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DEDICATION

To those who have the first and permanent credit for attaining higher education and reaching this moment, those who have always sacrificed and have never hesitated to do anything for my those who nothing would never be pleased without them and the weariness disappears with their consent, My dear father and my beloved mother, may God protect them and prolong their life.

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INTRODUCTION

In the last millennium, video games have witnessed great development and an increasing interest by researchers and educators, due to the proliferation of media that makes video games easier in. According to the latest data, in 2020, will be 2 billion 600 million actively video game players around the world [1], which means that video games cover the enormously wide spread market they are offering video content, products, virtual reality, special events...etc.

Sesame Street, the great television experiment that changed the way children around the world grow up, celebrated its thirtieth birthday in the year 2000, having begun broadcasting in 1970. Close to fifty percent of corporate employees (yes, we're talking about our colleagues, not our children) grew up with Sesame Street as a daily part of their intellectual diet. That program, as Malcolm Gladwell reminds us 2, "was based about a single breakthrough insight: That if you can hold the attention of children, you can educate them." Sesame Street held their attention as it taught them, day after day, year after year. How? It entertained them. It was fun. This connection between fun and learning has been part of half of our workers' consciousness since their earliest days [2]. The main idea is that we need to change our teaching methods to enhance the skills that future citizens will need in a digital society. Children and young people are introduced to the virtual world via videogames, and the ways that they interact with technology may be changing ways of learning and the production of knowledge. Engagement and motivation are interesting benefits of the use of games.

Like books and movies, video games can be used in many ways. The content of a game can produces a simplification of reality, and a lot of games are based on violent and not useful themes. For this reason, many critics suggest that what people learn from playing videogames is not always desirable. However, the design of a learning environment built on the educational properties of games can be an appropriate way to improve learning.

Interest in the use of video games for educational purposes was born in the 1980s with researchers like Malone [3]. This researcher has developed a model describing the characteristics that a Ludo-educational video game must present to be motivating: the challenge (the goal of the game is clear; the environment is uncertain; the objectives must neither be too hard to reach, neither too easy), curiosity (audio and video variation, the player must be

surprised), fiction, also called "fantasy" (the player must be emotionally involved, the game world must provide analogies related to the real world), and control (the player can easily make the link between his action and the result of his action, the player must have the impression that his actions have a certain power) [4]. These elements would create quality games where players would feel more involved.

And as the new millennium enters, Researches in educational games have captured many people's attention, this is due to the huge popularity of video and computer games, especially among the younger generations. People from around the globe regardless of age, background and culture just love to play games. A survey by Entertainment Software Association found that about 67% of American head of households play computer or video games. Krotoski in 2004 reported that the games industry is one of the fastest growing sectors of the late 20th and early 21st centuries [5].

Computer Entertainment Software Association reported that in Japan, almost 80% of the general public and almost 70% of women have at least one games machine in their homes. Similarly, in Korea, Korean Game Development and Promotion Institute stated that more than 50% of their population play online games. Some games titles even boast of millions of players - larger than the number of television viewers.

However, many questions arise on how to design such games; games that are fully entertaining as games while maintaining good pedagogy to ensure learning success. Oblinger [6] has argued that although games can be effective learning environments, not all games are effective, nor all games are educational. Similarly, not all games are good for all learners or for all learning outcomes. She believes that educational games are in the early stages of evolution, therefore much needs to be done and explored of this medium before successful learning through games can take place.

Many researchers believe games should properly combine good game design and pedagogy in optimizing its benefits and effectiveness in education. Hence, more established and comprehensive guidelines are needed in this field. Hirumi [7] stated that the advancement in educational video game production, however, are far outpacing research in its design and effectiveness. Indeed, if the integration of the educational component and the balance between

the fun and educational dimension are not satisfactory, learning would be less effective. A good educational video game does not favor one aspect to the detriment of the other.

Educational software has been strongly criticized for this lack of articulation between these two facets. Indeed, many of these softwares are composed of small non-educational games which are separated by very academic exercises. and the emphasis is often placed on the "serious" aspect rather than on the entertainment. According to Gee [8], it is better to start from a game and adapt it to a given learning objective. Serious games, which are part of this logic, took precedence over educational software in the 2000s. However, in order to think about creating an educational game we must ask the following question: Can the game make the player enjoy a successful game experience? Does it do her educational job?

It is the combination of these two opposite functions that we will focus on in the context of our work. More specifically, we sought to improve the learning of a difficult subject to teach through a video game. Inspired by many works dealing with the design of educational video games, we have designed one whose learning content is well integrated into a story. The goal is to make the game intrinsically motivating and to help the player more easily reach the learning objectives.

CHAPTER 1: DEFINITION OF THE GAME

1.1 The game

We will mainly focus on two authors who have published essays devoted entirely to this notion: Johan Huizinga, a Dutch historian and Roger Caillois, a French writer and sociologist.

First, by starting his essay with the phrase "The game is older than culture", Huizinga [9] highlights the fact that even animals played before humans. It also explains how important play is for people and that it is part of any culture.

He offers us a first definition of the game in "Homo ludens", *an essay on the social function of play*, describing it as "a free action, felt as fictitious and located outside of everyday life, capable nevertheless of absorbing completely the player ; an action devoid of any material interest and of any usefulness; which takes place with order according to given rules and gives rise to the relationships of groups in life willingly surrounding themselves with mystery or accentuating by their disguise their strangeness towards the usual world ". This first definition can be challenged because it is still too vague. For example, Huizinga says that "the game is free" but that "every game has its rules, absolutely compelling and indisputable". In a review of Huizinga's work, Lucien Febvre [10] disputes these statements by taking the example of a little girl who jumps in a meadow and who dances freely, this activity does not impose rules accurate. He also explains that many distinctions could have been added to define this concept of play more precisely.

In 1958, Roger Caillois [11] gave a new definition of play, characterizing it as a free activity, separate from real life, uncertain, unproductive, regulated or fictitious [12]. The first difference that can be noted between the definitions proposed by these two authors is that Caillois replaces "action devoid of any material interest and any usefulness" by qualifying the latter as "unproductive". In addition, it distinguishes games containing rules ("regulated" activities) from games not containing them ("fictitious" activities).

