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Serious Games Development and Impact for Business Education

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Abstract

Learning methodologies and experiences have changed over the recent years thanks to the incorporation of digital technology, among many of these technologies are Serious Games, that has a better opportunity to be used during recent pandemic times, the process of designing and incorporating games technologies is not easy and there are very few available development tools, this paper focus on basic guidelines and a practical experience. Review the process of developing a serious game and address some of the challenges of making a serious game from scratch. The objective is also to understand the challenges of developing and implementing gaming mechanics in Serious Games and the impact and results of the experience of using it with students' samples from Latin America and Europe. The results of this study is that gamming has a very positive impact in the learning process of higher educations students, whom value the use of this technologies in their education, however in general these technologies are not being use in higher education, there is more simulation type implementations, especially in marketing and logistic areas. There is a need to train teachers and create pedagogical departments that will enhance and develop this experiential learning tools.

Keywords: serious games, edutainment, entrepreneurship, gaming base learning, startup education, gaming mechanics, startup journey game

1. Introduction

Higher Education is one of the key strategic factors that are helping to sustain and increase development and social mobility [1, 2], the world is rapidly changing, now we have almost complete generations that have play many games since very early childhood like generation alpha, meanwhile generation Z is mostly on University students and joining the labor force are super familiar with games, the first generation that had games and social networks since very early stage [3], generation Alpha is the first totally digital natives generation and already are playing games like never before, they will be joining universities around 2030 with more experience in digital gamming that any other generation (**Table 1**).

Computer games have already set their foundation on mainframe computers and then extended its use to personal computers and many devices and ways, electronic

Generation Segment	Years Born	Workforce	Education Stage Now	Popular Games	Early Childhood Games (Under 11 years old mostly)	Characteristics	Formative Experiences	Aspiration	Learning Style
Generation X	1961–1980	35%	Mostly done with Higher Education	Pong (1972), Zork (1977), Space War, Space Invaders (1978) Galaxian (1979), Kung fu Master (1984), Pac Man (1980), Tetris (1984), Outrun (1986), Simcity (1989), Super Mario Bros (1988).	Pong (1972)		End of Cold War, Fall of Berlin Wall, Live Aid, Introduction of first PCs, Early Mobile Technology, Rising levels of Divorce	Work life balance	Participative
Generation Y/Millennials	1981–1995	29%	Graduate Level	Super Mario 64 (1997), The Legend of Zelda (1999), Pokemon Red/blue (1996), Sonic (1991), World Soccer (1994), Street Fighter (1992), Super Mario Kart (1992), Resident Evil (1996), Mind Craft	Pac Man (1980), Tetris (1984), Outrun (1986), Simcity (1989), Super Mario Bros 1988.		9/11 Terrorist Attacks, Play Station, Social Media, Invasion of Iraq, Reality TV, Google Earth,	Freedom and flexibility	Interactive
Generation Z	1996–2010	24%	High Schools, Undergraduate at Universities and Masters Degree	Technologies: Game Cube, Play Station 2, Xbox, Wii, Play Station 3, Xbox 360. Virtual Friends, Rez (2001), Wii Sports (2006), Call of Dutie (2007), Guitar Hero (2006), Silent Hill (2001), The Elders	Club Penguin, Mini Juegos, Super Mario Bros, Tony Hack, The Sims, Wii sports, Halo, Tamagoshi (Digital Mascot), Legend of Zelda, Mario Kart, Where in the World is Carmen SanDiego,	Multitaskers, Not bound by work schedules, personal well being, lack of trust and skepticism. The largest generation Ever, fully global generation, connected through digital devices, and	Economic Downturn, Global Warming, Global focus, Mobile devices, Energy Crisis, Arab spring, Produce own media, Cloud computing, Wiki leaks	Security and stability, pursue your passion	Multi-Modal

Generation Segment	Years Born	Workforce	Education Stage Now	Popular Games	Early Childhood Games (Under 11 years old mostly)	Characteristics	Formative Experiences	Aspiration	Learning Style
				Scroll (2006), The Legend of Zelda (2000), Halo (2001), The Sims (2000), GTA San Andreas (2004), League of Legends, Team Fortress 2, Counter Strike, Resident Evil, Grand Turismo, Need for Speed, Word of Warcraft, ForNite, Pokemon Go (2016)	Math Blaster, Barbie Detective, Rollet Coaster Tycoon, Sid Meirs Civilization,	egaged trthrough social media. Digital integrators.			
Generation Alpha	2011–2025		Basic School		Technologies: Play Station 5, Xbox One, Nintendo Switch, Virtual Friends, Call of Dutie, Rock Smith, The Legend of Zelda, GTA 5, League of Legends, ForNite, Fall Guys, Getting Over it, Among us, Dauntless, Pokemon Go	Digital Natives, Entirely born and shape in the 21st century, and will probably be around the 22nd, more technologically literate generation ever.	Migration and diversity, Covid 19, ecommerce, Countries fail to Climate change, distance learning		Virtual

Table 1.
Characteristics of generations and most popular games (own elaboration).

games have been close to at least the so-called generations X, Y, Z many of generation Z are studying at universities now and soon generation Alpha born on this century will be joining higher education with a big exposure to gaming has never seen before. In the last 50 years we have seen tremendous growth in the gaming industry and since a decade or so gaming has become serious with a new branch of edutainment, new games with the purpose of helping to teach certain specific concepts and decision-making experiences.

