Quizzing to Become an Engineer - A Commercial Quiz App in Higher Education

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Abstract

Mobile quiz apps have received a huge popularity in recent two years. They have brought the well-known game mechanic of a quiz to mobile apps as a new kind of media. Quizzes and underlying Multiple Choice Questions (MCQ) are an established assessment and learning aid. Therefore, quiz apps can be considered as a potential educational tool. However, there has not been a commercially successful quiz application so far, which allows the integration of self-created content. This situation has changed in September 2015, when QuizUp, one of the main competitors in the quiz app market, was opened for individual content. We employed QuizUp in two higher education courses of environmental engineering (n_M=21 resp. n_B=13) in two functions: first, the quiz app has been used as an accompanying learning aid in order to ensure a constant topic-relevant activity during the course. Secondly, the app has been utilized as a media in selected lectures. Our main research questions are (a) if a quiz app is received as a motivating learning aid and (b) in how far gamification elements (e.g. duels between players, ranking lists, badges and time pressure) contribute to gaming experiences. After the final lecture we conducted an online survey, which has been designed based on the results of guided interviews with 4 students. Furthermore, selected items of the Game Experience Questionnaire (GEQ) have been added. Additionally, we measured students' activities with statistical data exposed by the app. Among our findings, which draw an ambiguous picture, are: the usage in lectures as a medium is very accepted and led to both, high engagement and high immersion of students. The app was able to motivate only a small fraction of students to use it self-directed continuously. Although, the GEQ results indicate the perception of QuizUp in an educational setting as a game, educational topics are by far less attractive than provided entertainment topics.

1. Introduction

Starting in 2013 commercial quiz apps have received a huge popularity. Even if the hype has declined recently, *QuizClash* [12] and *QuizUp* [15] can be considered as successful. The German issue of *QuizClash*, *Quizduell*, accounts for a player base of almost 27 million accounts (January 2016). This is almost a quarter of the German-speaking population. At the same time it is used as a medium in a German TV show [13]. A similar development is demonstrated by *QuizUp*, an app which found 17 million players in its first five months [16]. Its developer *Plain Vanilla* names "QuizUp […] as] the biggest trivia app in the world with over 70 million users, 20 million in the US alone." [15] Having already used the principle of crowdsourcing for app-provided questions from an early stage of development, the app has been opened for completely user-defined topics in September 2015 [14].

Quiz apps base on multiple choice questions (MCQs), which are an instrument of formal assessment [11]. However, a phenomenon called *testing effect* describes the principle that repeated assessment can support learning as well [7]. Even if MCQs probably are not the most effective question format for learning [9], they are an easily assessable and therefore operable means of questioning. Furthermore, there is the (theoretical) possibility to represent knowledge of all cognitive levels by MCQs [1, 6]. A crucial issue of MCQ usage is the provision of high-quality questions. Thus guidelines have been developed [3, 4, 11].

For learning purposes a whole ecosystem of MCQ-based learning tools has been developed e.g. *Quizlet*, *Skive*, and *StudyBlue*. These apps focus purely on learning, which commonly is a cumbersome and extrinsically motivated process. In contrast, gaming can be considered as being motivated intrinsically. By the term game-based learning (GBL) learning processes in the context of gaming are described. Learning results are achieved during intrinsically motivated game play. In this context, Klopfer frames the design of mobile learning games [8]. The approach described here is to facilitate a commercial quiz app for learning purposes: learning should be made more attractive, which in turn leads to better results. As the learning activity of answering questions is the core of the game

play, a concept of Bruckman would be followed by this approach: "Make the learning inherently fun." [2]

Previous work has shown that specifically created gamified learning apps may not provoke sufficient intrinsic motivation [17]. Also we were able to determine that players enter quiz apps with a high willingness to learn and the wish to compete with their friends [18]. QuizUp supports this demand for sociability by the introduction of social network service features in May 2015 [10].

QuizUp. Main game mechanism is a match against a competitor. A match consists of 7 MCQs. Questions should be answered synchronously. The selection of the correct answer has to be accomplished within 10 seconds. Depending on the time used, a correct answer results in up to 20 points. Points won in matches are aggregated to a level. Ranking lists spur competition: for each month and each topic rankings are available. As it may be probable that there is no competitor available at a certain time, two fallback solutions have been provided: First, bots are assigned automatically. The other possibility is an asynchronous batch mode with a real player. At the backend, QuizUp provides a content management system for user defined questions. These questions are restricted concerning their length and the length of their answers.

2. Methodology and setting

We employed QuizUp in two regular environmental engineering courses in the last four weeks of the semester- spanning courses: a bachelor course in *Measurement Technology* and a master course in *Anaerobic Technology*. The aim was to support continuously learning and especially regarding the exam preparation. Table 1 shows the numbers of students, who were enrolled in a course and who completed the questionnaire.

Table 1 Number of students

	Bachelor Course	**Master Course**	**Total**
$n_{enrolled}$	13	21	34
$n_{questionaire}$	13	13	26

For each course we established a new question topic in QuizUp with each 33 questions. Thereafter, we informed students via email and face-to-face communication about this learning support tool.

The main research questions of our study are: *Is QuizUp a motivating learning aid for technical questions? (RQ1)* and *How do gamifications elements influence the learning and gaming experience? (RQ2).*

To answers these research questions, we collected data from app provided statistics, we conducted guided interviews and issued a questionnaire. App data was gathered on a regular base manually: App-provided ranking lists were useful to overview the participation. We observed new users, playing activity, levels and points as well as the played matches in educational and entertainment topic.

Prior to the preparation of an online questionnaire guided interviews of 45 minutes with 4 students have been done. The interviews served to harden or to reject our assumptions and should potentially reveal previously unknown aspects of the experimental situation. Additionally the in-game variant of the GEQ [5] has been appended to the survey of 27 questions.