To support this definition, Caillois [11] offers a classification of games. It defines four types of games: competitive play (agon), luck (alea), simulacrum (mimicry) and vertigo (ilinx). Competitive play, for example, includes group or individual sports, but also more intellectual

games such as drafts, chess etc. Luck includes games where humans have no impact on the purpose of the game, including slot machines and dice games. The simulacrum combines entertainment where man can free himself by being and behaving like someone else. The child who imitates his parents or who plays pirate and the theater in general are part of this category of games. The last type of game is vertigo, where the player tries to challenge himself, to surprise himself by doing parachuting for example.

In addition to these four categories, Caillois [11] added two concepts: paidia and ludus. The paidia includes games that do not include rules. Conversely, games included in the ludus category are subject to rules. To better understand these various categories, we can refer to the table of the distribution of games (Table 1.1), taken from Roger Caillois' book, “*Les Jeux et les Hommes*”.

Distribution of games

	AGON <i>(competition)</i>	ALEA <i>(luck)</i>	MIMICRY <i>(simulacrum)</i>	ILINX <i>(vertigo)</i>
PAIDIA ↑ din commotion giggling kite solitary achievements crossword ↓ LUDUS	races struggles ect. athletics boxe escrime football sports competitions in general	battery or comptines face roulette bet simple lotteries composed or postponement	childish imitations doll illusion games, outfits mask transvestite theater performing arts in general	childish <tournis> merry- go-round waltz swing volador fairground attractions ski mountaineering aerobatics
<p><i>N. B.</i> — In each vertical column, the games are classified very roughly in such an order that the paidia element constantly decreases, while the ludus element increases steadily.</p>				

Table 1.1 The table of distribution of games according to Roger Caillois [11]

Based on these definitions, a plethora of other authors have proposed new definitions of the concept of "game". We will stop on the one proposed by Szilas and Acosta [13] which takes into account a new component of the game concept. These define the game as “a dynamic

system of signs on which the player, without thinking of the consequences beyond this system, exercises actions in order to reach an objective (that the system gave it.)”. We are going to develop the notion of “dynamic system of signs”.

The signs of this system represent the objects that make up the universe of a given game. The universe of the Pacman game, for example, is made up of ghosts, cherries, strawberries, oranges, a labyrinth, a key, etc. All these elements that make up the universe of this game constitute a system of signs, and even if they exist in the real world, they take a particular meaning inside the game. The player learns these meanings by playing and they can change according to the context of the game. For example, in Pacman, you should not come into contact with ghosts, except when they become vulnerable thanks to the special Pac-erasers. At this time, you must eat the ghosts as quickly as possible because they bring in a lot of points.

1.2 The video game

We will develop the definition of game proposed by Szilas and Acosta by applying it to video games. Video games have the characteristics of a "normal" game: it is a free activity, separate from the real world, which is regulated, which has no consequences, which has an objective, etc. However, it has certain peculiarities, other than the computerized support, which we will observe here by looking at two components of a game: the mechanics of the game and the rules of the game.

The mechanics of the game are the equivalent of the constitutive rules presented by Salen & Zimmerman [14], which modify the state of the game according to the player's actions. Take the example of the Carcassonne board game: players must place tiles to form a landscape and score points by closing castles, fields or roads containing one of their pawns. When a player closes a castle, he must count the number of points he wins, remove his pawn from the castle, modify the point counter, etc.

In a video game, the mechanics are automatic: the change of state can be shown by a short cutscene, but the player has nothing to do.

The second component of a game is the rules of the game, in other words the operational rules of Salen & Zimmerman. These rules define what the player has the right to do. In so-called classic games, it is the players who manage the rules among themselves and ensure that they are

respected. For example, in Carcassonne, it is forbidden to position a pawn on a road that is already occupied by another player. If someone does this, the game is compromised. The advantage of video games in this regard is that the player cannot make these kinds of errors or can hardly cheat (depending on the player's intentions) since the system will directly reject the player's action.

In addition to these two elements, we can note some other notable characteristics of the video game: the diversity of content such as image, sound, videos, texts, etc.; the player's direct interaction with the game environment and the ability to receive automatic feedback corresponding to the player's various actions.

1.3 What is a serious game?

In the 2000s, after the relative failure of educational software, serious games were born. As with games, the concept of serious games has been defined by many researchers.

Alvarez [15] described serious games as having an "explicit and carefully thought-out educational purpose":

Games may be played seriously or casually. We are concerned with serious games in the sense that these games have an explicit and carefully thought-out educational purpose and are not intended to be played primarily for amusement. This does not mean that serious games are not, or should not be, entertaining.

As for John, he defined serious games as « computer application, the initial intention of which is to combine both serious aspects (Serious) such teaching, learning, communication, or even information, with playful springs from the video game (Game) ».

Alvarez & Djaouti invite us to be attentive and not to confuse serious games with video games, or with software that does not contain any playful dimension (see Figure 1.1).

