

Serious Games Serving Integration of Graduated Students: Review and Study Cases

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Abstract: Education systems have been applying games for a long time. Use serious games to increase the accessibility and inclusion of graduated students to the job markets are considering by our research. We intend to make it easy and more efficient. We started by conducting a systemic literature review of the application of games and gamification in learning, and it proved to be an effective and interactive tool. We found insightful results concerning the applications of game elements and mechanics in education. This paper will present an updated literature review; we collected hundreds of documents from multiple research databases discussing the learning theories, game theory and design, game development process, and tools. Then we will be presenting a practical work we conducted in the context of our research as an open workshop to create starting games. The first one is a drag and drop game to prepare a resume which is the first step of a laureate's career to set himself apart from others. The second one is a quiz game to prepare the laureate for interviews, make the best impression and show his qualification.

1 INTRODUCTION

A prominent number of tools, technologies and programs have been created throughout the last decade to increase the quality of learning and improve the educational systems. Still, how effective they are to achieve the intended outcomes? However, games proved to be a very effective and successful learning tool to reach them. A game can help students learn multiple training, skills, and new abilities, so why not use them to integrate graduated students inside companies successfully, all along by being engaged, motivated, and having fun.

In our last paper, we explored the application of serious games and gamification in the educational field by reviewing the recent literature, identifying the elements involved in the gamification process and explaining the game elements as a proof of concept (Sabri Zineb, 2020).

In this paper, we conduct an updated statistic; then, we will present how the learning model (Keller JM, 1983) based on attention, relevance, confidence and satisfaction leads us to two games to help the graduated students.

2 LITERATURE REVIEW

As the literature review is always an important milestone to reach in a research journey, we updated our corpus of data to enlarge our analysis and synthesis based on hundreds of papers retrieved from different research databases. We witnessed many studies in this field confirming the potential of games and gamification to improve their effectiveness in learning.

2.1 Methodology

We followed the methodology of N7+1 pedagogy (O'Neill, 2017), composed of eight steps, using Nvivo as a qualitative data analysis software to drive the analysis of our data deeply. By following every step of this process described below:



Figure 1: N7+1 approach and steps.

2.2 Corpus Presentation

We built a rigorous research set using different research databases by title, abstract, and keywords. We searched using multiple words as "gamification", "eLearning", "serious games", and "training" to retrieve so many different articles. We then sorted these research papers to get only those linked to our research study. We reassembled the sorted set in one RIS file using the reference management software: Zotero. Once the corpus set is completed and after checking every research paper to ensure that title, abstract, authors, database source and journal well informed, to have classified literature. We imported then the RIS file into Nvivo, which forms an important part to analyze the data collected by organizing, visualizing and coding it to get an insightful finding at the end:

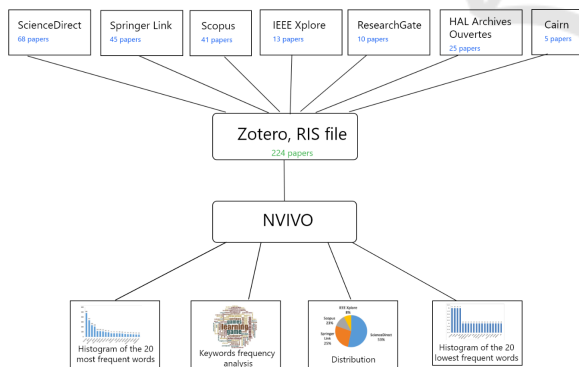


Figure 2: Data analysis approach.

2.2.1 Corpus Distribution by Database

Two hundred twenty-four papers were conducting researches on gamification, and serious games application in education and training extracted using "Science Direct", "Springer Link", "Web of Science", "IEEE Xplore Digital Library", and "Scopus". The

papers fetched from the research databases distributed as the following: 45 research papers from "Springer Link", 68 from "Science Direct", 41 from "Scopus" and 13 from "IEEE Xplore Digital Library", 25 papers from " HAL Archives Ouvertes" and five from " Cairn" (see Table 1).

Table 1: Distribution of sources by the database.

Database Provider	Percentage of sources
ResearchGate	4.72%
Springer Link	21.23%
ScienceDirect	32.08%
Zotero	0.47%
IEEE Xplore	6.13%
Scopus	19.34%
JSTOR	1.89%
HAL Archives Ouvertes	11.79%
Cairn	2.36%

2.2.2 Corpus Distribution by Year

As displayed in the following table, our corpus comprises different research papers from 1970 until now. We have in our set fifteen research published in 2021, which indicates the importance of games and education.

Table 2: Distribution of sources by year.

Year	Number of matching sources
1970	17
2005	19
2006	4
2007	13
2008	4
2009	2
2010	12
2011	19
2012	14
2013	46
2014	2
2015	8
2016	1
2017	1
2018	1
2019	1
2020	2
2021	15

2.2.3 Corpus Distribution by Reference Type

The reference type of the selected research papers is distributed as described in Table 2, Most of the documents are journal articles, and nearly 15% are conference papers.