After generation Y some concepts of learning were incorporated into education, but it was generation Z the one that learned many concepts, math, sciences, languages, and others with interactive games mostly.

Table 1 shows the different generations and their most common games, we can clearly see how gaming has become more and more popular each decade, most of the generation Z and Alpha, the current and future higher education students have a culture of gaming and are familiar with diverse gaming technologies like never before, and generation Alpha has been using virtual reality and augmented reality, these generations have been very active in this 180 billion dollars industry.

Serious Games, also called educational games or applied game, Clark Abt is credited for coining the term “serious game” in the 1970s, defined as “games have an explicit and carefully thought-out educational purpose and are not intended to be played primarily for amusement” [4].

Digital games whose main purpose is “serious” in the sense that the learning outcome is more important than to simply entertain the players. The primary “serious” purposes can be to teach or train in specific areas providing learning experiences for students.

There are some video games that can be used for learning skills competencies, as they have an educational setting, such as Sims City, perhaps other areas such as Astronomy and Space-Themed Mobile Games.

However, these games need many video game design skills in order to be attractive for students, there are many categories of Digital games, simulations, virtual environments and mixed reality/media that have been applied to teach or train through responsive narrative/story, gameplay or encounters.

Nowadays constant innovation is needed in all industries, specially education, and the incorporation of serious games is a technology that has been evolving and helping to improve the students learning experience since the early 2000s, and has been slowly incorporated into university classrooms activities, there is still a big gap for teachers to adopt this new roles as game designers and game coordinators, they need to build new instructional design models that will benefit of both new technologies available and the new generations of students with long gaming experiences [5].

It is important to incorporate serious games and educational technology in order to teach skills and competences that are more practical and changing very rapidly, there is a need to give a more experiential dimension to the acquisition of knowledge from students, in this regards some games and digital simulations have been developed over the last decade [6–8].

The research group wanted to use this tool to improve the experiential learning of business development with a serious game denominated “Start up journey game”, the objective of the game was to train and practice basic startup concepts.

The first steps were to determine what were the fundamental concepts to teach and then work with a specialized Game creation venture that will add the game experience best practices.

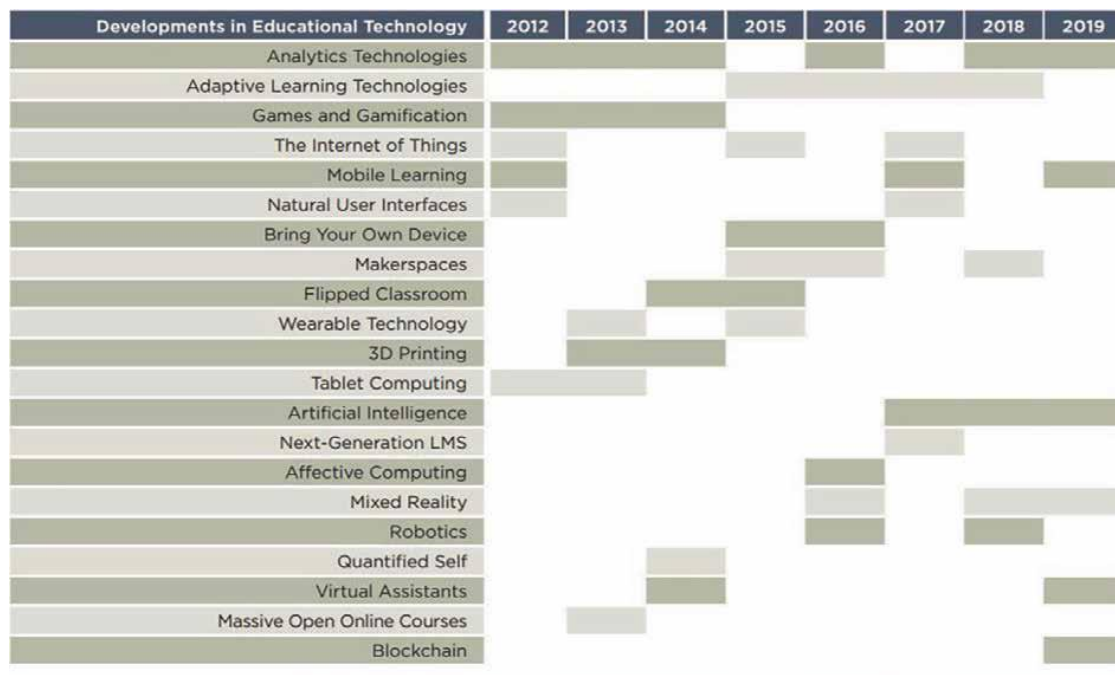


Figure 1.
 Development in education technology trends. (report: 2019 higher education edition. Louisville, CO: EDUCAUSE).

