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The MILAGE LEARN+ app on higher education

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Abstract

This paper presents the use of the MILAGE LEARN+ app in Higher Education, which takes advantage of gamification to motivate students and implements a self and peer assessment scheme. There are tasks with three different levels of difficulty to include all students. Teachers are responsible for producing assignments which once done are uploaded to MILAGE LEARN+ app, thus making them available to students. When students solve tasks they have immediate feedback, with the solution available with criteria for assessment and an educational video that explains the task solution, which can be revisited as many times as needed for the student to learn. MILAGE LEARN+ is available for free and can be used for face to face, online, blended or flipped learning. Its use in Higher Education shows that it promotes pedagogical differentiation and increases the autonomy of students.

Keywords: *Gamification; self and peer assessment; m-learning; pedagogical differentiation; autonomy.*

1. Introduction

The MILAGE LEARN+ app was developed by the University of Algarve, with the initial objective to improve the learning of mathematics in elementary and secondary schools in Portugal. This project was also implemented in Spain, Germany, Norway, Turkey and Cyprus. After this period this tool start to be used in other disciplines such as, biology, languages, etc. (Figueiredo, Bidarra, González-Pérez, & Godejord, 2017; Figueiredo, Godejord, & Rodrigues, 2016).

This app is available for free on Windows and OSX computers as well as iOS and Android devices which to take advantage of a wide availability of mobile devices that students carry with them.

Mobile devices give students flexibility and individualization of their learning experiences, as well as allow them to expand the time spent learning outside the classroom. This offers a great opportunity for teachers and students to take advantage of technologies to facilitate learning. It is important to note that these students are the generation of digital games and social networks. They are no longer the same for whom the education system was designed a few decades ago. A generation whose expectations are different from those that preceded it.

The MILAGE LEARN+ app uses features of games to motivate students and implements an approach with a self and peer assessment that promotes pedagogical differentiation and increases the autonomy of students.

This paper presents several examples about the use of the MILAGE LEARN+ app for learning on Higher Education.

2. The MILAGE LEARN + app

MILAGE LEARN+ was conceived as a game where the players are students and the main goal is to solve tasks uploaded by the teacher (Figure 1). These tasks are grouped in subchapters and chapters and this organization makes MILAGE LEARN+ structurally similar to a task book.

After login into the app, the game start, with the following steps:

1. Student select the “game” (task).

2. Find the game solution (solve the task).

3. Submit the solution.

4. Self-assessment of the task solution submitted based on the criteria for assessment.

5. Watch the educational video explaining the task solution if needed for better understanding of the task.

6. Peer-assessment of a colleague's solution.

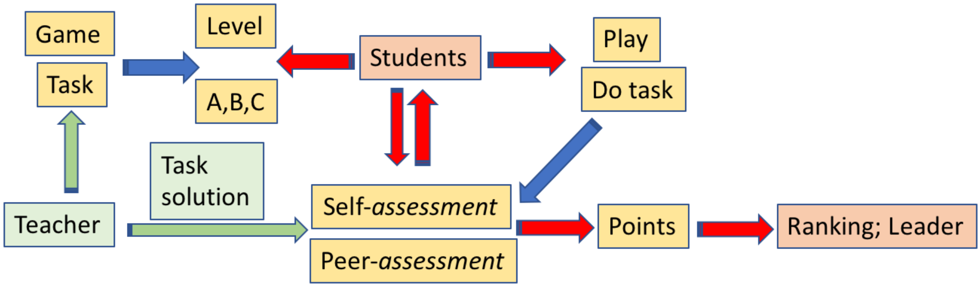

Figure 1. App MILAGE LEARN+ functioning/usage diagram.

In case of a multiple choice task, after the student selects his option, the app automatically identifies it as correct or wrong

In case of an open question task, the student need to solve the task using a pen and paper and after with a mobile device takes a photo and upload it to the server. In this case, the MILAGE LEARN+ app combines the analog and technology. It is also possible to submit the answer using the keyboard.

