

**UNIDAD EDUCATIVA PARTICULAR JAVIER**

**BACHILLERATO EN CIENCIAS**

**MONOGRAPH**

**“IMPACT OF VIDEOGAMES ON THE HUMAN BRAIN IN THE 21<sup>ST</sup> CENTURY”**

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### **Gratitude**

I want to thank my parents who gave me my life and taught me to be responsible, independent, and a good person. Also I would like to thank to my friends and all the people that have influenced in a positive way in my life and because of them I can live a happy life and motivate me to be better.

Marcelo de Tomaso

## Summary

The research of scientific and psychological institutions has been used to explain the main problem touched in this monography that is: Do video games have a negative influence on the human brain? And if that is true then what are the effects of these on your brain? Or what are the positive effects that video games have on your brain?

Video games have been judged since they were first invented but after years and years of existence and evolution, it has been proven that video games don't have the negative effect that is commonly said by the media, also another topic that is going to be addressed in this monography is the image that people have on video gamers that are commonly known for dumb or in bad shape but that is far from the truth.

Video games has been a topic that has been surrounded by a lot of controversy lately because of all the mass shootings and crimes occurring in the United States in the year 2019 and the continuously blame thrown on video games by their politicians as the likes of president Donald J. Trump to prevent the change for their actual gun laws.

In this monography you are going to learn the origins of video games, their genres that may vary between sports or fights, their evolution throughout history from the beginning just being made as a side project and how it was grow, how it has been applied in the education system through gamification and most importantly the effect that video games have on the human brain.

By the research of big institutions like the WHO (World Health Organization) and many more named in the references that help to better understand the way that video games work in your brain without any speculation, just basing on plain and scientific prove.

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## Introduction

The present monography has as its topic: *“Impact of video games on the human brain in the 21<sup>st</sup> century”* and has as its main importance to change the negative way general people look at video gamers and video games in general by presenting scientific researches that prove that video games are not what people believe and that they are no bad.

The objective of this monography is to prove to the general public that playing video games doesn't have a negative effect on your brain and that it actually has a lot of benefits on the human brain by going through the origins of video games, how they have evolved through time, what are the effects that playing video games might have on your brain and lastly how they have influenced the educational system with gamification.

For the following monography, some information was taken out of the following books and authors: Belli, S., & Raventos, C. L. (2013), A brief history of video games; Moncada, J. J. & Chacon, A. Y. (2012), The effect of playing videogames on social, psychological and physiological variables in children and adolescents; Kiryakova, G., Angelova, N. & Yordanova, L. (2014), Gamification in education and Gomez, L. (2013), Video games: concepts, history and its potential as a tool for education.

Video games have been around for a long time and the general public has always been skeptical on their opinion about the effects that video games might have in your brain but recently the topic has resurged with a lot more hate towards video games because of the mass shootings that have been occurring throughout the United States as the politicians in that country suggests that they are the result of people playing video games for long periods of time although science and psychological researchers have proven that is not the case.

The following monography presents 3 chapters about video games which are presented in:

Chapter 1 has as its topic the origin and evolution of video games and has sub topics like the history of video games and genres of videogames; Chapter 2 has as its topic the video game effects and has sub topics like the effect of video games on the human brain and video games and social skill; Chapter 3 has as its topic the Gamification in education and has sub topics like gamification in the educational system and the pedagogical background of gamification.

## **Chapter I**

### **Origin and evolution of video games**

Video Games have been around since the early 1950s but it didn't reach mainstream until the 1970s and 1980s when the gaming consoles using joysticks, buttons and controllers and the



video arcade games were introduced alongside with on home computer games and graphics computer screens were presented to the general public. Since then video gaming has popularized and has become a mainstream form of entertainment for people of all ages around the world.