In figure one we can review some of the educational technologies that have being incorporated in the last decade in higher education [1], here 21 new technological trends are identified, and we can see that games and gamification and many related technologies that complement this technologies such has analytics (that helps analyze students behavior and learning process), the use of mobile technologies and mixed reality. New technologies are being incorporated and the challenges of virtual education debt to the Covid pandemic has accelerated this incorporation (**Figure 1**) [9].

During this research we have made various surveys involving more that 375 students that have taking the Start Up Journey game in different countries and in different levels of higher education.

Some good practices applied to game developing and course implementation are review on this work.

It is not easy to produce full serious games, it takes time and could be very expensive, in the making there is two main challenges the content development in terms of the learning objectives and then what kind of gaming activities and type are the best to learn this, the gamification process that requires very specialized gaming concepts for users students that have a big expertise in gaming, but there are some companies developing simulations and tools that will help teaching specific contents.

2. About serious games

Games have been in society for a long time, there are evidence of dice playing since 3.000 ac, the go or Weiqi a board strategy game dates from 2.500 years ago played in China, many games had some learning concepts associated.

Serious and games seem concepts that are not normally related, but recently Serious games have proven to be effective to help experiential learning and that students can learn while they play.

“Serious games are games designed in which education (in its various forms) is the primary goal, rather than entertainment” [10–12].

Even though that there no agreed definition of Serious Games, this is often the case of new disciplines, basically the concept refers to games that have been primarily designed to learn rather than entertainment.

The field of edutainment, serious games or learning game design fields, have made big advances during the past years, they help understanding specific topics and acquire complex competences and they have expanded rapidly in primary schools, universities, and corporations, but they are still not very use in most Universities [8].

There are a few fundamental questions that this research attempts to address such as How has gamification been applied? What policies and strategies could help to successfully incorporate gamification, how is the learning process achieved and how students rate these serious games activities?

There are many Serious Games for higher education or simulation companies in the world today, such as:

Stratx Simulation (France), Cesim (Finland), EON Reality (USA), Simcoach Games (USA), Peak-Brainbow (United Kingdom), Costa Edutainment (Italy), and some new startups companies dedicated to develop games like Digital Dream Labs (USA), Game Lab (Chile), Fingerprint (USA),

We also have some traditional game base or simulation games such as Flight Simulator that was first launch in 1982, and now Microsoft Flight Simulation with a 2020 version, and is the longest running software from Microsoft, Pulse is a training serious game that simulates surgery on patients, Minecraft with an educational edition that was specially develop for schools.

Certainty COVID has been a catalyzer for technology adoption and distance learning in Higher Education since 2020 until 2022, but it has not really impacted Serious Games adoption jet, even that the need of engagement from students specially online and blended students is more necessary than ever.

3. Educational games (edutainment)

In **Table 2** we can see the most important concepts related to Serious games, even though they are related, their main purpose and learning objectives are different.

Educational games, can be traced back to the 1970's where “non digital” games where used in schools for math-related or social science understanding. The digital applications started around 1990's with the first multimedia computers, evolving the term to edutainment, but because of the poor quality and lack of understanding the interest decreased. Research has shown a positive effect of games as educational tools in various skills such as: strategic thinking, planning, communication, collaboration, group decision making, and negotiating skills [13, 14].

Edutainment, comes from “education” & “entertainment” it is designed to generate motivation, interest and a better understanding throw technology using games, music, internet or television to help both students and teachers in the process of learning. The market of business simulation for education are mainly centered on marketing, finance, strategy and optimization.

Category	Main purpose	Learning objective	Game characteristics	Application example
Gamification	Incorporate learning activities and modules.	Improve on a certain area.	Game elements	Prize for Results, Unlock activity levels
Serious Games	Build essential skills, games develop to learn specific objectives	Concepts, skills, competences, try experiential learning. Training value	All the game characteristics. More fun. Competition.	Flight Simulator
Edutainment	Entertainment	Basic learning concepts or skills	Few characteristics	Achieve it with sesame street, Kahoot
Simulation Games	To simulate a real world scenario and decision making impact	Learn impact of decision on specific indicators.	Very Few game element. Sometimes competition and stages	MarkStrat
Training Games	Specific skills and competences	Team Work, communication skills, other specific.	Entertainment concepts	World Puzzle
Games	Entertainment	None	All the game Characteristics	World Puzzle + C7:G13

Table 2.
Concepts related to serious games and edutainment. (own elaboration).

Gamification blends game mechanics with traditional eLearning activities and modules. For example using leaderboards, points, and eLearning badges add incentives for students to be more active on their online courses. Gamification and serious games are often grouped together they both motivate online learners and enhance their eLearning experiences [15].

4. Some facts about gamification

- Eighty percent of the learners say that their productivity would increase if the learning approach used in their university/organization is more game-like
- Eighty two percent of the learners are in favor of multiple difficulty levels and explorable content
- Seventy one percent of employees are not engaged for disengaged in their work
- Eighty nine percent of the learners show greater engagement of the LMS application has a point system
- Sixty two percent of the learners feel they would be motivated to learn if leaderboards were involved and they had the opportunity to compete with other colleagues

- Ninety percent of the learners recall information if the applying content within a stimulation

Source: <https://www.eidesign.net/gamification-in-elearning-facts/>

5. Development of serious games

Serious games did not come into wide use until the 1990s with the PCs sales increased, even though many games were created before those years. At the time, educational games and other software evolved into “edutainment”. However, interest in edutainment soon decreased, partly because of the (poor) quality of the games themselves and that playful experiences were not well accepted by higher education faculty that doubted the connection of entertainment and formal learning [16].