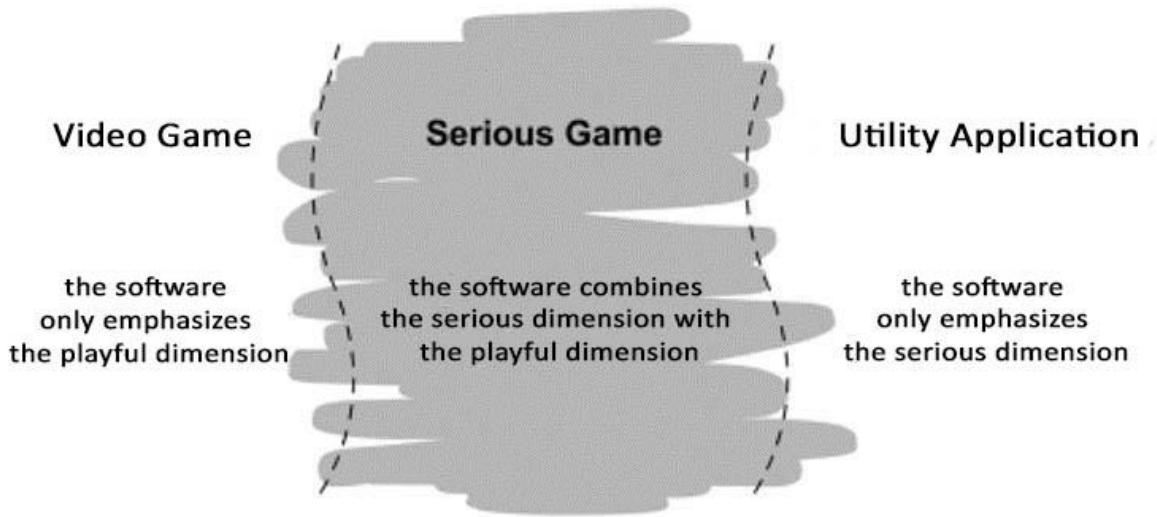


Figure 0-1 Positioning of Serious Games - from Introduction to Serious Games[15] .

The simplest definition of serious games, then, is games that do not have entertainment, enjoyment, or fun as their primary purpose. That isn't to say that the games under the serious games umbrella aren't entertaining, enjoyable, or fun. It's just that there is another purpose, an ulterior motive in a very real sense.

1.4 Where's the fun?

There are some people who will take exception to this definition because it contains no references to "fun." However, "fun" is not an ingredient or something you put in. Fun is a result. In A "Theory of Fun", Raph Koster [16] defined fun as a side effect of learning something new, something that we "get." The feeling of fun is essentially a positive feedback mechanism to get us to repeat the activity over and over.

A game can be fun, but only if the player enjoys playing the game. Since games are a voluntary activity, something the player chooses to do, there is an implication of enjoyment, either in anticipation or based on past experience. In the absence of anticipated enjoyment, or because of an unpleasant earlier experience, the player may choose to not participate or find something else to do. In other words, if a player does not find a game fun, he is unlikely to choose to play it again.

Whether serious games need to be fun, or should be fun, is an ongoing debate. In a survey of serious game developers, educators, and researchers, over 80 percent of respondents felt that the "element of fun" was Important or Very Important (see figure 1.2).

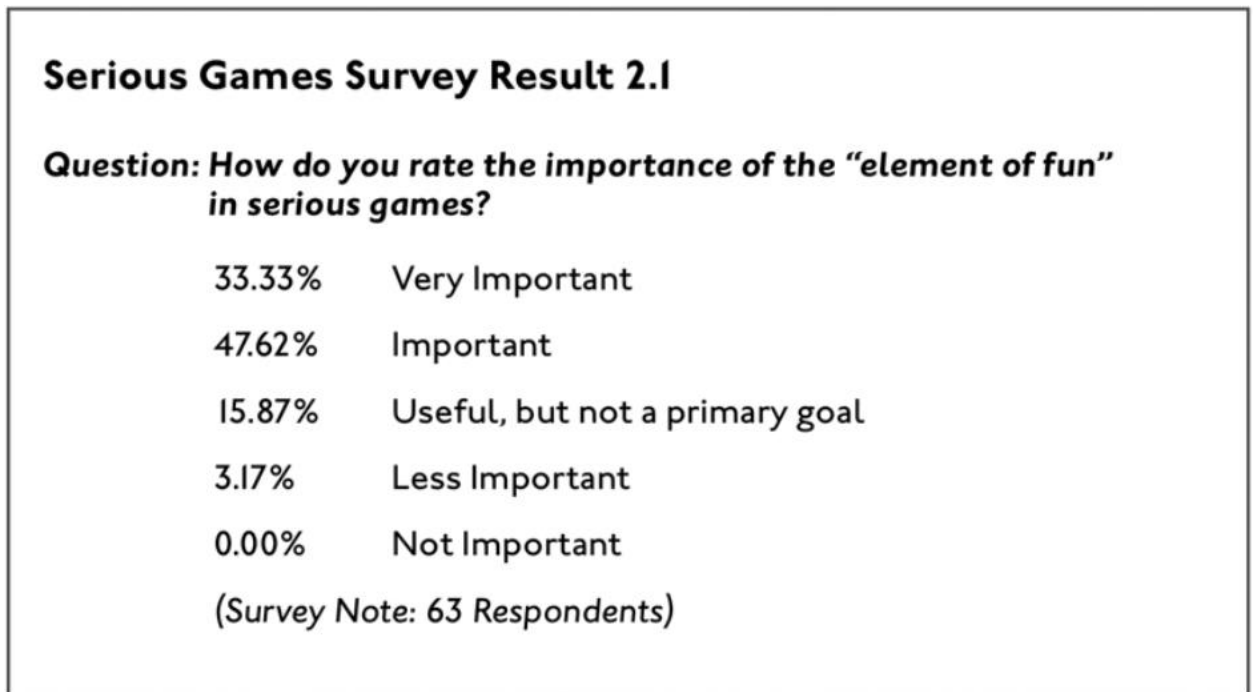


Figure 1.2 Survey result

Serious games often violate one of the six characteristics listed above in that they aren't always voluntary activities. Trainees may indeed be ordered to play a particular game as part of their training. This doesn't mean that the serious game cannot be fun. This is one of the advantages game developers and designers have to offer serious games: the know-how to make something fun.

Finally, what one person considers a fun simulation may be deadly serious to someone else. For example, the doctor trying to learn the best way to approach an upcoming surgery in a simulation isn't looking to have fun. He or she is dying to save a life by causing the least amount of damage to the affected tissue while still accomplishing the healing objective. In that case, fun must take a backseat to the accuracy of the simulation. [17]

1.5 What is an educational game?

The first educational games appeared early in 1980. Public interest in video games has raised questions about the possible combination of play and learning. "If the computer is an object of pleasure with video games, could we not use this enthusiasm in the service of learning?". At that time, these games were qualified as educational. It was about adding fun to educational practices to make them more attractive.

