

"PASSPORT TO LINEAR ALGEBRA: VECTORS AND MATRICES IN THE BAG!"- A GAMIFIED LEARNING EXPERIENCE FOR ENGINEERING STUDENTS

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ABSTRACT

To situate abstract mathematical concepts so that they are more relevant and engaging for engineering students, gamification has proven to be an innovative and successful strategy [1, 2, 3]. The proposed paper presents the experience "Passport to Linear Algebra: Vectors and Matrices in the Suitcase!", a gamified learning environment for first-year Biomedical and Electromechanical Engineering students at the Polytechnic Institute of Coimbra. The activity consists of creating a virtual team trip around the world, where students create and solve Linear Algebra problems. Each team receives a mission on a boarding pass and a luggage tag that identify the departure city and the arrival city. From here, students create a journey narrative that includes matrix operations, determinants, linear systems, eigenvalues and eigenvectors, and linear transformations while developing clues for the other teams. The tips, which aim to guide the team to a destination, must combine program content with imagination and contextualization.

49 students were involved in a full week of classes (4 hours). The teams collaborated to complete their mission, and the assessment was conducted through the clarity, creativity and interaction of the group in developing the problems presented in the "trip log" spreadsheet, in the formal correction of the solved problems, in the observation of the teacher in the classroom and in the pre/post question-naires measuring the knowledge acquired and the student's attitude.

The results indicated high levels of conceptual and motivational knowledge. Students became more involved and gained a greater ability to connect theory with practice. The experience also promoted transversal skills, such as teamwork, communication and problem solving [3, 4]. This gamification, interdisciplinary learning experience demonstrates the power of active learning techniques in engineering education to make mathematics more interactive, relevant, and engaging.

Keywords Gamification \cdot Linear Algebra \cdot Engineering Education \cdot Active Learning \cdot Interdisciplinary Teaching

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