GAMIFICATION THROUGH MOBILE DEVICES: A LEARNING DESIGN AIMED AT SELF-REGULATED LEARNING

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Abstract

Gamification and mobile learning can foster the shift towards a more active student role, which is coherent with the current design of Technology Enhanced Learning (TEL) directed towards enhancing Self-Regulated Learning (SRL). Gamification is normally defined as the introduction of game strategies and elements in non-game contexts. There are many learning activities that have introduced gamification in order to foster motivation and participation with generally positive results. However, the impact on results is still under discussion. Mobile learning is described as the driver for learning anywhere and anytime. Affordances and drawbacks are being discussed in international research as well as barriers related to both students and teachers digital skills.

This article presents research on a gamification activity through mobile devices, whose learning design is framed under a self-regulated learning approach. The activity is carried out with students of Early Childhood and Primary Teacher Education programmes of the University of the Balearic Islands (UIB) in Mallorca and Ibiza (Spain). Online quizzes are answered by students using their own mobile devices in classroom settings. The learning activity is aimed at fostering motivation through competition and participation as well as monitoring learning due to the possibilities for immediate feedback. Research goals are the exploration of students’ engagement and their perceptions on the educational experience. From a quantitative approach, data is obtained using diverse research instruments. Results on personal use of mobile devices do not show special skills for academic aims although their daily habits and routines anticipate a lack of difficulty to carry out a Bring Your Own Device (BYOD) activity in formal settings. Also, data show generally positive perceptions by students regarding both their motivation and the development of self-regulated learning skills although it can be observed that student teachers of Primary Education achieve higher levels of acceptance. Conclusions suggest challenges for self-regulated learning aims.

Keywords: gamification, mobile learning, self-regulated learning, Higher Education.

1 INTRODUCTION

Current design of Technology Enhanced Learning is aimed at fostering self-regulated learning (SRL) [1], which is coherent with the aim of gamification and mobile learning since they enhance the shift towards students’ control of their own processes. In general SRL has been understood as learning to learn [2]. It occurs in social contexts such as the classroom [3] where self-regulated learners play an active role in a “metacognitively, motivationally and behaviorally” way [4] to accomplish their learning goals [5]. Motivation is one of the most important factors that can impact the process of self-regulated learning [1]. Actually, [5], who described the process as a cycle of three phases, has understood motivation as a driver in the beginning and final stages. Expert students are better at self-regulated learning skills and processes [5].

There are numerous studies both about gamification as can be observed in the literature review by [6] and about mobile learning as [7] demonstrate. [8] present a learning experience based on the combination of both, and they conclude the impact on students’ motivation. Furthermore, self-regulated learning is normally observed in relation to one of each, such as in the work by [9] where it is related to gamification or in the study by [10] related to mobile learning. In both of these works, positive results are observed in relation to students’ self-regulated learning skills. Nonetheless, this work is a step forward since the self-regulated aim is included in a learning design, involving both gamification and mobile learning.
2 BACKGROUND

2.1 Gamification

Gamification is normally defined as the introduction of game strategies and elements in non-game contexts [11]; [12]; [6]. In the formal setting of Higher Education, the term has been used in the learning design of games with a view to encouraging self-regulated learning aimed at developing students’ motivation and skills minimising cognitive efforts [13];[14]. Elements of gamification are: points, badges, leaderboards, progress bars, performance graphs, quest, levels, avatars, social elements and reward systems [15]. There are many learning activities that have introduced gamification in order to foster motivation and participation with general positive results. However, the impact on results is still under discussion [11]; [12]; [6]. It has been related to conductist and constructivist theories as stated by [16]: with the former because of elements such as instant feedback, support, and small task programming whereas with the latter it shares the vision of the active role of students in the construction of their knowledge. Furthermore, it has also been related to connectivism because of the importance of social networks for both individual and group learning [16].

Motivation has been observed as one of the main educational aims of gamification [17]; [18]; [12]. In the context of gamification, motivation is boosted by success or failure [17]: the system can strengthen positive emotions by the usage of points and rewards, or anxiety can also be generated, which can also be positive. In this case, it is necessary for the system to promote experimentation and repetition. If difficulty is balanced, it is also possible to achieve optimal levels of motivation too [17]. There are two types: intrinsic and extrinsic, which have been defined in a continuum [17], and although there were described as opposites, current research has suggested that the two may coexist [19]. Traditionally, intrinsic motivation has been considered as a willing based on inner interest, challenge and pleasure whereas extrinsic motivation has been related to the willingness based on external factors such as rewards [19]. Gamification fosters the first but researchers claimed that students need to be lead to the second in which the reward is learning in itself [20].

In the context of traditional learning settings, gamification can have a great potential for unmotivated students and teachers [20], [21] and, currently, the constructive effect has been demonstrated in numerous studies [22]; [23]; [6];[14]; [24], highlighting the positive impact of competition [25], and in particular with the use of the Kahoot! platform [26]. However, the discussion is very interesting since it has been claimed that gamification could have negative effects on students with higher levels of intrinsic motivation [6].

