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Didactic Suitability and Mathematics Through Robotics and 3D Printing

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Abstract : Nowadays, education, motivated by the new demands of the 21st century, acquires a dimension that converts the skills that new generations may need into a huge and uncertain set of knowledge too broad to be entirety covered. Within this set, and as tools to reach them, we find Learning and Knowledge Technologies (LKT). Thus, in order to prepare students for an everchanging society in which the technological boom involves everything, it is essential to develop digital competence. Nevertheless LKT seems not to have found their place in the educational system. This work is aimed to go a step further in the research of the most appropriate procedures and resources for technological integration in the classroom. The main objective of this exploratory study is to analyze the didactic suitability (epistemic, cognitive, affective, interactional, mediational and ecological) for teaching and learning processes of mathematics with robotics and 3D printing. The analysis carried out is drawn from a STEAM (Science, Technology, Engineering, Art and Mathematics) project that has the Pilgrimage way to Santiago de Compostela as a common thread. The sample is made up of 25 Primary Education students (10 and 11 years old). A qualitative design research methodology has been followed, the sessions have been distributed according to the type of technology applied. Robotics has been focused towards learning two-dimensional mathematical notions while 3D design and printing have been oriented towards three-dimensional concepts. The data collection instruments used are evaluation rubrics, recordings, field notebooks and participant observation. Indicators of didactic suitability proposed by Godino (2013) have been used for the analysis of the data. In general, the results show a medium-high level of didactic suitability. Above these, a high mediational and cognitive suitability stands out, which led to a better understanding of the positions and relationships of three-dimensional bodies in space and the concept of angle. With regard to the other indicators of the didactic suitability, it should be noted that the interactional suitability would require more attention and the affective suitability a deeper study. In conclusion, the research has revealed great expectations around the combination of teaching-learning processes of mathematics and LKT. Although there is still a long way to go in terms of the provision of means and teacher training.

Keywords : 3D printing, didactic suitability, educational design, robotics
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