Among the most famous educational software, we can notably mention *Adi*, a game released in 1991 which featured an alien which provided some support to children. This software did contain games and learning content, but the two were not directly related. In order to be able to play the games contained in the software, the child first had to complete a certain number of exercises. This program did not allow learning by playing since the two dimensions were clearly separated.

Given the definition of serious games, we can conclude that video games for educational purposes are serious games in their own right. Given the contribution that these games are supposed to bring to users, we can think that they are undermining the definitions proposed by Caillois and Huizinga which respectively qualified the game as "unproductive" or activity "devoid of any material interest and any usefulness".

Berry and other authors (Kellner, for example), discuss two types of questions that arise in educational games. The first is precisely the attribution of an educational facet to the fun. How to combine two activities that are so much in opposition? By taking up different criteria that define play activity, we can clearly see the difficulty between the play project and the educational project, the tension between "school form and play form" [18]:

- First of all, play is an uncertain activity, the outcome of which is unknown, while in the educational field, we try to avoid there being a "loser", everything is planned in order to avoid a student is late compared to others. Would the level of the game be lowered so as not to go against this goal?
- Second, he notes that the "frivolity and gratuitousness" of the game may be incompatible with the serious notion of education.

- Finally, the educational field has a compulsory dimension which is in contradiction with the free action that is play.

The second question concerns the purpose of the game. Did this game really allow players to learn something? How can we prove the effectiveness of a given educational game? Szilas and Acosta argue that for an educational game to remain a game, the educational part of the game must be a side effect of the game. Play should be the primary goal [13].

CHAPTER 2: VIDEO GAMES AND LEARNING

2.1 Effect of learning

We consider that most of the research has focused on two aspects:

- Effects of learning with digital games (digital literacy);
- Learning with games in schools.

2.1.1 Effect of learning with digital Games

Videogames are useful instruments for learning specific strategies and for acquiring knowledge; they also develop the learning that is characteristic of the culture of the information society, and this learning is likely to have long-term consequences. Games can be used to learn a particular content, but they may leave an impression. Researchers are now investigating the types of learning that derives from the use of the videogames and their possible applications in other areas of study. We should also remember that videogames have certain features of their own that distinguish them from other computer products. The content of the medium -as McLuhan says- is another medium, since many types of content in videogames introduce important modifications. [19] To quote Provenzo, “Videogames are a complex, rapidly evolving form to which most parents and adults pay relatively little attention” .

Many computer applications, especially computer games, have design features that shift the balance of required information-processing, from verbal to visual. The very popular action games, which are spatial, iconic, and dynamic, have things going on at different locations. The suite of skills children develops by playing such games can provide them with the training wheels for computer literacy, and can help to prepare them for science and technology, where more and more activity depends on manipulating images on a screen.

According to Subrahmanyam and Greenfield, “Despite advances in interactive technology and the capabilities of current computer games, the fundamental nature of computer games has remained unchanged”. The current generation of games continues to include features that emphasize spatial and dynamic imagery, iconic representation, and the need for dividing attention across different locations on the screen. Therefore, the nature of the effects of computer game playing that stem from structural features of the medium would likely remain the same—

although the strength of the effects on visual intelligence could change with increasing sophistication of the graphics.

Two studies of children's use of computers at home argue that children's early interactions with computer games help to develop a playful approach to computers. This author considers that the use of games facilitates the use and understanding of technology. This has implications in the way that children approach computer-based learning tasks.

The central argument of Gee [8] about what video games offer to learning is the idea that semiotic domains are shared by groups of people, described as affinity groups, sharing knowledge, skills, tools and resources to form complex systems of interrelated parts. Learners gain resources from fellow members that equip them to solve problems. This is the evidence of active learning "the learner needs to learn not only how to understand and produce meanings in a particular semiotic domain that are recognizable to those affiliated with the domain, but, in addition, how to think about the domain at a 'meta' level".

Players have to understand the meanings of the internal design grammar and the ongoing social practice that determine the activity. This systemic view makes players think about and critically appraise games as systems and designed spaces [8]. According to Squire [20] videogames create experiences in which learners are immersed in situations in which they think with tools and resources with the aim of complex problem solving. In fact, when games become more complex, they begin to use intelligent tutors, scaffolding, etc.

An important point mentioned by Squire is that the main differences between e-learning and games is related to the content. In e-learning content is the most important thing, while the experience is the most important aspect of a game. Games structure the entire experience around problem solving.

In summary, researchers of the potential of games to support learning consider that games are not as good as other media for generating textual understanding. What they are able to do effectively is to promote conceptual learning, problem solving skills, co-operation, and practical participation. "Games are powerful contexts for learning because they make it possible to create virtual worlds, and because acting in such worlds makes it possible to develop the situated

understandings, effective social practices, powerful identity, shared values, and ways of thinking of important communities of practice”.

2.1.2 learning with Games in School

In recent years there have been a number of studies of the use of computers in schools intended to explore whether these games can have any role in supporting educational goals. Studies on the application of videogames in school curricula concentrate on the impact of the material in the games on learning. In these studies, knowledge of material in the curriculum correlated clearly with knowledge used in the games.

On the transfer of material in areas of the curriculum the study by Nussbaum and colleagues [21], conducted with 300 children in the fourth year of primary school, is particularly interesting. The team designed a series of games using Gameboy in language and mathematics. Each game was a story that included specific characters and interactions, but all shared certain common basic elements: the way the task was presented and how it was resolved; positive or negative feedback at the end of the task; interaction with rival characters; rewards; assigning a score. An important feature of the software is that it includes a self-regulation system, that is, a set of rules that adapt the game and its contents to the user's level, which is recorded by the machine itself. The aim is to avoid frustration and boredom.

Forty-six educational videogames were designed, covering almost the entire educational program in language and mathematics. In the area of language, a single objective was set, namely to support the process of decoding via the development of visual vocabulary, the visual discrimination between letters, and phonological and morphemic analysis: all different strategies for recognizing and analyzing words.

In the area of mathematics two broad objectives were set:

- to familiarize the child with the basic structure of skills and mathematical thought.
- to learn and apply basic mathematical contents, focusing on the areas of arithmetic and geometry. During the experiment, teachers learnt to use the instrument autonomously in their classes within a relatively short period of time (two-three months). A key factor in the success of the project was the fact that the teachers themselves had the opportunity to use the instrument.