After submitting the answer, the student gets the access to the instructions for self-assessment. In this way, the student gets immediate feedback and understands if what was done was correctly or not and feeds forward to know what to do to improve. At the same time the student can see small video with the solution.

Thus, the student can study solving exercises or review the course content while evaluating his work or the work done by a colleague.

Inclusion of self and peer assessment contributes to promoting formative learning, learners' independence and taking responsibility for the learning process.

3. Gamification Learning Scenario

Gamification is defined as the incorporation of game mechanics in other situations, with the aim of increasing motivation in a given product or service, facilitating behaviors that promote learning (Hsu, Chang, & Lee, 2013).

In the game it is possible for each player to choose their own path and choose different levels of difficulty according to their abilities, which ensures fun and new learning in case of corrective feedback (Chen, 2007).

The use of educational games allows the student to put in practice contents and ideas that are topics of a certain area of knowledge. Chairs(Winter, Wentzel, & Ahluwalia, 2016), Chirality-2(Jones, Spichkova, & Spencer, 2018) and Nomenclature Bets(Silva Júnior et al., 2018) are examples of applications for teaching chemistry based on gamification.

The MILAGE LEARN+ implements a gamification scheme, which is being used in teaching/learning “Organic Chemistry" course, where gamification is a used strand. This subject, organic chemistry, has been classified by the students as difficult to understand, which leads to a high failure rate in its curricular units.

The objective of this work is using gamification elements from App MILAGE LEARN+, to motivate the learning of this area of knowledge, promote autonomous work and facilitate fixation concepts through self and peer assessment.

The practice involving App MILAGE LEARN+ was carrying out organic chemistry tasks to do outside of the class and after there is a discussion in the class. These reinforce learning the concepts. The topics involved were, mechanisms of reaction, stereochemistry and structure of compounds. MILAGE LEARN+ works like a task book and is structured in chapters and subchapters with exercise sheets. This approach follows the strategy described above. The teacher uploads the tasks including the solutions with criteria for assessment and the student solves the tasks using the app MILAGE LEARN+ app (Figure 2).

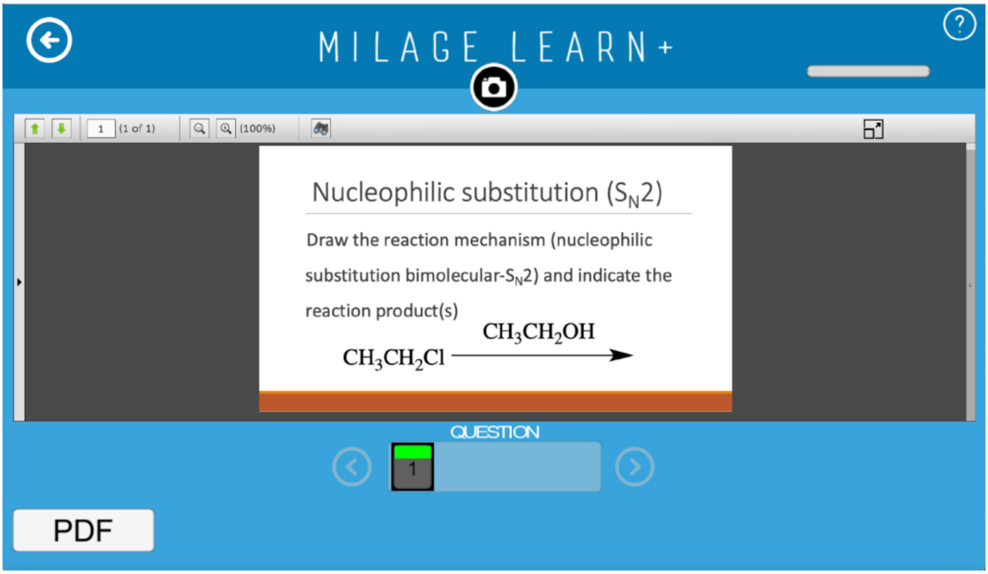

Figure 2. Students use the App MILAGE LEARN+ to solve tasks.