## **1.1 History of video games**

### **1.1.1 Origin and definition of video games.**

For a better understanding of the history of videogames you need to know the definition, Estes and Mechikoff (1999) have defined to play as: “Como una serie de actividades de ocio que se realizan de forma voluntaria, para diversión, y que es creativo y no tiene límites o reglas” (p.2). For its part, games are defined as: “Los juegos son actividades que tienen una serie de reglas, en los que hay ganadores y perdedores y que tienden a ser específicos de acuerdo a la estructura del juego” (Pellegrini, 2010, p.2). So a video game is basically an electronic game in which a player can control images on a video screen. “Los videojuegos pueden ser considerados como una forma de expresión artística en las últimas décadas, pero al igual que ocurre con las expresiones artísticas contemporáneas, la sociedad no es capaz de asimilarlas y hacerlas suyas” (Belli and Raventós, 2013, p.161).

The first video game created is Nought and crosses that was invented in 1952 that was simply a computerized version of three in a row that allowed a player to play against the machine.

Then in 1958, William Higginbotham created Tennis for two, the first game that allow the game between two human players using a program for the calculation of trajectories and an oscilloscope. Four years later Steve Russell, a student from the Massachusetts Institute of Technology, dedicated six months to develop Space war, a game in which two players that

controlled the direction and speed of two spacecrafts that play against each other and was the first video game to find some sort of success.

In 1972, Ralph Baer alongside with Albert Maricon and Ted Dabney developed the first domestic video game system called Magnavox Odyssey that was connected to a television and allowed to play several pre-recorded games.

### ***1.1.2 Evolution of video games throughout history.***

The rise of video games came with the Pong recreational machine that is considered the commercial version of the game Tennis for two by Higginbotham. The system was designed by Al Alcom for Nolan Bushnell for the Atari. This game was the cornerstone of the game as an industry, during the following years there were numerous technical advances that were introduced in video games with the highlight being microprocessors and memory chip games as Space invaders and Asteroids were played in arcades.

The 80s began with a strong growth in the video game area, encouraged by the popularity of arcade machines and the first video consoles that were created in the 70s. During these years, games such as Pacman (Namco), Zaxxon (Sega) and Battle zone (Atari) triumphed.

Unfortunately, in 1983, several American and Canadian computer and video game companies such as Atari, video games faces a great crisis that lead to bankruptcy. The main trigger for this bankruptcy was the huge amount of low quality video games that were on the market led to a significant reduction of sales in video games and a loss of confidence in customers. The crisis lasted approximately two years, it even showed doubts about the long term viability of the game industry.

Japan opted for the world of consoles with the success of the Famicom (which is more famously known in the West as Nintendo Entertainment System or NES) launched by Nintendo in 1983, after the end of the crisis the American followed the path opened by the Japanese and took the

NES as the principal video game system which help the video game industry to flourish and prosper again.

## **1.2 Genres of video games**

The first genre to be explored is the Online games. Bernete (2007) highlights that:

“lo que más les gusta a los participantes en este tipo de juegos es la posibilidad de relacionarse (68,4%), jugar con gente nueva (23,8%) y competir con otros (9,8%)” (p.172). Some other genres in videogames are:

- **Action:** It requires that the player uses his reflexes, abilities and precision which is often in a situation of combat or overcoming dangerous obstacles. Beneath this genre there are a lot of famous subgenres like shooting, fighting, arcades, etc.
- **Strategy:** The strategy based games are characterized by the need to manipulate characters, objects or data to achieve the objectives and two of the large subranges are real time strategy and turn based games.
- **Simulation:** It is characterized by trying to recreate real world situation and lets the player take control from what happens, the most popular are those of vehicle handling like driving a train.
- **Sports:** Are the ones that recreate real world sports, the player has to control characters of teams (in the sport that you are playing) and the objective is the same as the sport in the real world although some games have different modes in the game itself so the objective is dependent on the game you are playing.
- **Adventure:** These are videogames in which the character (mostly common the protagonist) must advance the story interacting with characters, objects and overcoming challenges.
- **Party games:** In this genre, the players will have to take in turns to advance in a virtual board and go through various challenges of different types in which they are competing

with each other to reach the goal, get the maximum number of points or to be the fastest to arrive.

Although there are a lot of genres that were skipped like musical, role plays or even sandbox games this are still important. It is not important the genre of videogame you are playing; the most important thing is that you are having fun (Bernette, 2007).

