

Contributing to Higher Education Success through Cognitive Development Games

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Abstract - The systematic application of study methods allows students to obtain better results in terms of knowledge acquisition. For this, they need to improve certain cognitive areas, such as memory, attention, concentration, etc. In the scope of a student support center in a Higher Education Engineering Institution, in collaboration with a R&D group in Serious Games it was thought that instead of a simple resource consultation platform, the best solution would be to create a serious game that would allow practicing and developing cognitive skills. This would add to the motivation of the students in the use of these tools. This article describes the developed game and the positive results of its use with a first cohort of students.

Keywords - Serious Games; Study Methods, Cognitive Development

INTRODUCTION

One of the identified problems with students in Higher Education is their inability to apply organized study methods. On one side, this might come from their ignorance of such methods but, on the other side, it also derives from a less than optimal cognitive development of some areas like memory, focus, attention, etc. Therefore, it is important to provide them with tools that potentiate solutions for both of these issues.

In the scope of a student support center in a Higher Education Engineering Institution, in collaboration with a R&D group in Serious Games it was thought that, based on previous studies, the best solution would be to adopt a serious game approach for this tool. Well-designed serious games take advantage of their immersive and motivational nature to focus the attention of the player into specific personal development objectives [1]. This allows for an effective and efficient process.

METHODOLOGY

Games are excellent personal development tools as they force the player to solve problems, to prioritize, to solve problems, to collaborate, etc [2]. Therefore, playing games develops a set of interrelated cognitive areas. On top, games are also extremely effective in increasing

student motivation. Serious games exploit this immersive and motivational nature of games to focus the player in a specific “serious” objective [3].

In this particular case, we focused on the use of games specifically dedicated to cognitive function improvement also known as “Brain Training” games (also *Cognitive Games* or *Cognitive Training Games*). The main principle behind these games is that cognitive functions can be improved if “exercised” routinely. This is a topic under debate especially for the unsubstantiated claims that some companies developing this type of games normally produce for marketing purposes. But a meta-research conducted in the scope of the work leading to this article showed that, in most cases, there has been, in fact, an improvement of the targeted cognitive functions.

Examples of these games are *Dr. Kawashima’s Brain Training*, *Lumosity*, *NeuroNation*, *Peak*, *BrainGymer* and *Fit Brains*.

For LearnIt, the predefined requirements were:

- The cognitive functions to be addressed were: memory, verbal reasoning, numerical reasoning, abstract reasoning, focus and attention and emotions;
- The application should take the form of a collection of mini-games, since this is the most common approach that users expect;
- These mini-games should be appropriate for short sessions, typical of casual games, so that they can be played in pause moments for the user;
- It should be clear which cognitive competence each mini-game aims to improve (although it is assumed that there is always some interrelation with other cognitive functions. For each cognitive area, in a first moment, three games were to be developed;
- It should run on the most popular platforms in mobile devices;
- A version compatible with personal computers should also be produced in order to give more options to the user;

- The application should connect to learning resources related to the cognitive functions and methods of study.



Fig. 1 Example of a game for verbal reasoning

The motivation of the player was also a relevant aspect considered. The concept of *Flow* proposed by Csikszentmihalyi was addressed by creating different mechanisms like levels, scores and rankings, therefore adjusting the difficulty of the challenges to the ability of the player [4].

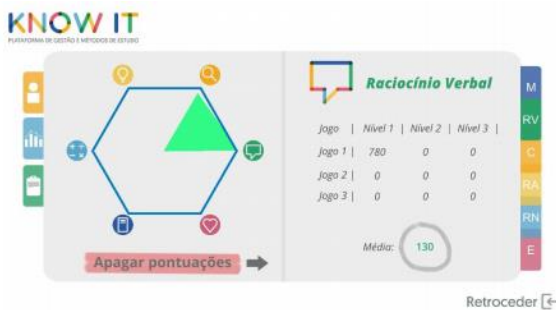


Fig. 2 Screen with user scores

FINDINGS

The evaluation of the LearnIt was carried out by two different groups of Engineering students. Students were given a brief introduction to the game and then they were able to download the game and play with it freely. After two weeks, students answered a questionnaire designed to gather their opinions and perceptions on three different dimensions: usability, gameplay and cognitive development. In total, 28 students completed the game evaluation.

Summarizing the obtained results, we can state that LearnIt was a success in several aspects: there was a considerable number of users who considered the application fun, intuitive, well designed and with a very consistent appearance. The variety of available mini-games was a highly praised feature, which shows that the app can appeal to users with different tastes. The difficulty levels and the progression scheme was also seen as a positive aspect, believed to be well balanced and fair. In addition, more than half of the participants stated that they felt to have developed some cognitive functions by using the game.

CASHE

Nevertheless, only a few users mentioned that they used the game on a daily basis. Because the regular use of the application is one of the most important aspects of its operation, this feedback indicates that adjustments must be made in the motivating factors of the game.

CONCLUSIONS

The purpose of this work was to create a motivational tool that allowed Engineering students to better apply some study methods by improving some cognitive functions. For that purpose, a serious game was designed, developed and validated. The evaluation of the game, done with students from an Engineering Faculty, was focused on the assessment of its usability, gameplay and cognitive development. By doing that it was also possible to assess the level of motivation and fun that students experience when playing the game.

Regarding these two last aspects, the results of the evaluation were, in general, positive, with most users agreeing that the app provides fun and that it can motivate for its continuous use towards cognitive development. Most users were also satisfied with the quality of the software and its easy-to-use interface. There was a dispersion in the identification of the most fun mini-games which indicates that LearnIt can cater for different personal tastes. Yet, a large number of students did not see the game as something they would want to use daily, so this aspect must be improved.

We are fully aware that to be able to ascertain improvements in cognitive functions would require a completely different validation approach. Although the project was supported by a group of Psychologists, they had more experience with the support of the students than with research in the cognitive domain. Therefore, a new stage of the project is now starting with the inclusion of neuroscientists from the Medical Faculty to completely design a more extended validation process using neurological tools which will certainly provide more accurate results in terms of the impact in the cognitive functions.

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