4. Class Discussion Scenario

MILAGE LEARN+ allows the application of active learning strategies, which aim to focus on the student in the creation of new knowledge, with the teacher as a facilitator of this process. The pedagogical practice of the “System Analysis and Design” (SAD) course aims to promote new ways of reasoning to students in order to facilitate the application of acquired knowledge, and aims to:

- Active learning in the classroom (through MILAGE) and outside the classroom (through a problem-based learning scenario)
- Plurality of points of view.
- The use of devices with network access to replace notebooks and the blackboard, incorporating technologies into everyday classroom life.

The SAD course encompasses theoretical and practical classes. Theoretical classes last one hour, taught twice a week. The content is provided in two 15-minute segments, alternating with tasks on the topics taught, using the MILAGE LEARN+ app. In this application, the statement of the task is presented and the students submit their solution. After submission, the student is able to view the video explaining the solution and self-assess its solution using the criteria instructions for self-assessment provided by the teacher. Upon completing the self-assessment, the student can proceed with the assessment of a peer’s solution (randomly assigned by the application) using the same instructions for assessment. Students accumulate points by self and peer assessment taking advantage of the gamification to motivate students and promoting autonomy with the self and peer scheme implemented in the MILAGE LEARN+ app.

In practical classes, tasks are carried out to reinforce the knowledge acquired in theoretical classes and in preparation for class discussion learning scenarios. In this context, the application is used in a different way, with the aim of discussing the various submitted solutions in the classroom. The teacher does not upload videos with detailed solutions to the MILAGE LEARN+ app, but criteria and good practices to apply in the solution. Figure 3 shows the tasks performed during this process:

1. Students submit solutions in groups using the MILAGE LEARN+ app.
2. Teacher shows all the student solutions.
3. Student groups discuss solutions.
4. At the end the teacher comments.

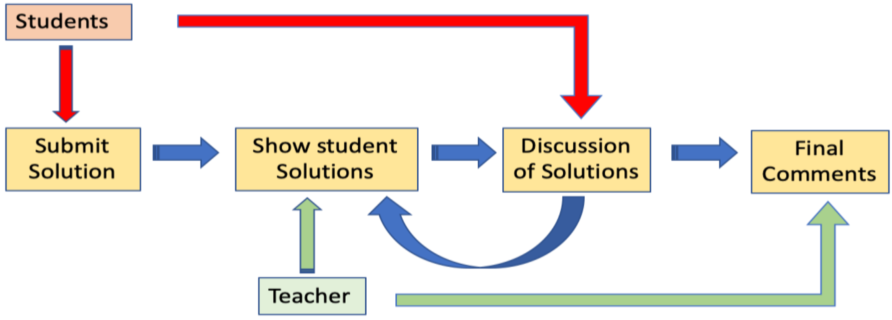

Figure 3. Class discussion learning process using the MILAGE LEARN+ app.

5. Evaluation and results

The practice of using the MILAGE LEARN app was measured through an online questionnaire with students attending the "Organic Chemistry", consisting of the following questions:

1. Are points results important?
2. Is the existence of leaderboard score motivating?
3. Doing the tasks as part of the game makes learning more fun?
4. Carrying out the tasks helps to understand the theory?
5. Carrying out the tasks motivates students to study the theory?
6. Self-assessment of the tasks helps to understand the solution?
7. Evaluating colleagues' tasks helps to understand the solution?

These questions aimed to assess the influence of the various gamification elements introduced in pedagogical practice through MILAGE i.e. the importance of points and the ranking of students as well as performing and correcting exercises as part of a game. The students had, as answer options, a 4-point Likert ordinal scale: (1) Totally Disagree, (2) Partially Disagree, (3) Partially Agree, (4) Totally Agree. Results are illustrated in figures 4.a and 4.b. The former shows the results of questions 1-3, and figure 4.b shows the results for questions 4-7.

The analysis of the 48 answers to the questionnaire shows how the majority of the students totally or partially agreed with all the questions asked. In this sense, it is possible to conclude that the gamification elements significantly contributed to the motivation of the students and to the understanding of both the theoretical contents and the practical tasks.

