

# LEARNING GEOMETRY THROUGH M-LEARNING

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Mathematics education is key to the development of responsible future citizens, who must be able to understand and analyse their environment. To that end, using ICT we have proved a noticeable improvement in students' attitudes towards mathematics, making them demonstrate a greater critical spirit, perseverance, precision and creativity, as well as an increase in their flexibility of thought (García & Romero, 2009). We introduced m-learning methodology based on the use of mobile phones in classrooms, which takes advantage of their interest in technology and is closer to the students' reality. This methodology gives them access to information without any spatial limitation, thus offering learning opportunities from beyond the classroom (Castro et al., 2016). Focusing on learning geometry, we used GeoGebra 3D, a virtual reality mobile app, which encourages them to create, manipulate and interact with geometric 3D models.

We carried out an action-research in a second-grade high school, with 28 students. We detected important deficiencies after an initial observation of students' three-dimensional geometric knowledge. We developed a didactic mathematic proposal using m-learning, and we observed what was happened in the classrooms. The goals were improved student spatial vision and an improvement in the learning of the principal geometric models. We got evidence, which proved the benefit of using m-learning in geometry learning. We did interviews with students, and we concluded that 100% of them think ICT, as mobile applications, are beneficial. They feel that they have improved their learning capabilities and what they have learned is useful.

From the teacher's point of view, thanks to GeoGebra 3D, students have had the opportunity to contextualize the mathematical content and visualize it, and to develop abstract thinking later. Further to this, the group have improved their final qualifications. We will continue with a next cycle of research-action, improving the educational proposal, the following academic course.

## References

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