The problems encountered in edutainment are reflected in phrases such as “edutainment, an awkward combination of educational software lightly sprinkled with game like interfaces and cute dialog” [17], or “most existing edutainment products combine the entertainment value of a bad lecture with the educational value of a bad game” [13].

With the general renewed interest in serious games, game developers have moved from “skill and-drill interactive learning paradigms towards situational and constructionist approaches” [18]. Games in education is gaining acceptance, but their use is not widespread, and it is a controversial issue [18, 19].

Educational games is also faced with the challenge of providing research evidence of the acclaimed benefits, which currently is “complex and thinly spread”, possibly because the study of games and gaming relates to several different disciplines; “as a result of the diversity and complexity of games themselves, and the range of perspectives taken by researchers, there are few hard and fast findings in the literature” ([14], p. 2; [20]).

Despite the “few hard and fast findings”, research is showing positive effects of games as educational tools. Games can support development of a number of various skills: strategic thinking, planning, communication, collaboration, group decision making, and negotiating skills [13, 14]; see also Gee, unpublished manuscript). However, “hard facts and evidence” is for future research to provide. There is also a number of concerns to consider in order to realize the full potential of games as educational tools: resources (many schools have computers that are too old for new games, technical support, time for teachers to familiarize themselves with the game, etc.), how to identify the relevance of a game to statutory curricula, difficulty in persuading school stakeholders to the potential benefits of computer games, etc. [18].

5.1 Benefits of serious games

- Allow the decision-making process with little cost if failing or wrong, the possibility to fail and learn at a low cost. This also helps performance improving through try and error iteration.
- They are more experiential and interactive than lecture classes

- The freedom to experiment, games allow players to explore and discover new strategies and pieces of information
- The possibility to give quick feedback to students, and the possibility to analyze the student's decision making process.
- Problem base approach to learning, there are goals to achieve and problems to solve.
- The learning experience facilitates teamwork and collaboration among players.
- The freedom to assume different identities: games encourage players to see problems from a different perspective
- The freedom of effort: games allow players to go through periods of intense activity and relative inactivity, so that players can pause and reflect on tasks they have accomplished. To this end, gamification can be broken down into individual elements, each of which bring specific advantages and disadvantages to educational processes [21].
- Retain more information and learning stored in long term memory
- It is easy to monitor events and the advances of students, also keeps records of many situations.
- Possibility to establish emotional connection
- Multi tasking possibilities (**Figure 2**).

5.2 Serious games application challenges

The challenge facing serious games though, is to find a balance between the ludic and skills or knowledge transfer goals so that neither a dominant game mode

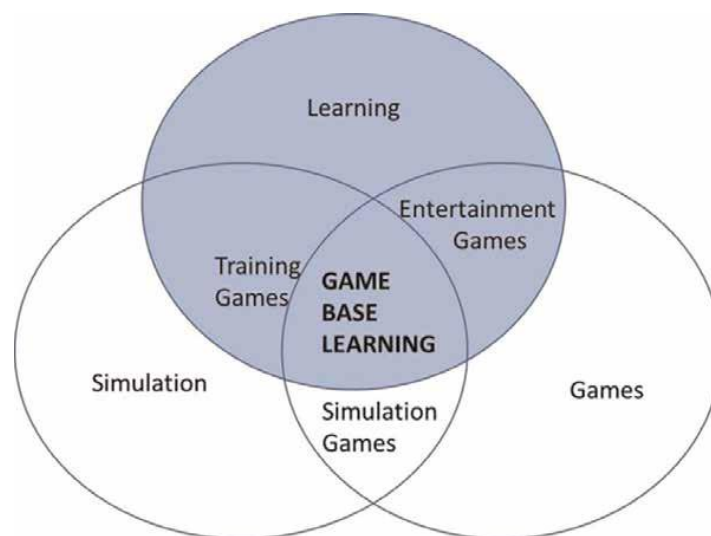


Figure 2.
 Intersection of learning, computers science and games. Game-based learning according to Ulicsak and Williamson [22].

(taking away from the learning outcomes) nor learning mode (removing the fun element) is present.

6. Game development

You could develop your game, use an existing one or paid for a company that provides serious games alternatives like Gamelabeducation.com

- a. Adapting an existing game: In the case of using an existing game, the cost tends to be lower, and the experience is good but is not personalized for the class.
- b. Developing a game by the University/Professor: This alternative has various options, the two basic ones are to develop the game as part of a project with the computer sciences department or engineering students that program it. Other option is to develop with a professional company that does know about games and will develop a customized game for you. The cost of developing the game ranges between US\$ 60.000 to US\$ 300.000 according to the specific requirements and complexity, in any case will require many working hours from the teacher designing the game.
- c. Use a serious game service that will provide the platform for you and you will use with a usual price per student that ranges between US\$ 15 to US\$ 125 dollars per student depending in the complexity of the service the prices have been soaring over the last few years, with an average close to 50 dollars per student in licenses.

