

Error-based learning in Nutrition subjects: validation of a teaching strategy in an interuniversity context

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Detection of errors introduced by the professor, i.e., *error-based learning*, may help to retain knowledge by the student during the learning process. In addition, gamification through platforms such as Kahoot! makes learning fun and interactive due to the use of quizzes and rewards that promote motivation among students, thus, helping in learning reinforcement

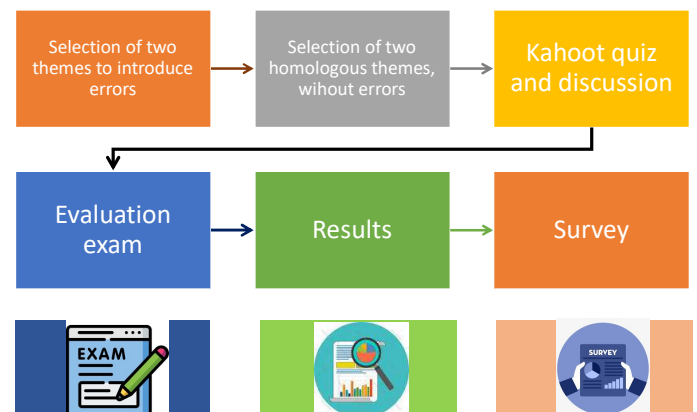
Hypothesis: academic performance improves if the professor deliberately includes errors and manages to motivate students to find them through gamification strategies. Moreover, the active search for these errors by groups of students was supposed to increase the dedication to the subject, the acquisition of knowledge and the promotion of teamwork

Objective: to examine whether error detection by students, after intentionally introducing them by the professor during a master class, improves self-study and learning outcomes in university students, taking as an example those of the Nutrition Degree

Methods

A total of 65 students participated in this study, all of which were enrolled in a second-year course. A core subject was chosen for this study (Culinary Technology).

- Firstly, we selected two themes to introduce up to 10 errors in each theme (intervention themes). Additionally, two homologous themes, similar in size and difficulty, were selected from the syllabus of the subject; these themes did not include any errors (control themes). Each theme was covered in a master class
- In the following classes quiz questions from topics with errors were implemented with Kahoot!, whereby every question included responses with errors and without errors. The same was done for the topics without errors. After every Kahoot! quiz (4 in total), the results of the responses were discussed, mainly regarding those including the errors
- The evaluation exam included multiple choice questions following a similar procedure, for themes with and without errors
- A survey was used (18 items) to know about the student's perceptions



Results

Learning outcomes

Students who conducted error detection and subsequently completed self-regulation activities (Kahoot! quizzes and posterior discussions) achieved better performance. The percentage of positive responses was 65% and 56% in themes with and without errors, respectively. This difference was statistically significant (p -value=0.02). There were no differences by gender regarding the rate of positive responses (p -value>0.05)

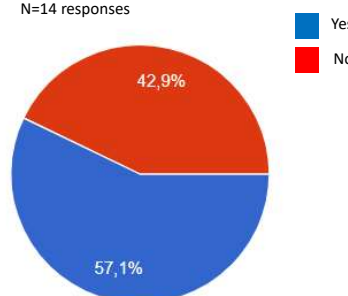
Furthermore, the correlation analysis revealed that error detection assessed by the number of positive responses was positively correlated with the students' performance (ρ =0.36)

In multivariate regression models, the final grade tended to increase with the ratio of positive responses in themes with errors vs those without errors (p -value=0.06)

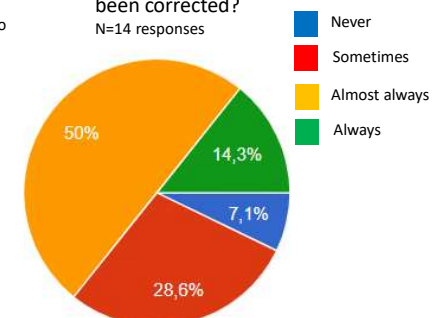
The number of positive responses (assessed as percentage) was compared between both groups of themes by Student's t-test. In addition, we analysed the effect of this experience on the final evaluation grade (independent variable) using linear regression models (dependent variable: positive responses in themes with errors vs without errors), controlling for variables such as gender and attendance rate. Survey response rates were also analysed. Statistical significance was set at 0.05 threshold.

Survey responses

When you were told about the purpose of such a project, did you find it interesting?
N=14 responses



When studying the topics, did you remember what and where the errors were once the issue with errors had been corrected?
N=14 responses



Other interesting findings were:

- 87% of the respondents found Kahoot motivating and fun
- Motivation was higher in themes with errors than in themes without errors for 57% of the respondents

Conclusion

Our results suggest that intentionally introducing errors in the master classes and their subsequent identification by the student might be a tool with considerable potential in the teaching and learning process of subjects of the Nutrition degree. Results are being validated in University Complutense Madrid. Furthermore, to confirm our findings, this study will be extended to other subjects and degrees



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