Table 3: Reference type distribution of sources.

Reference Type	Percentage of sources
Conference Paper	15.02%
Journal Article	84.98%

2.3 Serious Games and Education

Victoria proved the concept by developing the game named It's a deal based on an educational theory; its primary purpose is teaching intercultural business communication (Victoria Guillén-Nieto, 2011). Also, Laurence Hanes and Robert Stone conducted teaching history in their research to prove the impact of serious games in education by defining a model to present historical courses and information using a video game (Hanes and Stone, 2019).

Several meta-analyses (studies of studies) have indicated that game-based learning is more effective for learning than traditional classroom instruction.

Pieter Wouters and colleagues (2013) compared results from 38 individual studies and found that learning games or serious games promote learning and retention more effectively than traditional methods. They also found that using serious games, students learned more than those taught with conventional instruction strategies - lectures and discussions, when the game was augmented with other instructional methods when multiple training sessions were involved, and players worked in groups.

Traci Sitzmann (2011) conducted a meta-analysis of 65 independent samples and data from more than 6,000 trainees, found that trainees who had played games as opposed to those who participated in conventional instructional methods: "had 11% higher declarative knowledge levels, 14% higher procedural knowledge levels, and 9% higher retention levels than trainees in the comparison group."

She also found that the games were "17% more effective than lecture and 5% more effective than discussion, the two most popular instructional methods in classroom instruction." (Sitzmann, 2011).

In another study, Thomas M. Connolly and colleagues (2012) conducted a meta-analysis by reviewing 129 papers reporting evidence related to

the outcomes of computer games and serious games concerning learning and engagement. One firm conclusion they reached was that the most "frequently occurring outcomes and impacts were knowledge acquisition/content understanding and affective and motivational outcomes." learning games are a highly proficient form of instruction for obtaining desired learning results (Thomas M. Connolly, 2012).

3 SERIOUS GAMES: STUDY CASES

We found the word "serious games" mentioned more than 100 times in every research paper collected. Based on the histogram of the most frequent words concluded from our study mentioned earlier (Sabri Zineb, 2020). We found the word serious games and learning are directly connected, reflecting the focus of research for a long time on the application of gamification and games in education, as the best levels of retention, content acquisition, and learning come while playing games.

We followed this highlight in our research because any person learns by experience, not just by teaching. Following the traditional way as an analogy is when you tell a small child not to touch a stove because it's hot. The scenario usually goes like this: you say to the child not to touch it, but the child decides to have the experience on his own and feels the stove. Of course, the child gets burned, but he internalizes the experience and the lesson and decides that touching a hot stove is bad. So, the games or gamification works in the same fashion.

Evolved on this previous approach, we will be presenting two games implemented using C# and unity in this section.

3.1 Puzzle Games

Puzzle games make up a large genre of games, and nearly every game includes a puzzle-solving strategy. They arise from serious mathematical or logical problems.

The puzzle games operate on many problem-solving abilities like logic, pattern recognition, sequence solving, spatial recognition, and word completion.

The puzzle game developed in this present work is for students to get them ready for their first job. The primary purpose is to ease their integration into professional life. The first step is to prepare a

professional resume following the minimum rules that employers use.

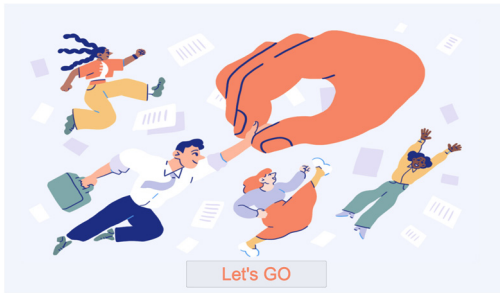


Figure 3: Starting page of the game.

Let's detail the game basics and map it to the dialect of games:

Table 4: Definition of the game.

The Term	The game
Game goal	- Build a professional resume
Core Dynamics	- Drag and Drop the resume elements
Game Mechanics	- Answer the first questions Play with generated blocs to place them in the correct positions
Game Elements	- Chance: depending on what position the player put the generated blocs in, he may have a good or bad event. - Strategy: the player should develop a plan to acquire and gets the rules to win the final resume. - Aesthetics: The visual look of the template grid inspires college-themed versions of the game. - Conflict: the player gets into head-to-head contests with the multiple blocs generated.

