MATHEMATICS DIAGNOSTIC IN ENGINEERING AND INSTRUCTIONAL DESIGN OF THE LOGICAL AND MATHEMATICAL SKILLS WORKSHOP

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ABSTRACT

In the context of engineering, first year students find it difficult to cope with the high mathematical content of their degree, a large number of students find mathematics modules difficult in the first year and, as a result, fail them. This hampers progression, retention and also the more demanding advanced mathematics courses required in subsequent years.

The results of the mathematics diagnostic test administered in 2024 to first-year engineering students at Universidad San Sebastián (Chile) revealed significant gaps in fundamental areas such as operations with real numbers, basic algebra, equation solving, and problem-solving. This situation prompted the implementation of an innovative proposal called *Taller de Aptitudes Lógicas y Matemáticas* (TALM), a course designed to strengthen students' foundational mathematical competencies and enhance academic progression through an integrated approach.

TALM combines a face-to-face component with an online module. The in-person component focuses on the development of mathematical skills through the use of contextualised exercises, game-based learning, and challenge-solving activities aimed at fostering active and collaborative learning that aligns with students' future professional practice. In parallel, the online component addresses metacognitive and self-regulation aspects of learning (such as time management, motivation, and study strategies), which are critical to sustaining academic effort during the transition to university life.

This study presents a description of the instructional design of the TALM. It highlights the course's innovative and adaptive approach, as well as its potential for replication in other contexts facing similar levelling challenges. The initiative forms part of a broader strategy to improve student retention, promote equity, and enhance the quality of teaching in engineering programmes.

***K*eywords** academic levelling · engineering · integrated mathematics education · active learning · games and challenges · contextualisation

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