Videogames have come a long way since they were first invented and have managed to develop extraordinary and the top researchers have many definitions of exactly what video games are but McGonigal (2018) affirms:

Los video juegos nos desafían para hacer un mejor uso de nuestras fortalezas y eliminan el miedo al fracaso, mejorando nuestras posibilidades de conseguir el éxito. Los buenos juegos apoyan a mejorar la cooperación social y la participación cívica a gran escala. (p.27)

Which is considered to be one of the best definitions for what videogames are and has been commonly used to explain what they are.

## **Chapter II**

### **The video game effects**

In science, you form a hypothesis to explain an event and then test it against the evidence to see if your logic is sound, if not the hypothesis fails and you discard it and form another to explain what is happening. The hypothesis is being put forward by several politicians including President Trump is that video games cause damage to a person's brain and is responsible for the rise of mass shooting against all the scientific evidence that proves otherwise.

#### **2.1 Effect of video games on the human brain**

As the popularity of video games continues to rise, scientists have researched how video games affect the brain and behavior. The Frontiers in Human Neuroscience published the results of 116 scientific studies, it is generally believed that playing video games can affect attention of the person however many of the studies show that players improve divided attention which makes them capable of being able to be aware of several things at once and also help sustained attention. In addition to this, the parts of the brain involved in these processes become more efficient in regular players, because they require less activation to be focused on their activities.

Research also shows that playing increases the size of the brain and improves the abilities of certain parties responsible for visuospatial abilities (the ability to identify visual and spatial relationships between objects), especially in the long term.

Although it is not all positive effects, as of 2019 the WHO (World Health Organization) has listed Gaming disorder after Gambling Disorder and uses the same meaning of Gambling disorder word for word just swapping the word Gambling by Gaming. Those with gaming disorder may show: “Impaired control over gaming, increasing priority given to gaming to the extent that gaming takes precedence over other life interests and daily activities, and continuation or escalation of gaming despite the occurrence of negative consequences.” (Owen, 2019, p.12).

Children who play video games have better motor skills and better school performance, although 2 hours a week are enough to obtain these benefits. On the other hand, playing 9 hours or more per week is associated with the presence of behavioral problems, conflicts with peers and lower social skills. Pujol (2016) affirms:

Traditionally, children acquire motor skills through action, for example with sports and outdoor games like soccer or basketball. Neuroimaging research now suggests that training with virtual and computer environments is also capable of modifying brain circuits that deal with motor skills learning. (p.15)

### **2.1.1 Video games and social skill.**

Video games have changed the way you meet, interact and talk to people, thanks to videogames you can meet someone at any time because of the online possibility that every game has nowadays. Some of the classic negative effects of gaming are a weak relationships or even the strengthening of racial or sexual social stereotypes (Christensen, 2008).

But there is not a lot of talk about the positive skills that video games bring, the ability to talk with confidence to people that you don't even know, they improve overall well-being, favor empathy, positive social interactions and reduce anxiety. Another big advantage that people not talk about enough is the ability to keep in touch with your old friends, a study shown by the Universidad de Salamanca shows us that 46% of people who are 25 years or older often lose touch to their old friends and found in video games a new way to stay in touch and have fun through their online games and party chats.

They also help to form new friendships with the people that you meet online, after all the people that you are meeting in a game have already something in common, the game that you are playing. This doesn't mean that every person that you meet playing video games is going to be nice or is going to become your friend, one final positive skill that video games bring is that a person that is an introvert can become an extrovert if they planned to achieve that can be done through the constant meet up with strangers in the voice chat.

## **2.2 Mass shootings related to video games**

Many scientific studies done by idUS, Polygon, Science Daily have shown that there is no clear connection between video games and violent incidents like mass shootings. Although all this prove is put on the table there is still people that believe that playing video games can be the reason for the recent mass shootings, this is being put forward by several politicians, including President Donald Trump.

These politicians use video games as an escape to avoid touching the bigger problem that is the gun control, the theory that these politicians put can quickly be disproven by just taking a simple look at the world. Even if you are skeptical about science and all these studies that shows that there is no connection, the United States does not exist in a bubble. This means that

we can take a look at similar countries that share similar cultures and gaming habits and make a comparison.

