

Structured Digital Templates and Peer Assessment to Foster Active Learning and Individual Accountability in Laboratory Sessions

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Laboratory courses in engineering education often face recurring challenges, including limited structuring of student work, high grading workload for instructors, and difficulties in assessing individual contributions within group-based activities. This paper presents an educational innovation implemented in laboratory sessions that combines the use of a structured digital Excel template with a system of self- and peer-assessment to promote active learning and individual accountability.

A customized Excel file was designed to guide students through experimental data acquisition, calculations, and intermediate analyses in experiments (Fig.1). The template aligns directly with the learning objectives of the laboratory practice and must be submitted on the same day as the experimental session. This approach reduces opportunities for academic misconduct, supports student self-regulation, and enables fast, objective grading by instructors.

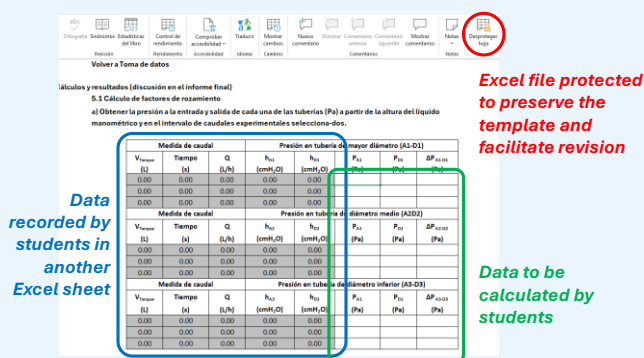


Fig. 1. Printscreen of Excel template.

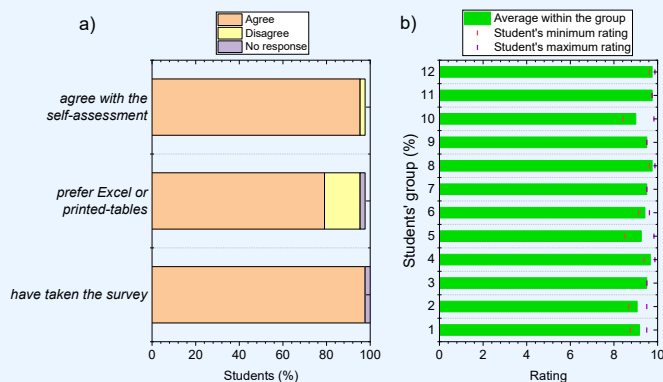


Fig. 2. (a) Comparison of student preference: structured Excel template vs. paper-based data tables and about self-assessment; and (b) average rating within the groups.

Additionally, a self- and peer-assessment component was introduced to evaluate individual engagement within laboratory groups. The effectiveness of the approach was evaluated through an anonymous student survey and the analysis of peer-assigned grades (Fig. 2). Survey results show a strong student preference for the structured Excel template compared to traditional paper-based tables, highlighting improved organization and conceptual understanding. Importantly, peer-assessment results did not lead to uniform grading within groups, as differences among group members were observed, indicating a realistic evaluation of individual contributions.

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