Their opinion at the end of the experiment was positive; they considered the videogame to be an easy to use educational instrument with potential as backup to other teaching material.

McFarlane, Sparrowhawk, and Heald [22] also assessed the knowledge acquired via the use of videogames in primary and secondary teaching. The study was based on teachers' opinions on the limits and potential of videogames. Their results reflect that most of the teachers had a very positive view of adventure games and above all of simulations. However, in spite of this very positive assessment, they stressed the difficulty of using these simulation games in secondary teaching due to pressure of time and the need to cover the educational curriculum outline in its entirety.

The main disadvantage of the use of games in the classroom is the amount of time it takes for both the student and teacher to guide themselves within the game. Squire [20] describes several sessions using simulation games showing the considerable effort needed by the teaching staff to use the game in the curriculum. In the interesting dissertation by Egenfeldt-Nielsen [23], he concludes that we need more experiences in the classroom to see what happens when computer games area brought into an educational setting accompanied by sound didactic considerations.

2.2 Language game:

In this article, we will treat eight studies, five Arab studies, and three foreign studies. They will be presented according to language and chronology:

For Arab studies:

Attallah [21] conducted a study entitled: "The impact of a proposed program in language games for the treatment of reading weakness for third-grade primary students". This study aimed to know the impact of a proposed program on language games to treat reading weakness among third-grade students. The sample consisted of a group of third-grade students; it was divided into two groups, the first is the experimental group that was studied using a proposed program in language games. And the second is control group that was studied by classical way. The study found that there are statistically significant differences at the level of significance between the average marks of the experimental group and the control group in the post-test that is attributed

to the effect of the proposed program on language games and to the benefit of the experimental group.

Hassan [22] conducted a study entitled: “The efficiency of using educational games in grammar learning of fourth grade primary students”. The study aimed to know the effectiveness of the use of educational games in the grammar learning of fourth-grade students. The study sample was divided into two groups, the first is the experimental group that was studied using educational games on the subject of “the present tense verb”. And the second is control group that was studied “the present tense verb” by classical way. The study found that there are statistically significant differences at the level of significance between the average marks of experimental group and control group in the post-test and to the benefit of experimental group.

Abu Jamous [23] conducted a study entitled: “Language patterns in Arabic textbooks in the first three grades of primary education in Jordan, and a statement of the level of mastery of students”. The aim of this study was to determine the linguistic patterns in the aforementioned books, and to demonstrate its mastery by the students. The sample of the study consisted of (465) male and female students. A test called proficiency test for third-grade fundamental class, it consists of two parts: nominal sentence test, verbal sentence test. The results reached an increase in verbal sentences over the nominal sentences, as they were (69.8%) to (30.2%), respectively. It also found that the level of mastery of sample students for nominal sentence patterns is better than their level of mastery of verbal sentence patterns. The study also concluded that the sex factor had no effect on the mastery of the sample students' linguistic patterns.

Al Fakh study [24] entitled: “The effect of using language games in teaching English learning of seventh grade students in Jordan.” The study aimed to know the use of these games in learning of English language. The sample of the study consisted of four sections of seventh grade students, two male sections and two female sections. The experimental group was studied in a way of using language games, whereas, the control group was studied in the classical way. The results revealed that there were statistically significant differences at the level of significance between the average marks of experimental group, and control group in the post-test due to the method of teaching, and to the benefit of experimental group that used language games.

Abdouh [25] conducted a study entitled: “The effect of using language games in strengthening communication skills in English as a foreign language for a sample of beginner students in Jordan”. This study aimed to know the effect of using these games on enhancing communication skills in English as a foreign language. The sample of the study consisted of (66) male and female students from the first-year class in one of the private schools affiliated to the Directorate of Education in Greater Amman. The study sample was divided into two groups, the first is experimental group that studied oral communication skills using the language games technique. And the second is control group that was studied oral communication skills by classical way. The results of the study showed that there are statistically significant differences at the level of significance between the average marks of experimental group and control group in post-test of language game technique, and to the benefit of experimental group that used language games.

For foreign studies:

Elizabeth [26] carried out a study entitled: "The effect of general program on intra-class play in Britain, and conclusion of teachers' theories of the concept of play to strengthen the links between theory and practice."

This study aimed to know the effect of these approaches on play and to know the views of teachers on the concept of play to strengthen the relationship between theory and practice.

The sample of the study consisted of nine teachers who have experience in play in the classroom. The study focused largely on playing games, especially the play of children that are in a period of growth and development. The results of the study showed that the general program had an impact on the building of content and different topics, and that play has the greatest impact on learning and development, it is an essential part of the practice in classroom.

Herselman [27] conducted a study entitled: “Application of educational computer games in teaching English as a second language in medium sixth class in South Africa”. The study aimed to apply these games in teaching English as a second language. To achieve the aim of the study, educational computer games "exercise and train" games were presented. The results of the study revealed that games provide a basis for lifelong learning, fit each individual learner, and motivate him to develop creative thinking in order to solve problems in life situations. At this

stage, the student feels a challenge, adopts the discussion when playing games, and improves his linguistic competence by preparing to preserve familiar content.

Turner [28] conducted a study, entitled: “Explaining the effect of age on understanding and using link statements.” This study aimed to show the effect of age on comprehension of link sentence and how to use it. This study included children of different ages, starting at the age of four, and ending at the age of twelve. The study found that there are differences between students because of age at the level of significance, while there were no differences due to gender at the level of significance. The study revealed that there are differences between children due to the interaction between age and gender.