If video games are indeed the cause of all these mass shootings, then logically they would have the same effect on any country that these games are played, but unfortunately, they do not and the United States is frequency of mass shootings is unique in the world. We can compare the situation of the United States to countries like Canada, Australia, New Zealand or the United Kingdom because they all share a common language, share a large amount of popular culture and have a large gaming market.

In just a quick look we can roll out video games as the problem of these mass shootings, although not of them are completely free from horrible mass shooting, the rates of mass shootings per capita are drastically lower than the United States which in just 2019 alone has been 249 mass shootings comparable to 1 in Canada and 1 in New Zealand who's the most recent one (the amount of mass shootings are until the date of 3 of August).



## **Chapter III**

### **Gamification in education**

Classroom, VR (virtual reality), Storytelling. Many are the new terms that constantly flood the field of education, most of them still unknown to most teachers and I have to say to keep up with the advances in teaching is not an easy task. Motivating students can be a difficult problem for any teacher who enjoys watching his students enjoy the class. It is obvious that in this article I cannot cover all these didactic innovation fields, but I would like to get a little closer to the gamification methodology, and specifically, the keys and the pedagogical background hidden behind its success.

#### **3.1 Definition of gamification**

Gamification is a learning technique that moves the mechanics of games to the educational-professional field in order to achieve better results, either to better absorb some knowledge, improve some skill, or reward specific actions, among many other objectives. But Deterding (2011) affirms that gamification is: “the use of game designs elements, characteristic for games, in non-game contexts to make a product, service or application more fun, attractive and motivating to achieve participation and involvement of the user” (p.6).

Gamification also highlights the importance of social elements within this field, especially for those users who make use of social networks daily. And is that social games and gamification share certain characteristics such as they can be user loyalty, achievements or recruitment of users from a social network and the most important is that it is fun.

### **3.2 The pedagogical background of gamification**

In regards to the pedagogical background of gamification Foncubierto (2014) confirms that:

The importance of activity design gamified, on which success or failure depends on it. In turn, the design is directly related to the choice of game elements, for which it is necessary to first apply the pedagogical criteria and, secondly, to analyze the functionality and usability of the resources we will use. (p.8)

In reference to the emotional component, it is necessary to mention about the following affective factors that can be stimulated by gamification:

- Positive dependence: challenges or tasks. The game is a key element for develop interaction and social skills. Through challenges and tasks, we do of learning a cooperative and / or participatory experience, which helps us generate the desire to learn.
- Curiosity and experiential learning: The expectation allows us to focus attention, which leads us to obtain knowledge. To achieve curiosity in students we can use resolutions of riddles, information gaps, narratives and spaces based on imagination. This last one, as well as fantasy and simulation, help students to overcome the boredom and fear or modesty to communicate in another language and to be more creative.
- Protection of self-image and motivation: The feeling of vulnerability is very frequent when learning, especially in the case of a second language, and if we protect our own image with an avatar we can get avoid it and strengthen our self-esteem. Some activities allow for example the creation and design of your own avatar or the assignment of a character.
- Sense of competition: The tables of results or rankings allow the student to be aware of the progress of their own learning and know at what stage it is. These should promote

always a healthy competition and provide the student with information or feedback on strengths and weaknesses in their learning.

- **Autonomy:** The creation of an imaginary world goes linked to the incorporation of a control structure based on standards that regulate our behavior, which in the classroom means giving the activity of an origin, a purpose and a direction. This, together with a certain margin to take initiatives, promotes self-confidence and autonomy. Some elements that we can use to accomplish this goal are progress bars, badges and virtual goods.
- **Error tolerance:** Is important to get students to understand that error is a natural part of learning and therefore do not have to be afraid of being wrong or not being able to meet expectations, both own and external. With the activity gamified we managed to create a world of contradictions that accepts error and with the feedback we turn the failure into something useful for our progress.