Some steps to work on the project are:

1. Goal Setting is the first step (What do you want to do and learning Objectives);
2. Pick The Right academic and developer partner team;
3. Focus On eLearning Character Development;
4. Identify The Ideal Game Mechanics;
5. Embed Third-Party Resources to Increase Serious Game Interactivity;
6. Design a Prototype;
7. Test it with students;
8. Develop a logic teaching experience;
9. Monitor the learning process.

The time use to develop a game will range between 6 months (if you are customizing) and more than two years, an average (according to the survey) is between 12 and 18 months.

The game usually is adapted to different academic level of students, most them can be use in High School, Undergraduate, Senior Undergraduate and master's degree programs.

7. The startup journey entrepreneurship game

7.1 Goal

Teaching Entrepreneurship and Creation of New Businesses were the main goal of the Serious Games.

After the evaluation of the contents, various approaches, we came to the conclusion that it was extremely difficult to develop a game that could help you train the expertise and experiences, decision making of an Startup Journey, usually lasting 5 to 6 years in most countries in the world, special cases like silicon valley you could speed up the process but it is difficult.

The academic training team agreed in that the experiential teaching was possible in 3 different games, or game levels, one that will happen the first year of setting up the enterprise, the resulted game will be happening on the month 3rd to 12 of the first year of launching the company and the main learning objectives are:

7.2 Market fit

Through market research the players will find information about the customers segments in the objective place, and will define the segment and two main characteristics of the developed application.

7.3 Competitors analysis

Through market research, developing networks and visiting places the players will gather information on the Competitors, and what are they offers in the market plus size.

7.4 Network development

The players could develop their networks through the hired personal, sharing with them through coffees and telephone calls.

7.5 Team development

A right team is important for any startup so it is important to recruit and select the right team for the project.

Through the simulation, players will understand the importance of the following aspects when starting a business: formation and strengthening of a work team, creation of a network of contacts, benefits of having a mentor, identification of the needs of each target segment and positioning of the product with respect to the competition and having a basic analysis of the projected profitability through cash flow information.

8. Pick the right academic and developer partner team

The academic team for the game were mostly experts in startups, it consisted on 3 main consultants, one with 26 startups experience and three exits, the second with 9 startups experience and academic experience with a Phd, and the third with a long academic experience in entrepreneurship teaching and research.

Regarding the software development team, the agreement was with gamelab education and startup company that had developed two other logistics games and had experience with higher university teachers.

Also the team counted with English and portugues speakers.

8.1 Focus on eLearning character development

The game was though to be applied in presence and e-learning mode and was decided to be develop in at least three main languages, English, Spanish and Portuguese (**Table 3**).

8.2 Identify the ideal game mechanics

There are common types of game mechanics and experiences such as.

The logic chosen for the game was MMO – RPG, Masive multiplayer online with role playing, so the whole class could be part of the game, and you could have a small class of 20 players in groups of 3, or a large class of 100 players with groups of 4 students each.

The players could play in teams or alone, but the academic recommendation is that there are teams of 3 or 4 participating and playing in parallel. The basic role is of the startups founder team, they will prospect the market and take decisions.

There are places that are open after achieving certain goals, and an startup mentor that is achieved when the players develops the network (**Figure 3**).

Mechanics may also consist of incentives or rewards, such as badges that unlock new content or leaderboards that fuel their learning motivation.

Type of game	Description	Examples
FPS	First person Shooter	Doom, Call of duty
RPG	Role playing games	The Witcher, Fable 2, Mario Kart 8
MMO	Masive Multiplayer Online	Audition, Fornite
MMO RPG	Masive Multiplayer O. Role Playing	World of Warcraft, Fantasy line, Sim City
MOBA	Multiplayer Online Battle Arena	League of Legends
RTS	Real Time Strategy	Warcraft III, Rise of Nations
ADV	Adventure Game	The legend of Zelda, Fall out, Asassin Creed
FPS/RPG	Hybrid Game	Halo infinite

Table 3.
Types of video games and examples (own elaboration).



Figure 3.
Startups game scenery ecosystem (own elaboration).

9. Embed third-party resources to increase serious game interactivity

What do you do if you want to increase online learner engagement and immersion, but you do not have the time or resources to develop additional content?. You can enhance the game by embedding third-party resources, you can have add ons for your serious game without having to create everything in-house. Include a link to a helpful tutorial that walks online learners through a task, or embed a YouTube video that explores a topic at length. You can even create printer-friendly eLearning courses by integrating PDF files and other downloadable documents that online learners can access via the serious game.

10. Design a prototype

Choosing your eLearning authoring tools carefully, integrating the most effective game mechanics, and knowing when it's time to outsource are the secrets to serious game success.

A light version of the game was developed with most of the functionality and then got the feedback for testing players helped increase and solve many of the serious games improvement opportunities (**Figures 4 and 5**).

11. Test it with students

This is an important step in order to learn how to teach and implement the gaming experience.