2.2 Mobile learning

Although an agreement has not been reached on the clear definition of mobile learning [27]; [28], a vast majority of authors describe it as the driver for learning anywhere and anytime [29], [7]. [29] has recommended the use of mobile learning for educational aims. Currently, affordances and drawbacks are being discussed in international research [7] as well as barriers related to both student and teachers' digital skills [30].

First of all, the increasing motivation of students of diverse levels has been observed [31], [32]. Secondly, it can be used under many educational approaches and learning tasks such as peer learning, flipped classroom, project based learning or gamification [7]. However, it should be pointed out that the mere fact of introducing technology and mobile devices does not guarantee educational innovation per se [33].

There are some set of drawbacks that have also been observed in relation to digital skills. As for students, the fact that they are good at downloading music, games and films, or access information and use social networks does not mean that they have sufficient and suitable skills in the use of technology for learning aims [30]. As for teachers, the fact that they use mobile technology for their everyday life does not mean either that they have developed digital skills for professional contexts. Likewise, teachers’ digital skills are more than technical abilities; they are about the pedagogical knowledge needed to design and implement true innovative learning designs [28], in which autonomy is given to students.
3 THE STUDY

3.1 Context and participants

This study is carried out with three groups of participants, based in Mallorca and Ibiza (Spain), in two Teacher Education programmes of the University of the Balearic Islands (UIB) in two different subjects of their years one and three in 2015-2016 and 2016-2017.

The group of participants is of 379 students, from which 68% are in their year 1 of the Primary Education teacher programme and 33% in their year 3 of the Early Childhood training programme. The vast majority are women (81%) and the average age is 21.

The learning activity is based on a platform that has got two sides: the one called getKahoot! in which teachers prepare questionnaires and the other one, Kahoot!.it where students can answer the questionnaires. Six quizzes were prepared to be answered in class with an average of ten questions each. Questions were based on learning resources such as reading comprehension text and videos. The learning activity is aimed at fostering competition and participation as well as monitoring their learning process due to the possibilities for immediate feedback afforded by the system.

3.2 Methodology, instruments and results

From a quantitative approach, results obtained with two research instruments are presented. Research aims are the following:

1. To explore students’ usage of their mobile for learning aims
2. To explore the possibilities of Kahoot! for self-regulated aims and students’ perceptions on the learning activity

Questionnaires based on previous models are built ad hoc. The instrument to explore the task in the context of self-regulated learning is built based on that of [22]. A Delphi Panel was used for the validation of the new resulting instruments in which some items were modified. The reliability of the instrument’s internal consistency was estimated using Cronbach’s alpha coefficient, which was 0.77 in the first instrument and 0.81 in the second.

3.3 Results

A selection of results are presented in tables and charts in relation to research aims.

1. To explore students’ usage of their mobile for learning aims

All students are equipped with a mobile device with which carry out their learning activity and 67% of them consider it as an essential tool for learning. General results about students’ usage of mobiles show that 64% of participants use their mobile devices on a regular basis and 36% admit to using them more than necessary. Results in table 1 show quite similar educational usages of mobile devices by students in both years. It seems that these devices are mostly used for communication and access information. Students in year 3 achieve higher levels of communicative uses in the context of learning with their smartphones. Results on the creation of objects are surprisingly low. Although mobile phones are presumably used to take photos or videos, for example, these data suggest that further edition is carried out on their personal computers.

| Table 1. Frequency and average of students’ usage of their mobile devices for learning aims. |
|-----------------------------------------------|-------|-------|-------|-------|
|                                               | Year 1 | Year 3 |       |       |
|                                               | Frequency | Average | Frequency | Average |
| To access information                         | 0,316    | 31,6    | 0,305    | 30,5    |
| To create objects (audio, video, picture)     | 0,012    | 1,2     | -        | -       |
| To share and communicate with others          | 0,574    | 57,4    | 0,678    | 67,8    |
| For all aims                                  | 0,1      | 10      | 0,025    | 2,5     |
| TOTAL                                         | 1,002    | 100,2   | 1,008    | 100,8   |
To explore the possibilities of Kahoot! for self-regulated aims and students’ perceptions of the learning activity

General results show positive answers by students of both Teacher Education programmes in all items in relation to the possibilities of Kahoot! for self-regulated aims and also in particular for their satisfaction with the learning activity as can be observed in table 2.

