MOBILE ELECTRONIC LEARNING AND GAMIFICATION IN THE PRACTICES OF OPHTHALMIC OPTICS I

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Abstract

Mobile electronic learning (m-learning) consists of using mobile electronic devices to facilitate learning. It is characterized by its portability, immediacy, ubiquity and flexibility. Gamification involves the use of techniques and dynamics from games in other activities to enhance motivation and productivity. The combination of both concepts in teaching results in a tool that facilitates the construction of knowledge, the resolution of problems in an autonomous and ubiquitous way, the constant feedback and the measurement of the student learning. Kahoot! is a web service of gamified education in which any person can create a game board (Kahoot) with multiple choice questions that would have to be solved as a contest. Once the Kahoot is created, players join it by entering a PIN code in the mobile application so that the device becomes a remote control with which to answer questions and see who wins. Thus, Kahoot! is postulated as the ideal tool to implement gamification and m-learning, methodologies based on the use of Information and Communication Technologies.

Ophthalmic Optics I (OOI) is a subject of the third year of the Degree in Optics and Optometry of the University of Alicante which focuses on the study of the fundamentals and the geometric and optical parameters of the simplest ophthalmic elements and their main measuring, adaptation and assembly techniques. We have developed 5 Kahoots, each consisting of 5 multiple choice questions related to the concepts to be dealt with in 5 of laboratory practices of OOI. Each question offered four possible answers of which only one is correct, in a similar way to those that will appear in the evaluation tests of the lab practices. Before starting the practice session, any doubts arising from the previous reading of the corresponding script were resolved and the PIN code of the Kahoot of that day was provided to the students, who had a time between 5 and 10 minutes for its resolution. Once finished, any new doubts that might arise were resolved. An opinion survey consisting of a Likert scale was requested to all students. Normalizing the scores to 10, the usefulness of the Kahoots was scored with 8.1, the concordance between the concepts discussed and those questioned with 8.5, the time spent with 7.7 and the number of questions with 8.0. With regard to the possibility of including it as an evaluation test, only a score of 3.5 was obtained. We have compared the average evaluation results of the last years and the number of students that passed the exam has increased by 38%.

Keywords: m-learning, gamification, ophthalmic optics.

1 INTRODUCTION

The United Nations Educational, Scientific and Cultural Organization (UNESCO) has affirmed mobile electronic learning (m-learning) has a great potential in enhancing the quality of learning results [1]. M-learning consists of using mobile electronic devices to provide a portable, immediate, ubiquitous and flexible learning. Hence, UNESCO recommended Governments to adopt technological infrastructure to ensure equal access to mobile connectivity and the increasing range of learning possibilities. On the other hand, gamification is the application of game-design elements and game principles in non-game contexts [2] in order to enhance motivation and productivity. Education and training are areas where there has been interest in gamification in the last years [3]. The combination of m-learning and gamification in teaching results in a tool that facilitates the construction of knowledge, the resolution of problems in an autonomous and ubiquitous way, the constant feedback and the measurement of the student learning [4].

Ophthalmic Optics I studies the process of image formation and properties of all types of ophthalmic lenses used in optometric prescriptions and their adaptation process, in addition to dealing with the techniques of centering, adaptation, assembly and manipulation of all types of lenses, of an optometric prescription or a visual aid [5]. Within the Degree in Optics and Optometry of the University of Alicante, the teaching methodology used in the subject is based, on the one hand, on an in-person part that includes theoretical class modalities, problem practices and practical classes, and, on the other hand, a
non-attendance part that promotes self-learning and that includes the modalities of non-attendance tutorials and group and individual study and work. Laboratory practices are pooled in 8 individual practices of 2 hours duration in which the measurement and assembly of all the compensating elements studied in the subject is carried out. For each practice, a script is prepared indicating the objective, the material and the procedure to be followed.

Kahoot! [6] is a web service of gamified education in which any person can create a game board (Kahoot) with multiple choice questions that would have to be solved as a contest. Once the Kahoot is created, players join it by entering a PIN code in the mobile application so that the device becomes a remote control with which to answer questions and see who wins. Thus, Kahoot! is postulated as the ideal tool to implement gamification and m-learning, methodologies based on the use of Information and Communication Technologies.

