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STEAM-Based Teaching Practices in Preschool and Primary Education with the Poly-Universe Game Family

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Abstract

The Early-Poly project aims to strengthen STEAM education in preschool and primary school settings by integrating the Poly-Universe game family into educational practice and supporting the preparation of pre-service preschool and primary school teachers. The project introduces learners to the game's geometric shapes, colours, sizes, and diverse applications while promoting interdisciplinary, play-based learning experiences. Since early exposure to STEAM education contributes to the development of creativity, problem-solving skills, and positive learning attitudes, the project seeks to provide innovative methodological support for educators working with children aged 3–10.

As part of the project, a needs analysis survey was conducted among educators in four European countries to explore the use of manipulative teaching tools and the perceived needs related to STEAM education. The findings revealed that manipulatives are widely used in both preschool and lower primary education and that educators expressed a strong need for methodological resources that effectively support the implementation of STEAM approaches across educational settings. No significant gender differences were identified regarding preferences for manipulative tools or attitudes towards STEAM education. Participants also emphasized the importance of facilitating the transition from preschool to primary school through developmentally appropriate, play-based methodologies and highlighted the role of the arts in promoting integrated STEAM learning.

In addition, a series of Poly-Universe-based problem-solving activities demonstrated a significant positive shift in students' attitudes towards mathematics. The hands-on activities promoted creative thinking, collaboration, engagement, and self-confidence while encouraging active participation in mathematical learning. The findings suggest that the Poly-Universe game family provides an effective pedagogical framework for interdisciplinary STEAM education and supports the development of mathematical thinking and key twenty-first-century competencies in early childhood and primary education.

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