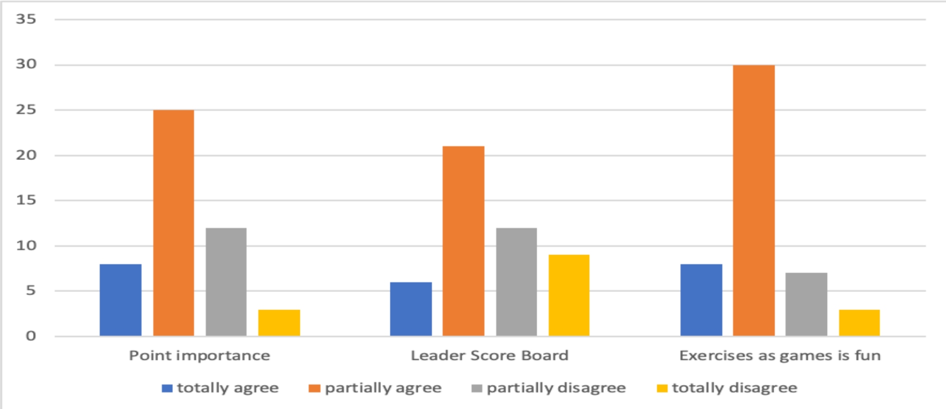

Figure 4a. Results of questions 1-3 of the gamification evaluation questionnaire with the MILAGE LEARN+ App. The Y axis represents the number of responses obtained from a maximum of 48 respondents.

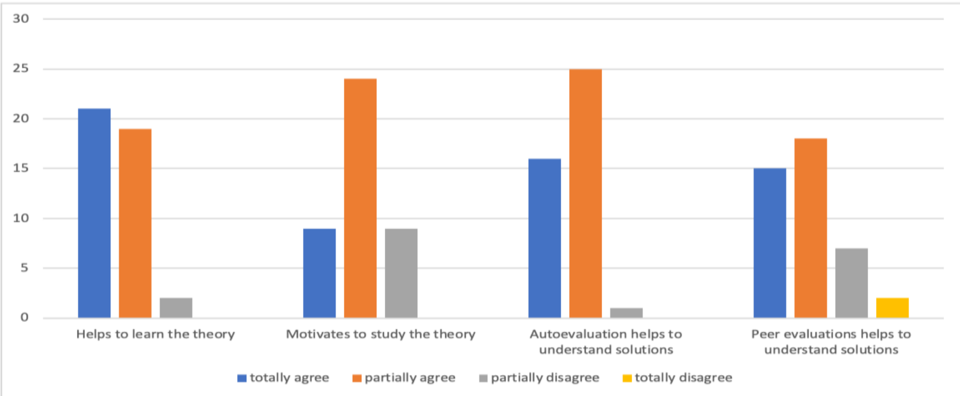

Figure 4b. Results of questions 4-7 of the gamification evaluation questionnaire with the MILAGE LEARN+ App. The Y axis represents the number of responses obtained from a maximum of 48 respondents.

However, it was observed that the degree of agreement was variable, with question (6) "Self-assessment of the tasks helps to understand the solution" the one that obtained the highest agreement (97.62%) and question (2 ”Self-assessment as an aid to understanding the solution with the lowest agreement (56.25%). It should be noted that in terms of the different game activities, there was greater agreement on the value of carrying out the tasks than on the value of the evaluation activities.

6. Conclusions

This paper shows the use of the MILAGE LEARN+ app to implement gamification and class discussion scenarios on Higher Education explored for the teaching of “Organic Chemistry” and “System Analysis and Design” courses.

The main element for analyzing the results is the appreciation of the MILAGE LEARN+ application by the students, which, being positive, motivated the teachers to continue with this teaching approach by applying the MILAGE LEARN+ app.

After analyzing the questionnaires, it can be seen that the appreciation on the part of the students was, in general, quite positive. From the perspective of teachers, active learning strategies were applied extensively. Gamification motivated students for the learning. Carrying out activities centered on students allowed promoting the autonomous exploration of solutions and the ability to explain them. Strategies such as self-assessment and peer assessment promoted the development of their critical thinking capabilities and autonomy.

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