You learn aspect such has, you need to do short trial test of the simulation first and after training rounds, in this case two training rounds are suggested before the final round.

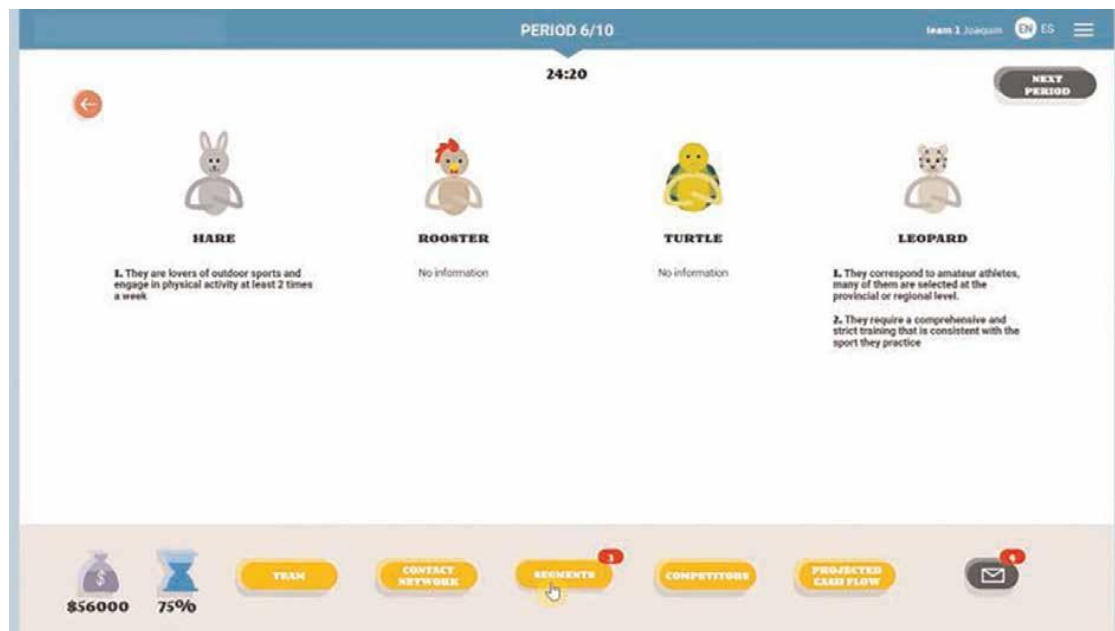


Figure 4.
Segmentation characters and basic characteristics (own elaboration).

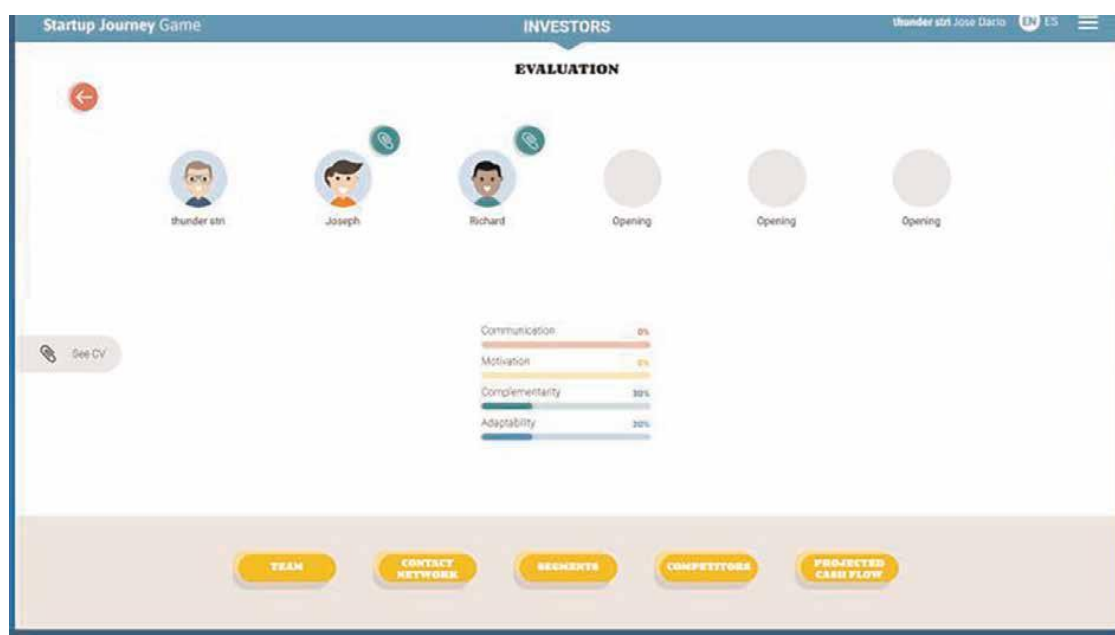


Figure 5.
Team selection and creation example, with skills (own elaboration).

12. Develop a logic teaching experience

Once the game has been developed and tested it is important to create the learning experience. The game mechanics could be taught and teach in many different ways so the teaching experience could be organize in many ways, depending on the audience and on the program that is being tough, usually it has to be personalize to the audience, undergraduate versus postgraduate, short programs, long programs.