The game's play is composed of two parts; the first part proposes a friendly typed question to get some data of the player to generate the proposed blocs, as displayed in the following figure:

Figure 4: Home Page

The second part proposes to the player multiple blocs generated on the left (see Figure 5), based on the information he typed earlier, then he starts enjoying by dragging and dropping the blocs on the grid as he wants,

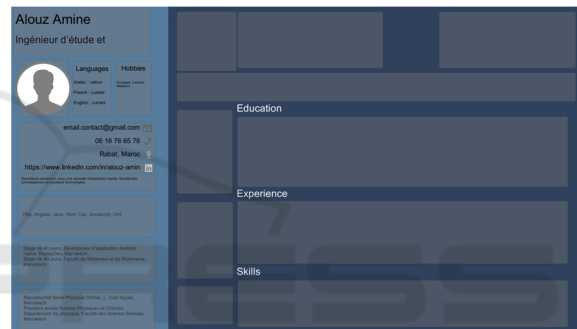


Figure 5: Generated blocs

if he puts the right bloc in the right place, he earns points and indications to guide him understand how to present himself in the resume the most effective way to be selected amongst others,

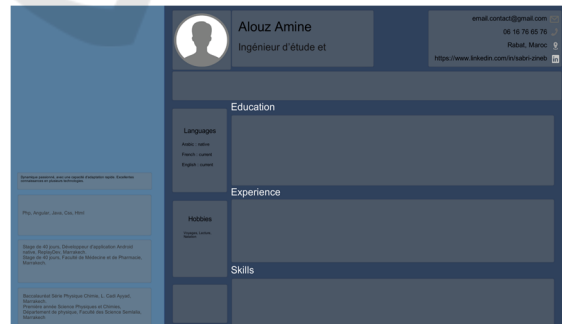


Figure 6: Drag and drop blocs

3.2 Quiz Games

Quiz games have been prominent in our time through tv programs and shows, game consoles, mobile games, etc. They are widely in the education field in

the way of learning, self-assessment, exams and evaluations.

A quiz is composed of a flow of questions. Within this flow, each question is designed for a specific takeaway and requires a predefined answer.

The quiz game developed in this present work is for students to get them ready for their first job. The primary purpose is to ease their integration into professional life. After learning the main basics to build a professional, the graduated students will have to pass the interviews, the second game's primary goal.

Let's detail these game basics and map them to the dialect of games:

Table 5: Definition of the second game.

The Term	The game
Game goal	- Prepare for a job interview
Core Dynamics	- Choose an answer within multiple options
Game Mechanics	- Put the player in a problem-solving situation or context, and let him decide accordingly
Game Elements	- Aesthetics: The visual look of the game has inspired a wide range of spin-offs - Challenge: the player gets to challenge himself with multiple contexts.

The game's play is composed of two parts; first part puts the player in different contexts; the first one, for example, while he is getting ready for the interview at home, he should choose the clothing style, so the game suggests him multiple choices, he gets to choose one option by clicking on it:

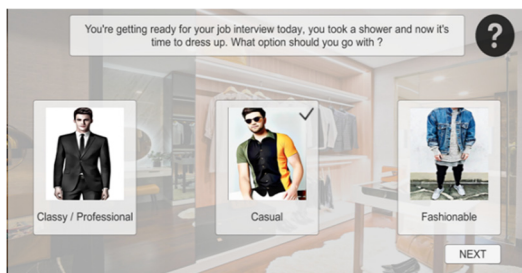


Figure 7: Clothing situation

And then, the player passes to the second one, for example:

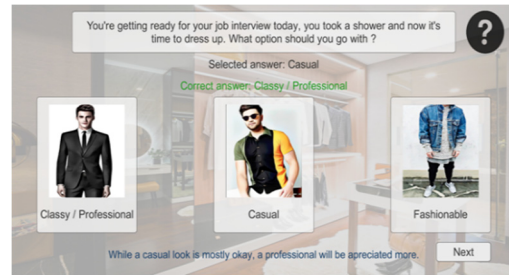


Figure 8: Clothing indication

it's always advisable to have multiple copies of your Resume and getting out early to be on the exact time of the interview, even this problem-solving strategy, is an essential skill that many recruiters and companies require. So, this kind of game can be a helpful way of encouraging this type of mindset and evolving these skills.



Figure 9: Resume copy's situation

As the player continues with the game, he earns points as an award to attend the feeling of well-being and pride that comes from the admiration and recognition that winners and achievers often receive.

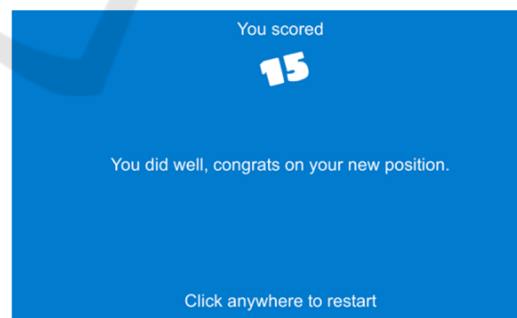


Figure 10: The score view

4 CONCLUSION

Evidence strongly supports the conclusion that games can be effective, practical and efficient tools for teaching players. Our goal to achieve is mainly easing and make the laureate's integration into professional

life very successful. We started by the analysis of literature review to prove the exciting impact of learning through games. We implemented two early version games to test the proposed approach before getting deeper to create a prototype aiming to fulfil the needs. We gathered the requirements while interviewing multiple recruiters in different offshoring enterprises to define the mandatory training students must pass. Then, the soft skills they wish laureates had before integration made it easy and efficient.

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