Through previous studies, we can record the following points:

- The majority of studies that have been studied in educational games, including language games, confirmed that it can be used in different educational stages, from the pre-school stage and kindergarden to the school stage. The results of these studies revealed its effectiveness and relevance to different educational stages, with a focus on the basic stage, such as the Herselman study (1999).
- Some of these studies confirmed the effectiveness of teaching by language games in teachnig and in increasing student learning, such as Hassan (1999) study, and Fakhri study (1995), and also effectiveness for treating reading weakness, such Atallah study (2003).
- Some studies have shown the effectiveness of language games in the field of developing different Arabic language skills, such as Hassan's study (1999).
- Some of these studies confirmed the effectiveness of language games in enhancing communication skills in the English language, such as Abdouh's study (1993).
- Some of these studies confirmed that students' mastery of the nominal sentence patterns is better than their mastery of the verbal sentence patterns. Likewise, there was no effect of the sex factor on the mastery of the sample students of language patterns, such as the study of Abu Jamous (1998).

2.3 The motivation of the players

Game designers are wizards of engagement. They have mastered the art of pulling people of all ages into virtual environments, having them work toward meaningful goals, persevere in the face of multiple failures, and celebrate the rare moments of triumph after successfully completing challenging tasks. In this section, we do not focus on the motivations children and youth have for playing video games [29]. Instead, we aim to identify several characteristics of video games that seem to promote an effective motivational style both in and outside gaming contexts. Specifically, decades of research in developmental and educational psychology suggest that motivational styles characterized by persistence and continuous effortful engagement are key contributors to success and achievement [30].

According to Dweck and her colleagues, children develop beliefs about their intelligence and abilities, beliefs that underlie specific motivational styles and directly affect achievement. Children who are praised for their traits rather than their efforts (e.g., “Wow, you’re such a smart boy”) develop an entity theory of intelligence, which maintains that intelligence is an innate trait, something that is fixed and cannot be improved. In contrast, children who are praised for their effort (e.g., “You worked so hard on that puzzle!”) develop an incremental theory of intelligence; they believe intelligence is malleable, something that can be cultivated through effort and time. We propose that video games are an ideal training ground for acquiring an incremental theory of intelligence because they provide players concrete, immediate feedback regarding specific efforts players have made.

Further, research has shown that the extent to which individuals endorse an incremental versus entity theory of intelligence reliably predicts whether individuals in challenging circumstances will persist or give up, respectively [30]. Thus, these implicit theories of intelligence have implications for how failure is processed and dealt with. If one believes that intelligence or ability is fixed, failure induces feelings of worthlessness. But if intelligence or ability is presumed to be a mark of effortful engagement, failure signals the need to remain engaged and bolster one’s efforts. In turn, this positive attitude toward failure predicts better academic performance [31].

Notably, video games use failure as motivational tools and provide only intermittent chances for large-scale success. As behaviorists have documented for decades [32], the kinds of

intermittent reinforcement schedules that are doled out to video game players are the most effective for “training” new behaviors. We propose that being immersed in these gaming environments teaches players an essential basic lesson: Persistence in the face of failure reaps valued rewards [33]. Moreover, contrary to what we might expect, these experiences of failure do not lead to anger, frustration, or sadness, although players often do feel these negative emotions intermittently. Instead, or as well, players respond to failures with excitement, interest, and joy [34]. When faced with failure, players are highly motivated to return to the task of winning, and they are “relentlessly optimistic” about reaching their goals [35]. The development of a persistent motivational style charged with positive affect may, in turn, lead to lasting educational success [33].

In summary, although playing games is often considered a frivolous pastime, gaming environments may actually cultivate a persistent, optimistic motivational style. This motivational style, in turn, may generalize to school and work contexts. It is also probably the case that certain types of games will more likely foster these healthy motivational styles, while others may not. Moreover, individual differences in players’ personalities and preferences for game genres may also have a differential impact on motivational outcomes. New studies that are designed to take these complexities into consideration are necessary to move the field forward significantly.

CHAPTER 3: GAME DESIGN AND DEVELOPMENT

3.1 Analysis of the needs

By looking for information in some elementary schools on the subjects which posed the most problems for the pupils, we were able to observe the distress of the teachers and the pupils faced with the learning of conjugation and grammar. Teachers are trying by all means to play down this subject that scares the students so much. So, they try more fun activities, like games of the families, memory etc. In addition, as "Al-Bajah Abdel-Fattah Hassan" note [36], errors concerning the writing of verbal forms are very present in elementary school, which seems normal, but they are always as present in high school and even sometimes at university.

During our research on the list of existing products, we could note the absence of a conjugation or grammar game whose learning content was strongly integrated into a story. Indeed, most of the software that we have been able to find consists of simple exercises where the goal is to give a verb at a given time [37]. We were also able to find conjugation mini-games in the form of memory for example [38].

3.2 The target audience

We considered it appropriate to consolidate the achievements of students from elementary school. The target audience of our game is therefore made up of children in 4th grade of Primary Education in Algeria, or an equivalent class; they are about 9 years old. These children must be Arabic-speaking.

3.3 Constraints

Our game was created with the aim of being tested in a class. Several constraints had to be taken into account when creating the game. First, the game should not last more than 30-40 minutes. The levels should therefore be few and not too long.

Even if this game was created with the aim of being tested in the classroom, we would like to point out that it was not designed for a specific use. As it does not require external intervention (from a teacher or a parent), we believe that it can be used both in school and out of school.

Finally, A primary school director suggested two wishes. He wanted the children to be able to save their game in order to resume it later, and he also wanted to know where the students had made the most mistakes.

3.4 The educational objectives

After discussing with a director of a primary school about most of the problems that students in the fourth grade of primary school suffer from, the director told us that the basic step for Arabic language proficiency is to proficiency the grammar and conjugation. So, this game is about the learning of conjugation and grammar in Arabic language like:

- Conjugate verbs in the past, future, and command
- The necessary and transitive verb
- Open ‘*Taa*’ in verbs and nouns
- The closed ‘*Taa*’
- ‘*Hamza*’
- ‘*Alif allayinat*’ in verbs and nouns

3.5 The technical solutions adopted

3.5.1 Development environment

"أنفذ قرينتك!" game was developed on the Android Studio environment. It is the official integrated development environment (IDE) for Android application development. It is based on the IntelliJ IDEA, a Java integrated development environment for software, and incorporates its code editing and developer tools.