Prizing rewards for the winners is a clear motivation for the players.

13. Monitor de learning process

Surveys could help to learn about the students' learnings, likes, and experience.

The gaming should have a logs system that tracks the players decisions, times involved, sequence of plays and other relevant information.

14. Results on classrooms

The game was use in four different classes, two hundred and fourteen college students and one hundred and seventy-five senior high school students on pre-college workshops were interviewed and participates with the following results (**Tables 4–7**).

If educating the player should be the primary goal of serious games like Michael and Chen [19] proposed, the results on the learning process was clearly achieved, the students got better results than just preparing their classes, the students were able to share their experiences and discuss the results, plan strategies and. Class attendance also increased in classes that involved game simulations close to 95% (**Figures 6 and 7**).

In **Figure 7** we can observe the story telling of the game, firs the students learn how to go through the city spaces and take the decisions they need in order to learn about the customer segments (Market research), then build a team

Have you participated in serious games before (university)		Have you participated in serious games before (high school)	
No	57%	No	77%
Something similar	17%	Something similar	11%
Yes	27%	Yes	27%

Table 4.
Have you use serious games before (own elaboration).

Which learning method do you prefer		Which learning method do you prefer	
reading papers and text books	13%	Reading papers and text books	11%
Presentation Classes &Videos (Regular Teacher Class)	18%	Presentation Classes &Videos (Regular Teacher Class)	16%
Online courses – E-learning	10%	Online courses – E-learning	4%
Serious Games - Simmulators	17%	Serious Games - Simmulators	27%
Workshops	12%	Workshops	16%
Study Alone	14%	Study Alone	9%
Personal/Private Teacher	2%	Personal/Private Teacher	2%
Reading Books	2%	Reading Books	2%
Videos - Youtube	14%	Videos - Youtube	13%
Other (please specify)	0%	Other (please specify)	0%

Table 5.
What is your preferred method of learning (own elaboration).

What is the contribution of the Serious game to learning (University)		What is the contribution of the Serious game to learning (High School)	
Very Low	0.0%	Very Low	0.0%
Little	2.8%	Little	3.1%
Medium	26.8%	Medium	19.8%
High	32.4%	High	29.2%
Very High	38.0%	Very High	47.9%

Table 6.
Evaluation of the serious game experience (own elaboration).

Did the game contributed to learning about Entrepreneurship		Did the game contibuted to learning about Entrepreneurship (High School)	
No contribution at all	0%	No contribution at all	1%
Learned some new concepts	33%	Learned some new concepts	8%
It made learning easier and fun	24%	It made learning easier and fun	34%
A much better understanding of the concepts	29%	A much better understanding of the concepts	35%
Really helped to clarify and team entrepreneurship concepts	14%	Really helped to clarify and learn entrepreneurship concepts	22%

Table 7.
How was the level of contribution to learning with the serious games (own elaboration).

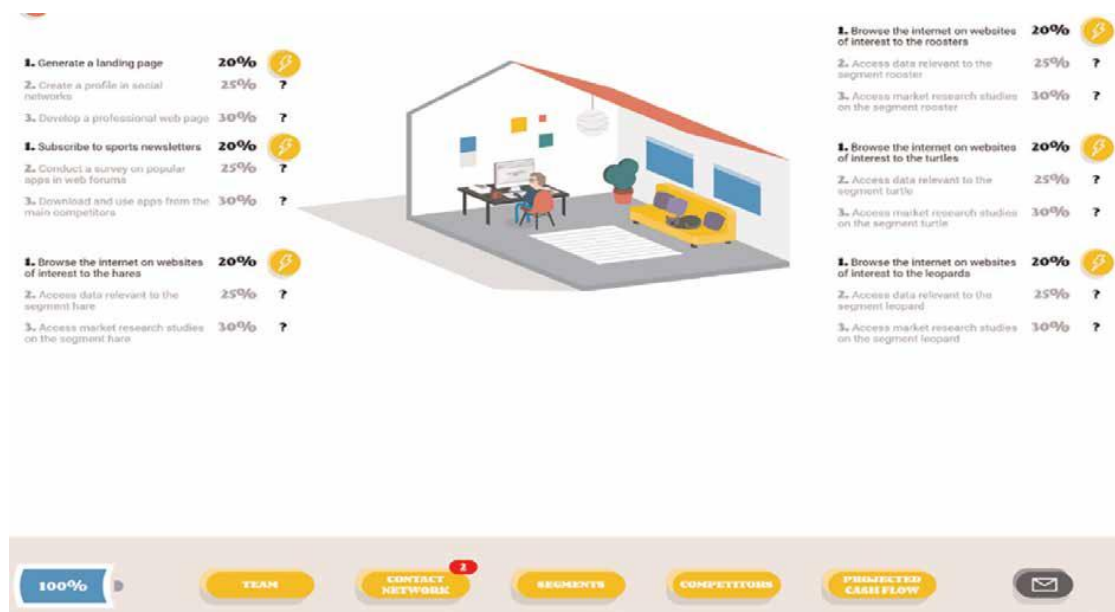


Figure 6.
Startup journey game (Universidad Tecnica Federico Santa Maria/Gamelab, Chile).

