

Evaluating the impact of gamification in Chemical Engineering education and its relevance to society and employers

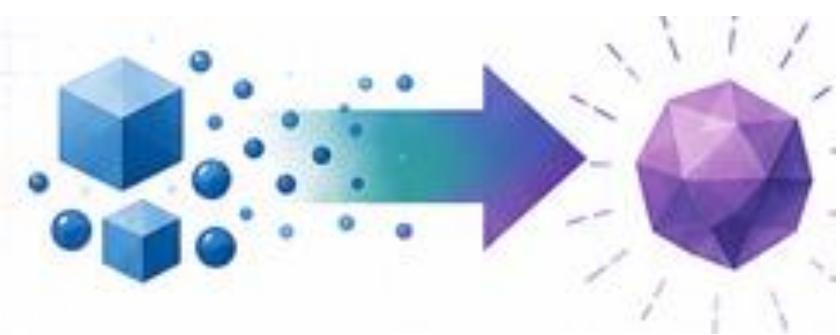
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INTRODUCTION & AIM

CHEMICAL ENGINEERING

is halfway between **ENGINEERING** and **CHEMISTRY**, being the science of *transformation*, converting one thing into another.



CHEMICAL ENGINEERS HAVE TECHNICAL KNOWLEDGE ACROSS DIFFERENT AREAS



AS WELL AS COMPLEMENTARY AREAS



Changes into the discipline, and the professional needs of graduates, mean that Chemical Engineering education should face **continuous challenges**.



A notable pedagogical trend is the incorporation of **gamification methodologies**.



to analyse, based on a revision of innovation projects focused on gamification and their outcomes, how **gamification-based approaches** have enhanced the learning and professional performance of future chemical engineers.



METHOD

This work compiled lists of funded teaching innovation projects at the University of Oviedo (Spain) by the Education Research Institute (INIE) from **2010 to 2025** (INIE, 2025), and selected those related to Chemical Engineering studies, a total of **249**.

1 SOURCE OF INFORMATION

Data were collected from publicly available information on the INIE website.

2+3 SELECTION AND EXCLUSION CRITERIA

Projects were included if they were officially recognized by the University within the specified period and were related to Chemical Engineering studies. Duplicated entries or incomplete records were excluded.

4 RESULTING SAMPLE

A total of **249** projects related to Chemical Engineering studies were selected.

More than a quarter of these 249 projects are related to **gamification and ludic learning**.

RESULTS & DISCUSSION

Gamification and ludic learning, has been applied not only to **specific Bachelor's and Master's subjects** but also more broadly to **entire degree programs** and to **general aspects of technical Bachelor's curricula**.



The high number of initiatives suggests a **preception** from both students and faculty:



Likewise, it was observed a **positive influence** on **student evaluation of teaching (SET)**, although not exempt from subjectivity, as they come from student feedback gathered once the activities were completed, as well as from comparisons of academic performance in subjects with and without gamification.

Serious games can improve autonomy and competence. Nevertheless, **main drawbacks** of gamification include:



which may even result in incomplete coverage of curricular content. In summary, the principal challenges in evaluating the suitability of gamification can be condensed into **two interrelated issues**:



It is pointed out the **importance of instructional content** that influences student learning. Effective teaching requires solid instructional content; methodology alone is not enough.

Many instructors who implement these methodologies recognize the limitations of not completing the syllabus. This has been perceived even by the students, who believe that these methodologies limit the acquisition of knowledge. This has **two direct and perverse consequences**:

1 The first indicator (SET) is usually **more positive** due to the lesser difficulty in passing the subject and increasing grade.

2 This **limits the performance** of professors in subsequent subjects based on these methods.

One possible hypothesis to understand, then, the motivation behind teaching innovation projects could be the requirement for **teacher evaluations** (such as DOCENTIA programs) and **accreditations for teacher promotion**, at least in Spain.

CONCLUSION

IMPROVED TEACHING SATISFACTION
Gamification shows a clear association with improved teaching satisfaction.

LIMITED MEASURABLE IMPACT
but limited measurable impact on quality indicators.

POTENTIAL RISKS
Although gamification can enhance motivation, they present the risk of limiting content and distorting SET.

PATH FOR IMPROVEMENT
Improvement efforts should emphasize coordinated program-level actions and rigorous content delivery.

FUTURE WORK / REFERENCES

Díaz, E., & Ordóñez, S. (2026). Assessing the impact of Teaching Innovation Projects on university quality indicators and employer expectations: a case study in the Spanish university. *Multidisciplinary Journal for Education, Social and Technological Sciences*, 13(1). <https://doi.org/10.4995/muse.2026.25238>