This work is structured as follows. In section 2, we detail the methodology consisting of developing different Kahoots and presenting them to the students. Next, in the third section, we assess the results from those Kahoots and we compare the results of the evaluation of the laboratory practice of this year with those of previous years. Finally, the Conclusions section is aimed to discuss results and findings.

2 METHODOLOGY

We have developed five questionnaires corresponding to five laboratory practices. Each test consists of five multiple-choice questions with only one correct answer between four options whose content was related to the practice session. These questionnaires have been implemented in Kahoots and were presented to the students as a challenge to resolve before the different practice sessions. Students needed to install Kahoot! App on their mobile devices and enter the code manually for each questionnaire. Figure 1 shows two screenshots of the App. As the student answer the questions, the correct choice is highlighted, and the next question is presented. A review student data could be consulted at any time to see which students had completed the challenge and how many questions they had answered. It allows tracking the progress and finally downloading a spreadsheet with a report for the game.

![Figure 1. Screenshots of mobile device. The questionnaire is presented as a challenge. There are 60 seconds to answer each multiple-choice question.](image)

A Likert scale [7] has been used to assess the opinion of the students regarding the experience. It consisted of six questions with different scales as can be seen in Table 1. Note that, although all them present growing scale, the fourth and the sixth questions actually are of increasing and decreasing scale, with the central score being the most favourable.
Table 1. Opinion Likert scale.

<table>
<thead>
<tr>
<th>Q1: Assess the usefulness of doing a Kahoot before each practice session</th>
<th>Not useful</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>Very useful</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q2: Would you include Kahoot results in the ongoing evaluation?</td>
<td>No way</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td></td>
<td></td>
<td>Sure</td>
</tr>
<tr>
<td>Q3: The concepts asked in the Kahoots are consistent with those treated in each session</td>
<td>Nothing</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>Entirely</td>
</tr>
<tr>
<td>Q4: The time allotted to each question</td>
<td>Scarce</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>Excessive</td>
</tr>
<tr>
<td>Q5: The concepts asked in the Kahoots agree with those treated in the scripts.</td>
<td>Nothing</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>Entirely</td>
</tr>
<tr>
<td>Q6: The number of issues in each Kahoot</td>
<td>Scarce</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>Excessive</td>
</tr>
</tbody>
</table>

3 RESULTS

The Likert scale to assess the opinion about the experience was answered by 57 students. Figures 2 and 3 show the statistics for each question from the scale. Answers to questions 4 and 6 have been transformed from (1, 2, 3, 4, 5) to (1, 2, 3, 2, 1) in order to reflect that the central score is the most favourable. Results show that the experience is valued positively with the 88% of the students considering the Kahoots useful. Around the 85% think that the concepts in the Kahoots and those in the scripts or dealt in the practice sessions agree. Regarding the time established and the number of questions, more than the 60% is in complete agreement. Finally, the possibility of including Kahoot results in the ongoing evaluation is not viewed favourably by almost the 40% of students. Normalizing the scores to 10, the usefulness of the Kahoots was scored with 8.1, the concordance between the concepts discussed and those questioned with 8.5, the time spent with 7.7 and the number of questions with 8.0. With regard to the possibility of including it as an evaluation test, only a score of 3.5 was obtained.

![Figure 2. Staked bar graph with the results for questions 1, 3 and 5 from the Likert scale.](image)
The reports provided by the Kahoot! App allows analysing the total correct answers. They were the 49±15% in average. We have also assessed the influence of the implantation of the m-learning and gamification on academic outcomes. In Figure 4, we present the percentages of each score, corresponding to the European Credit Transfer and Accumulation System grading scale, of the practice assessment test of the present year (18-19) and the average of the three previous years. The improvement in results is evident, with 38% fewer fails.

4 CONCLUSIONS

The combination of m-learning and gamification in teaching the laboratory practices of Ophthalmic Optics I has resulted in a tool that improves the academic results. Students favorably value the experience, but they are reluctant to the Kahoots as an assessment test.

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REFERENCES