3. Results

3.1 Guided Interviews

Beforehand we had been aware that there is a range of motivations and player-type specific preferences. However, we have been surprised by directly contrary positions concerning known or unknown competitors. So one interviewee responded that he reduces his ambition and his will to win when he plays against friends. In contrast he gives his best to win against unknown competitors. In contrast another interviewee stated that play is only fun when friends are involved.

A further area of contrary tastes is mastery. For one person a quiz is boring, when he knows most of the questions and no new questions are added. Another one does not like unknown questions.

A further finding is that students deliberately differentiate between courses, which are prone to pure memorization and courses which require a deeper understanding of matters. Whereas students put their learning effort during the semester to master the latter ones, memorization courses are candidates to establish learning tools. Course accompanying learning would help to avoid the

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predominantly indicated bulimia learning, i.e. knowledge required for exams is memorized shortly before the exam, but vanishes very fast.

3.2 App Data

Most of the players installed QuizUp when the educational topics were introduced to the courses. However, our observations of the number of played matches showed, that a relevant part of the players completed by far more matches dealing with entertainment topics. Figure 1 compares the numbers of educational and entertainment matches after educational topics have been introduced. A logarithmic scale is required to depict the partially vast differences between both categories. From our perspective, it shows the difference between two player types: One group puts its effort into learning and the second group easily gets distracted by an obviously more attractive activity. The distinction between both groups seems to be very clear: either a player belongs to type 1 or to type 2, in-between variants occur seldom.
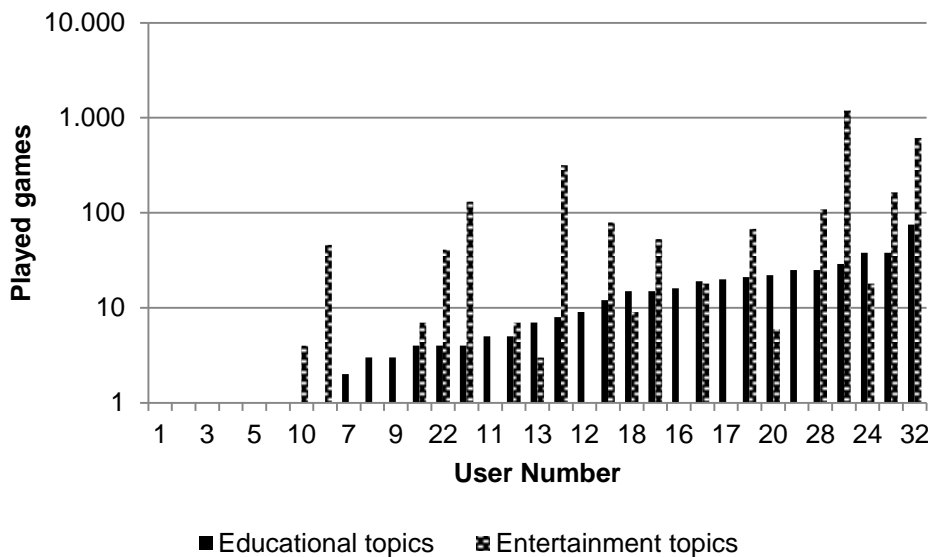

Figure 1: Distribution of matches between educational and entertainment topics

3.3 Questionnaire

Demography. There were 26 participants, 38% were female and 62% male (Q25). 13 of them were involved in the master course, others were enrolled in the bachelor course.

Motivation and attitudes. 38% (10) of the participants confirm that GBL is a good opportunity to learn in a self-paced and self-directed manner (Q2). 24 participants state that the educational use of QuizUp is a good choice to learn for fact-based courses (Q20). However, 9 persons declared that they have used the game only because the lecturer pointed out the relevance for the exam (Q19). In general, there was a positive attitude towards GBL, participants are motivated to deal with QuizUp as an educational tool.

The role of time pressure as a game mechanic is ambivalent. On the one hand, 45% of players declared that time pressure impacts learning results negatively (Q18). On the other hand, 73% feel challenged in a positive sense by the time pressure (Q18).

Game experience. In order to measure to what extent students experienced answering technical questions as a game, we included the in-game items of the *GEQ*. The results have to be considered as valid only in a limited manner, as we have measured them just once. Additionally we have translated them into German, which potentially reduces accurateness further. Results are shown in Figure 2.

Figure 2: In-game GEQ

There are high measures for the components *Positive affect*, *Competence* and *Challenge*, whereas *Negative affect* and *Tension* are rated as low. From our perspective, these figure can be considered as a hint that *QuizUp* is receipted as a game. Accordingly, comparatively high standard deviations are an indicator for different preferences of heterogeneous player types.

4. Discussion

For sure the study shows some limitations. First, the group sizes are small, thus the results cannot be considered as representative. Another limitation was the low number of provided MCQs. Thus only a part of learning goals was represented by questions. Additionally, some interviewees indicated that a question topic comprising only 33 MCQs caused that the topic has been receipted as boring. Nevertheless, the study suggests, that utilization of commercial quiz apps can be a valid attempt to enlarge the set of educational tools. However, such an approach requires the design of an appropriate setting. The intrinsic motivation of player, which is observed in entertainment settings cannot be transformed undiminished to its educational use.

5. Conclusion and Outlook

Our results indicate that the usage of QuizUp has enriched the courses and provided an additional learning media. Most remarkable are the hints that motivation to use the app depend on the purpose. Whereas educational topics required mostly additional encouragement by supervisors, many students readily got involved in entertainment topics. Although QuizUp has been installed to serve the educational settings in the courses, many students ended up having played entertainment topics much more intensively. Further research should look at causes for the different reception of both categories of topics in order to increase the attractiveness of educational topics.

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