(Recruiting, interacting, motivating, complementing skills), through events and participating in activities they will learn about their competitors (Competitors map), then they will be able to find some financial information about the segments (Profitability and market potential), with all the segments information they will go

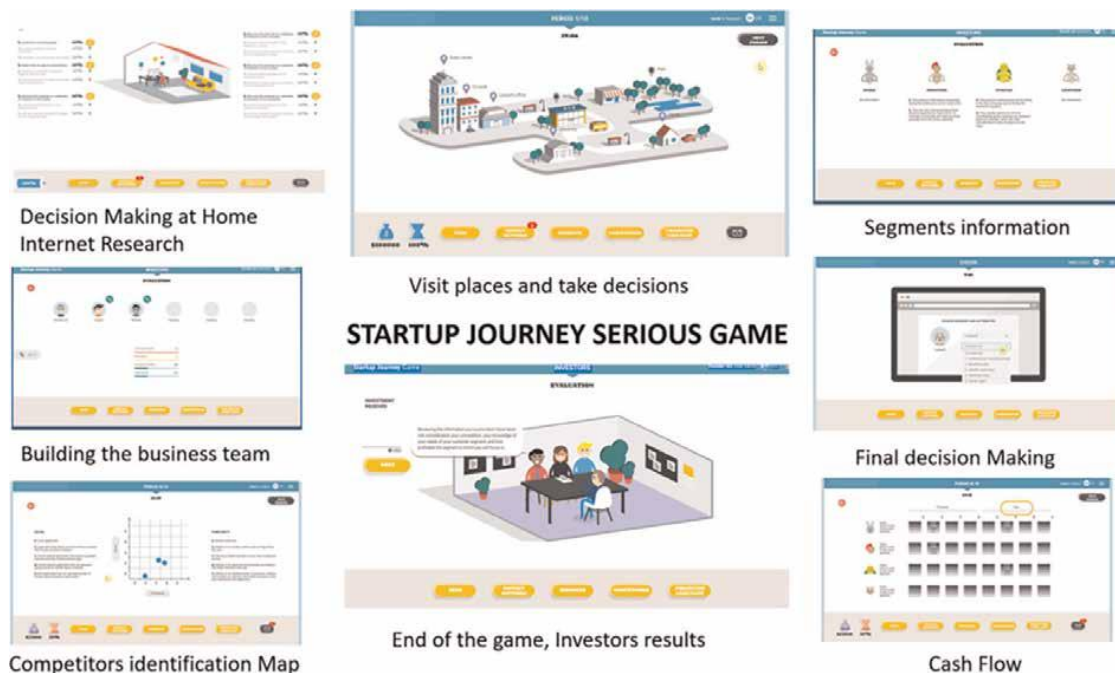


Figure 7.
Startup journey serious game logic (own elaboration).

to the Final decision making stage, they will decide what market segment to address and with what kind of application and functionality focus (Market Fit), with this the game ends, the investors will invest certain amount in the Startup or not invest and will give feedback to the Startup team. The group that raises more of the capital wins.

15. Conclusions

Certainly, there has been a change in the culture and the way young students learn, all millennials are used to play digital games since very early age, some of them are role playing games such as Oblivion, the Witcher, Pillars of Eternity, South Park, Fornite, so they are more ready for Serious Games than previous generations.

The fast pace of technological changes, business model changes, society changes make more challenging the training and education of young professionals, serious games are an excellent tool to make the experiential learning easier, to incorporate new technologies to the learning process, and to shorten the learning process, the experience of flight simulator as a training tool has slowly opened the path to the use of innovative learning technologies, however adoption has been slow so far.

The process of creating a learning game is indeed very complex but there are many alternatives in the market for using already developed games.

The Universities will benefit of developing areas that will help them produce serious games in a serial format, with specialist teams or partnering with game developing companies that have already developed simulations or have the ability to personalize games.

New technologies will be incorporated to serious games and gamification, virtual reality, face and voice recognition, gesture control, new graphics, augmented reality, wearable gaming, on demand gaming are some examples of the new technologies that

will help improve the learning experience and will deliver more engagement and knowledge acquisition [23].

Students really value experiential learning through serious games, even though they are demanding more quality and complexity, usually have the benchmark of games that have had years on the making and multiple hundred of dollars in development, anyways with basic gaming the students are engaged and declare that they do learn more concepts and enjoy the classes more.

The cheaper availability new technologies such as Computer Graphics, virtual reality and interactive visual simulation, hardware interactive sensors and tools, human computer interaction, will provide new grounds for Serious games development that could be highly beneficial both for higher education and industry.

During 2020–2021 since the pandemic outbreak the need of developed virtual entertaining learning programs has increased, the video game industry is close to 150 US\$ Billion and growing, more than 2300 developing companies, 70,000 employees are part of the new generation of games, in the Universities and higher education there is a long way to go forward but there will be rapid growth and adoption in the next decades and the incorporation of serious games will be also part of the most early education. Probably the Higher Education Industry with these new technologies will have more changes in the next decade that it has in the last 2000 years.

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