We wanted initially to develop the game on the Unity games engine, but because it does not fully support the Arabic language, we could not do that, as we note that the Unity games engine does not provide all its services for free, most of the necessary tools are expensive.

We chose the Android Studio environment because it provided great interest in the Arabic language in the processes of input, verification and rendering, and it is also completely free.

This environment is extremely logical: the layout contains all the objects that will make up a given scene (what users will see). It is associated with an event sheet which will contain all the events that will occur following the player's actions.

The special thing in this environment is that it gives us the full possibility to export the game and install it on any mobile device or tablet. This feature would have helped us a lot in the game experience in the classroom.

3.5.2 Game graphics

The main difficulty in creating "أنفذ قرينتك!" was to find enough consistent images to make the game attractive. We were able to find all the necessary images online in different banks of royalty-free vector drawings like: Freestocks [40], Pngtree [41], PNGWing [42].

These images allowed us to make some initial tests on PowerPoint before inserting them into Android studio, in order to judge whether the arrangement of the elements was pleasant without the screen being too loaded or too empty.

Many elements of the game were also produced via photoshop [45] (notably the speech bubbles, the "montages" of images, the different buttons, characters' pictures, moves, and backgrounds) that draw the child's attention inside the game.

3.5.3 Adding voices and music

In order to make the game as entertaining and enjoyable as possible, we decided to include music and bring our characters to life by giving them a voice.

The music was found on two sites [43] [44] containing sounds free of rights.

For the voices, we created a game script (Annex 3) before recruiting the "actors" and recording their voices. Once the recordings were finished, we were able to integrate them into our game and readjust it accordingly. Indeed, adding these voices.

3.5.4 The test and debug phases

An important step in game design is the testing phase. This is to test all the possibilities that the game offers in order to be able to find any bugs that players might face. The test phase also allows us to estimate the difficulty and the playability of the game. For this part, we called on

outside people who did not necessarily know our project and we asked them to play as they normally would. We also participated in this stage.

Many adjustments had to be made following this. Indeed, problems with display, following events, etc., were encountered by the people performing this test phase.

3.6 The mechanics of the game

To describe the mechanics of the game, we will talk about the "gameplay bricks" (see Figure 3.1) used to sort video games on the site created by Djaouti & Alvarez: gameclassification.com. In this context, they identify ten bricks which refer to the "basic rules" of a game. These bricks are separated into two categories: the rules of objectives to be achieved (orange bricks) and the rules proposing means to achieve these objectives. (blue bricks).

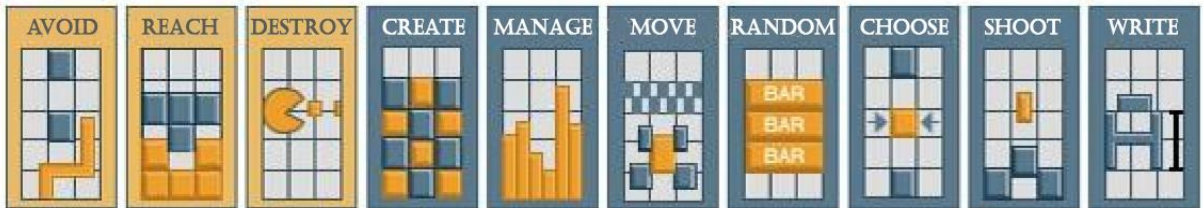


Figure 0.1 Bricks of Gameplay - from Serious Game Design Theoretical and technical considerations on the creation of video games with utility vocation [15].

To characterize our game, we will use two blue bricks: choose and write. Indeed, in order to be able to advance in our game, the player must either choose a correct answer from several choices by clicking on it, or write the appropriate answer on the keyboard.

3.7 History and stages of the game

The game has an increasing difficulty through each level. It consists of three different levels, each level is more difficult than the one before it, the first level has questions with different choices and the student must choose the correct answer while the second level is required of the student to enter the correct answer via the keyboard. The third level which is the last one is a combination of choice and input questions with the addition of a time countdown timer.

Our game is called "أنقذ قريتك!" and it takes place in a fictional area which is a small village in which a group of villagers live, it is attacked by a group of villains who want to control the village and enslave the citizens, and therefore the goal of the game is for the child to be able to fight the bad guys and save The village in order to return as it was. You will find below a

storyboard explaining the different stages of the game. The green sticker represents the first scene of the game and the orange sticker represents the last scene (See figure 3.2).

