theory and practice in collaboration with students. Data collection includes interviews, observations and practical use of the platforms, which are later analyzed in the MAXQDA 24 software. The focus is on identifying factors that influence the quality of learning in VET education. In summary, it is concluded that the integration between computational thinking, programming languages and digital platforms represents an innovative pedagogical approach, aligned with the technical and socio-emotional skills required in the twenty-first century.

Keywords

Computational Thinking, Programming Languages, Professional Education, Skills Development and Creative Learning.

Introduction

The advancement of digital technologies transforms VET Education, making it essential to integrate Computational Thinking, Programming and Creative Learning to develop 21st century skills and train critical, creative and innovative professionals, prepared to solve problems.

Computational Thinking, according to Wing (2006), involves problem decomposition, pattern recognition, abstraction and algorithms. Resnick (2020) highlights its importance in all areas of knowledge. Papert (1980) emphasizes the construction of knowledge through digital technologies, valuing exploration and creative learning in the development of competencies.

Programming Languages play an essential role in this process, as they allow the materialization of Computational Thinking. For Aho and Ullman (1994), understanding these languages makes it possible to structure efficient solutions to complex problems. Bers (2021) emphasizes that its introduction into Vocational Education promotes autonomy, logical reasoning, and creativity.

In Vocational Education, Castilho (2018) emphasizes that learning must align technical and socio-emotional skills with market demands. Creative Learning, according to Resnick (2020) and inspired by Papert (1980), promotes experimentation and the construction of ideas, while Bartelett, Burton and Peim (2001) highlight the importance of creativity in innovative strategies.

Thus, the articulation between Computational Thinking, Programming Languages and Professional Education develops essential skills for the digital society. This study investigates, answering the question: “How to enhance the development of computational thinking, for students of the first year of the Professional Technical Course of Informatics-Systems, with the use of educational platforms and virtual laboratories?”.

Method/Description of the experiment

The methodological approach used will be qualitative Design-Based Reasearch (DBR), which fits this more practical research, which involves several participants in education and a group of students, who are relevant agents for the project.

According to Nobre & Martin-Fernandes (2021), this method emerged in the twenty-first century, and it is a more real experience, being a “participatory research, which integrates external participants, with the purpose of producing knowledge and data” (p. 236), using quantitative methods (numerical data) and/or qualitative methods (non-numerical data) to obtain insights and conclusions, thus seeking a variety of data collection techniques that will later help to answer the research question and sub-questions.

During the project, entry and exit questionnaires were applied, complemented by group interviews with eight students. At the same time, direct observation was carried out during the implementation of content in two units of the Code.org platform, in the Computer Science Discoveries course, and activities in Tinkercad, involving assembly of electrical circuits and programming in C/C++ Language.

Results

The study analyzed the impact of the digital platforms Code.org and Tinkercad on the development of computational thinking in students of the 1st year of the Professional Technical Course of Informatics-Systems. Using the qualitative Design-Based Research (DBR) methodology, it combined theory and practice, promoting collaboration between researchers and students. Questionnaires, interviews and observations were analyzed in the MAXQDA 24 software, identifying factors that influence learning. The results showed that programming in blocks and in text favors the gradual learning of languages, stimulating autonomy, creativity, logical reasoning and problem solving. It is concluded that this innovative pedagogical approach strengthens technical and socio-emotional skills for the challenges of the twenty-first century.

Discussion and Conclusion

The study analyzed how digital platforms, such as Code.org and Tinkercad, contribute to the development of computational thinking in 1st year students of the Professional Technical Course of Informatics-Systems. Using the qualitative methodology Design-Based Research (DBR), it was possible to observe the integration between theory and practice, flexibly promoting collaboration between researchers and students.

The results show that block and text programming environments promote the gradual learning of programming languages, stimulating autonomy, creativity and problem solving. Questionnaires, interviews and observations, analyzed in MAXQDA 24, allowed the identification of factors that influence the quality of learning in the context of Vocational Education.

It is concluded that the combination of computational thinking, programming languages and digital platforms constitutes an innovative pedagogical approach, aligned with the twenty-first century, enhancing technical and socio-emotional skills essential to train critical, creative professionals prepared to face the challenges of the digital society.

References

Wing, J. M. (2006). Computational Thinking. Communications of the ACM. 33–35.

Aho, A., & Ullman, J. (1994). Computer Science: The Mechanization of Abstraction. http://infolab.stanford.edu/~ullman/focs.html

Bartelett, S., Burton, D., & Peim, N. (2001). Introduction to education studies. Paul Chapman Publishing.

Bers, M. (2021). Coding as a Playground - Programming and Computacional Thinking in the Early Childhood Classroom (2nd ed.). Routledge. Ebook.

Castilho, M. I. (2018). Hiperobjetos da Robótica Educacional com ferramentas de abstração reflexionante e do pensamento computacional. http://hdl.handle.net/10183/189624

Nobre, A., & Martin-Fenandes, I. (2021). Abrir caminhos para a investigação em educação: design-based research. Práxis Educacional, 17(48). https://doi.org/10.22481/praxisedu.v17i48.8821

Papert, S. (1980). Teaching Children Thinking. In Contemporary Issues in Technology and Teacher Education (Vol. 5, Issue 4). www.teacherscollegepress.com

Resnick, M. (2020). Jardim de Infância para a Vida Toda. Porto Alegre.

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