**Table 2. Assigned values of Kahoot! for self-regulated learning aims and for students satisfaction towards the task.**

<table>
<thead>
<tr>
<th>Item</th>
<th>Year 1</th>
<th>Year 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Average</td>
<td>Standard Deviation</td>
</tr>
<tr>
<td>1. Degree of help of Kahoot! for self-regulated aims</td>
<td>6.92</td>
<td>1.71</td>
</tr>
<tr>
<td>2. Degree of motivation for the usage of Kahoot!</td>
<td>7.92</td>
<td>1.76</td>
</tr>
<tr>
<td>3. Degree of help of Kahoot! for feedback</td>
<td>7.9</td>
<td>1.72</td>
</tr>
<tr>
<td>4. Degree of satisfaction for the use of Kahoot! in class</td>
<td>7.8</td>
<td>1.73</td>
</tr>
</tbody>
</table>

More detailed data about answers by students in Year 1 and 3 are presented in figures. As can be observed in figures 1 and 2, more than half of the group in Year 1 understand that Kahoot! has been quite beneficial in terms of self-regulated aims (levels 7 and 8) whereas these levels are only admitted by approximately 29% of participants in Year 3. Conversely, the lowest levels have a more relevant presence among these students.

**Figure 1. Kahoot! for self-regulated aims in Year 1.**  **Figure 2. Kahoot! for self-regulated aims in Year 3.**

Motivation is again higher in Year 1 since 43% of students value it in levels 9 and 10 (fig. 3), which do not appear in Year 3 (fig. 4). Intermediate scores such as 7 and 8 are quite similar in both groups (41% and 43% respectively) although they reach the highest number for students in year 3. Again, the lowest grades are more prevalent for students in Year 3 (about 30% in 3 and 4 levels).

**Figure 3. Motivation towards Kahoot! in Year 1.**  **Figure 4. Motivation towards Kahoot! in Year 4.**

As shown in figures 5 and 6, students valued the feedback afforded by Kahoot to a similar degree although is still higher for students in Year 1 (40% and 30% respectively between 9 and 10 levels and
nearly 50% in both groups for levels 7 and 8). A very low average appears for the lowest grades of less than 5.

General satisfaction can be observed in both groups, as data presented in figures 7 and 8 demonstrate. However, the highest scores between 8 and 10 only appear in Year 1, given by 66% of participants. A more cautious acceptance is observed by students in Year 3 where levels 6 and 7 are given by only 57% of participants. Conversely, a relevant 28% of students in Year 3 indicate their dissatisfaction.

A general overview of the data allows us to confirm positive and very positive perceptions towards the use of the questionnaires with Kahoot! for self-regulated aims, and student satisfaction towards the activity per se. It can be confirmed that students have been motivated by the use of the tool. And in particular, it seems that Kahoot! can be very useful for receiving feedback.

4 DISCUSSION AND CONCLUSION

In general, it can be suggested that results show generally positive perceptions by students regarding the self-regulated learning skills developed through the gamification-based activity. Also, personal use of mobile devices does not show special skills for academic aims although their daily habits and routines anticipated a lack of difficulty in carrying out a BYOD activity in formal settings.

Furthermore, some interesting and challenging observations can be observed when analysing data obtained in both groups. It might have been expected that expert learners would appreciate SRL possibilities more than less expert learners, based on [5]. In this sense, it could have been expected that students in Year 3 should perceive the SRL affordances more than students in Year 1. However, this has not occurred, but in fact, quite the opposite. Thus, some hypothesis could be suggested. For instance the usage of mobile devices may have influenced students’ perceptions. Likewise, the fact that students in both years are from different Teacher Education programmes may be a relevant variable to take into account for further research. The personal characteristics of students in Early Childhood programme may differ from those in Primary Education programme, which might explain the different results obtained here. Thus, these results have important implications for future educational implementation and research.

This learning activity is in line with the use of ICT to give student teachers early experience with which influence their attitude and beliefs, as key elements for future use in their careers [34], [35]. In particular, the need to integrate mobile learning in the development of digital skills has also been claimed in research [30]; [28]. Furthermore, it involves another design in which ICT can be used in
order to overcome traditional methodologies based on teacher lecturing and the passive role of
students [36], [37].

Although Kahoot! has been explored previously [26] this current study takes a step forward since it is
related to self-regulated learning. Firstly, motivation has been considered intrinsically, allowing
students to feel engaged by scores and rewards but making them aware of the knowledge achieved
through reassessment. Secondly, feedback has been immediate and facilitated by the internal
characteristics of the questionnaire service. And, thirdly the questionnaires have become a moment to
monitor one's own process and to collaborate with others.

Gamification has been used as a game element in a non-game context [11]; [12]; [6]. Data on
students’ perceptions confirm previous research in which positive effects have been observed [22], [6],
[14], [24]. Student engagement has been achieved by positive competition and social collaboration as
observed by [13],[14]. Also, rewards have fostered student motivation and participation as claimed by
[25]. The final scale of punctuation for each participant has been another element of gamification that
can be important for feedback as suggested by [38].

However, further research is needed to explore gamification in terms of self-regulated learning. It is
really challenging that results do not show better perceptions for expert students as might have been
expected. Also, the effect of motivation has been discussed so far and possible negative effects on
intrinsically motivated students, as have been argued in research by [6]; [24] have not as yet been
measured.

The main recommendation derived from this study is the relation of gamification and mobile learning to
the self-regulated learning framework. It is paramount for the use of ICT for learning to go beyond the
use of tools and devices per se and promote reflection and collaboration through the use of games.

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