Chapter 2
Effectiveness of PBL for Learning E-Sustainability: A Study With Students of the Bachelor's Degree in Early Childhood Education

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ABSTRACT

This research aimed to assess the effectiveness of Problem-Based Learning (PBL) to improve the competencies of future Early Childhood Education teachers in digital sustainability. For this, a quasi-experimental pretest-posttest study with an equivalent control group was designed. 163 students of the 2nd Degree of Early Childhood Education at the University of Alicante (Spain) worked on e-sustainability through PBL (experimental group) and 105 with traditional classroom methodology (control group). A comparative analysis of the data was conducted with the statistical analysis

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software SPSS version 29.0. The results showed statistically significant differences in favor of PBL, particularly in knowledge about the safe and responsible use of digital technologies. In contrast, this didactic methodology had a lower impact on the development of skills and attitudes favorable to e-sustainability. The authors discuss the possible reasons and conclude with some proposals to promote the use of PBL for teaching digital sustainability among future teachers.

INTRODUCTION

The accelerated development of digital technologies that has taken place in recent decades has made them an integral part of human existence. The growth of the Internet and the multiple possibilities offered by these devices have made them essential resources for transforming this world into a better place. Among other applications, they are particularly useful for promoting new teaching-learning methods in developing regions (Matias et al., 2024), for facilitating access to basic healthcare in low-income countries (Vasanthan et al., 2024), and even for reducing pollution and climate change on the planet (Shen & Yang, 2023). However, the effects derived from its disproportionate use constitute a serious threat to the social, economic and environmental balance proposed by the United Nations Organization for the 2030 horizon (Islam & Inan, 2021; Zulfiqar et al., 2023). For example, it has been calculated that data storage and transmission via the Internet means, each year, the emission of 97 million tons of CO_2 into the atmosphere, the consumption of 2.6 billion liters of water and the productive depletion of 3,400 km2 of land area (Obringer et al., 2021). To address this serious problem, it is necessary that future generations become aware of the negative impact of the inappropriate use of digital technologies and adopt more sustainable usage models (Škare et al., 2024).

In this context, universities play a crucial role, as they must ensure that their students acquire the necessary competencies to face the challenges of the present and the future, including those posed by digital transformation and progress (Mallow, 2020). To achieve it, active methodologies can become particularly useful strategies, since they promote the participation, involvement and protagonism of students in the teaching-learning process, favoring the acquisition of key competencies for sustainable development (Martínez et al., 2022). However, among all of them, the potential that Problem-Based Learning (PBL) has for teaching the eco-responsible use of technological tools has not yet been sufficiently evaluated. Based on this, this study set out to assess the effectiveness of this didactic methodology for learning digital sustainability among future Early Childhood Education teachers.

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