### **3.3 Gamification in the educational system**

Game-based learning consists of incorporating games or videogames into the didactic activity as a complement to the usual teaching. These games can be commercial, created for entertainment purposes, but their theme or form of use allows us to extract lessons applicable to the subject, elaborated with the contents of the course or are serious games, simulation games designed specifically for a non-activity just playful.

Gamification reflects the spirit of the new pedagogy centered on the student's role and his curricular progress. Without being exhaustive we can intuit that the three methods provide improvements on student involvement. The playfulness makes us assume better the roles that come into play in the problem to be exposed, it carries an emotional burden and an interest that makes the activity be assumed as an experience and not as a mere gathering of information (Foncubierta, 2014).

To gamify effectively we must rely on a deep reflection on teaching methodologies and how they educate games. In the Unidad Educativa Javier we can see that gamification is being implemented in the classes by the uses of apps like GeoGebra or Kahoot that inspires the students to learn about what they are seeing on class and also to compete with their classmates to see who is got the highest grade and what is need to be explain more.

Gamification is a new way of learning that is expanding all over the world and it is really easy to implement all you have to do is:

1. Plan the class and choose a game according to results of learning
2. Contextualize the students the dynamic in role of learnings expected
3. Specify the rules and time to use
4. Create a rewards system
5. The teacher identifies the errors that are showed more frequent in the game and feed back to who have wrong in the answers.

### **Conclusion**

After the completion of the three chapters which were Chapter 1: Origins and evolution of video games; Chapter 2: The video game effects and Chapter 3: Gamification in Education we can conclude that:

- That there is not a single game or a single genre, there is a genre for everyone if they would like to play.
- The gaming industry almost didn't exist in America if in 1983 the United States didn't recover from their crash and adopted the newly released console in Japan the NES (Nintendo Entertainment System) and the gaming industry bloomed again.
- Video games don't affect in negative way to the person playing it and it actually has positive effects like more focus, being able to multi task more easily, helps people to more sociable and it helps to maintain relationships with friends at a long distance.

- Video games are not responsible for the mass shootings that are being done in the United States even if the politicians affirm that is fault of video games, and science, psychology and many investigations have proved that.
- An easy way to look at how video games are not the problem in the mass shootings you would just have to look to similar countries to the United States like Canada or Australia which share similar cultures such as their language, their religious believes and their access to video games, after taking a look at these countries we can see that the numbers in comparison aren't even close to what the United States have.
- Video games have come a long way since they were first releases to the public, nowadays as they can be found in the educational system through gamification in app like Classroom, Kahoot, Storytelling or Audibles are great ways to learn everywhere and in an entertaining way.
- Applying gamification in your classes is not difficult at all, the only thing you have to do is to: plan the class and choose a game according to results of learning, then contextualize the students the dynamic, after that specify the rules and time to use, then create a rewards system, at last the teacher identifies the errors that are showed more frequent in the game and feed back to who have wrong in the answers.
- We come to a conclusion that gamification is a learning technique that moves the mechanics of games to the educational-professional field in order to achieve better results, either to better absorb some knowledge, improve some skill, or reward specific actions, among many other objectives.
- A video game is basically an electronic game in which a player can control images on a video screen, which in some ways can be considered an art by the way of the storytelling of some games works and how their stories can convey thrilling and emotional experiences.

- The evolution of video games comes hand to hand with humanity is technological advances since their start when it was an 8-pixel graphics and a controller with 2 buttons and nowadays is 1080 graphics with advanced controllers that bring comfort and easy to use.

### **Recommendations**

After reading through all of this monography it is recommend to:

- Go ahead and investigate more about the subject because it is very interesting to see how far these changes in video games have come.
- Try to find a game you might think it would be interesting and play it, you might end up like it them a lot and find yourself playing more.
- Before judging people that play video games, try it yourself and then make a judgement.
- Don't believe everything bad that is said on the news about video games, investigate yourself.
- Try learning through gamification, it is a way you can be entertained and learn a lot at the same time.
- Don't stop doing productive stuff like stop eating or stop doing exercise because of video games that is a mental problem classified in the World Health Organization (WHO) as gaming disorder, video games are fun and entertaining but you shouldn't put everything aside just because of it.

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**Qr Code**