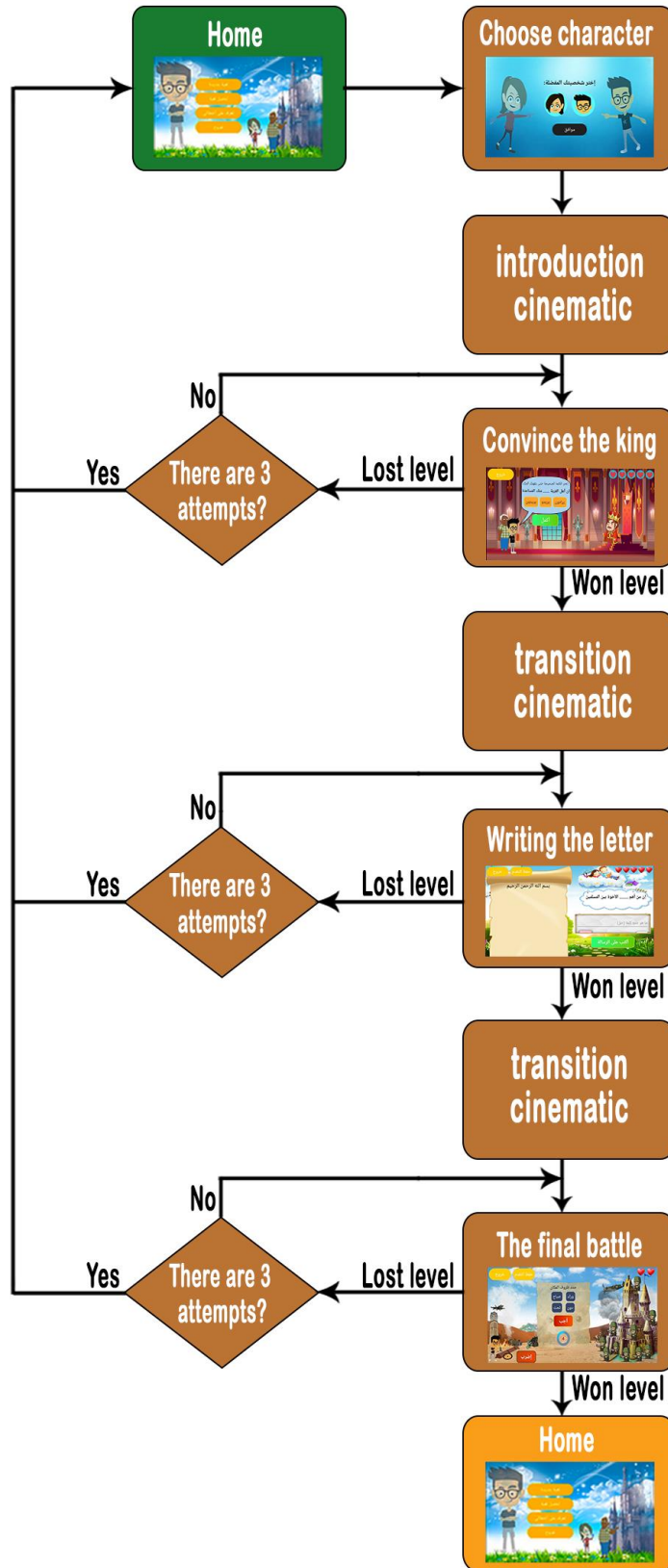


Figure 0.2 Storyboard of “!أنقذ قرينتك”.

3.7.1 Homepage:

It is the main interface of the game with a general background on the game, in order for the child to take a general idea of the thing that he will deal with inside the game, it contains buttons to manage the game where the child must choose one of them to enter the game (See figure 3.3).



Figure 0.3 Screenshot of Homepage.

لعبة جديدة : a new game was launched from the beginning with all levels.

تحميل لعبة : If the child has already played and saved his progress, and then wishes to complete his game from where he left off, then he is required to enter the details of his first and last name in order to enter where he stopped previously.

تعرف على أخطائي : in order to review the mistakes the child made while playing.

خروج : This button is for exiting the game where it shows a small window asking it if it is sure to exit or not.

3.7.2 Choose character

We thought that giving opportunity to the child to choose his favorite character would be more fun in playing (see figure 3.4), as we would abandon the contempt problem for one of the two sexes over the other (male and female). If the main character was "male", the game would be neglected by the female and vice versa.



Figure 0.4 Screenshot of choose character.

After selection, this character will accompany him until the end of the game.

3.7.3 Introduction

The learner plays the role of the character he chose in the previous stage in a fictional world reminds us of antiquity and primitive populations. The voice of the narrator begins with a narration of the game's events from the beginning and how the village was controlled by the gang of villains. He meets a person who had escaped from that village called "Uncle Abdullah" who asks him to accompany him to the king of the neighboring village to ask for help and save the village.

We have seen that combining sound with reading is of better efficiency and benefit than reading alone, as the first targets more than one sense, which benefits the child more in operating his senses and creating an atmosphere of pleasure and fun, while reading alone is a path towards boredom no matter how doubling the element of suspense, and as a result of that The child cannot pass this introduction at the beginning of each stage until the narrator completes her reading aloud, which increases the opportunity for him to understand strongly the details of each stage.

3.7.4 Convince the king

Once the introduction is complete, the child finds himself in front of the king of the mentioned castle, he must now explain to him what happened, and why he is standing in front of him now. In this exercise, the child must have one of the three proposed solutions (see figure 3.5), he must choose the correct answer so that he can Continuing his explanation, there are at this stage more than 15 questions that the child must answer at least 10 of them correctly in order successfully persuade the king to help him.



Figure 0.5 Screenshot of convince the king.

In the event that the child does not specify any of the proposed answers, a message appears at the bottom of the screen in blue telling him that he must choose one of the answers in order to be able to continue playing. (see figure 3.6).

If the child chooses the correct answer, a message appears at the bottom of the screen in green for a small period of time that encourages him to continue and that he is doing the right thing such as: “ ذكي ”, “ عمل متقن ”, “ أنت رائع ”, “ ممتاز ” ... (see figure 3.7).

If he chooses the wrong answer, he will see a message at the bottom of the screen in red with vibrate telling him that he is wrong such as: “ ركز جيدا ”, “ لا تيأس ”, “ حاول مجددا ”, “ خاطئ ” ...

furthermore, when the child makes a mistake, the king shows him that he did not understand by saying sentences such as : "ماذا تقول؟", "ماذا تحاول إخباري؟", "عفواً؟" (see figure 3.8).



Figure 3.3 Screenshot of undefined any of the proposed answers.



Figure 3.4 Screenshot of a correct answer.



Figure 3.8 Screenshot of a wrong answer.

If the maximum number of errors is reached the king apologizes and orders him to leave the castle, and also recommends that he speak well the next time, the child is again in front of the game's home page to start a new game.

If the child succeeds in convincing the king correctly without reaching the largest number of attempts, the king asks him to help write a letter to the soldiers to instruct them to prepare for the start of the war and save the village.

We also note that the game contains many speeches, each of which is chosen randomly so that the child does not encounter the same questions every time he enters the game and thus saves it and exceeds the level with ease

We have modeled a flowchart in order to clearly summarize the first level (see figure 3.9). The X we are talking about in the operation "Set X to 1" corresponds to the number of the sentence. The shapes with rounded edges represent the beginning and end stages of the level, they are terminals. The diamonds represent "decisions", which is why they have several branches. If the answer to the question is "yes", a certain treatment applies, if the answer is "no", another treatment applies. Here, the only action performed by the player is to select an answer from a given sentence. Finally, the rectangles are the actions taken by the software itself in response to the player's inputs.

Recall here that this flowchart does not contain certain actions that the player can do: exit the game, save, load and delete backups, and consult the instructions.

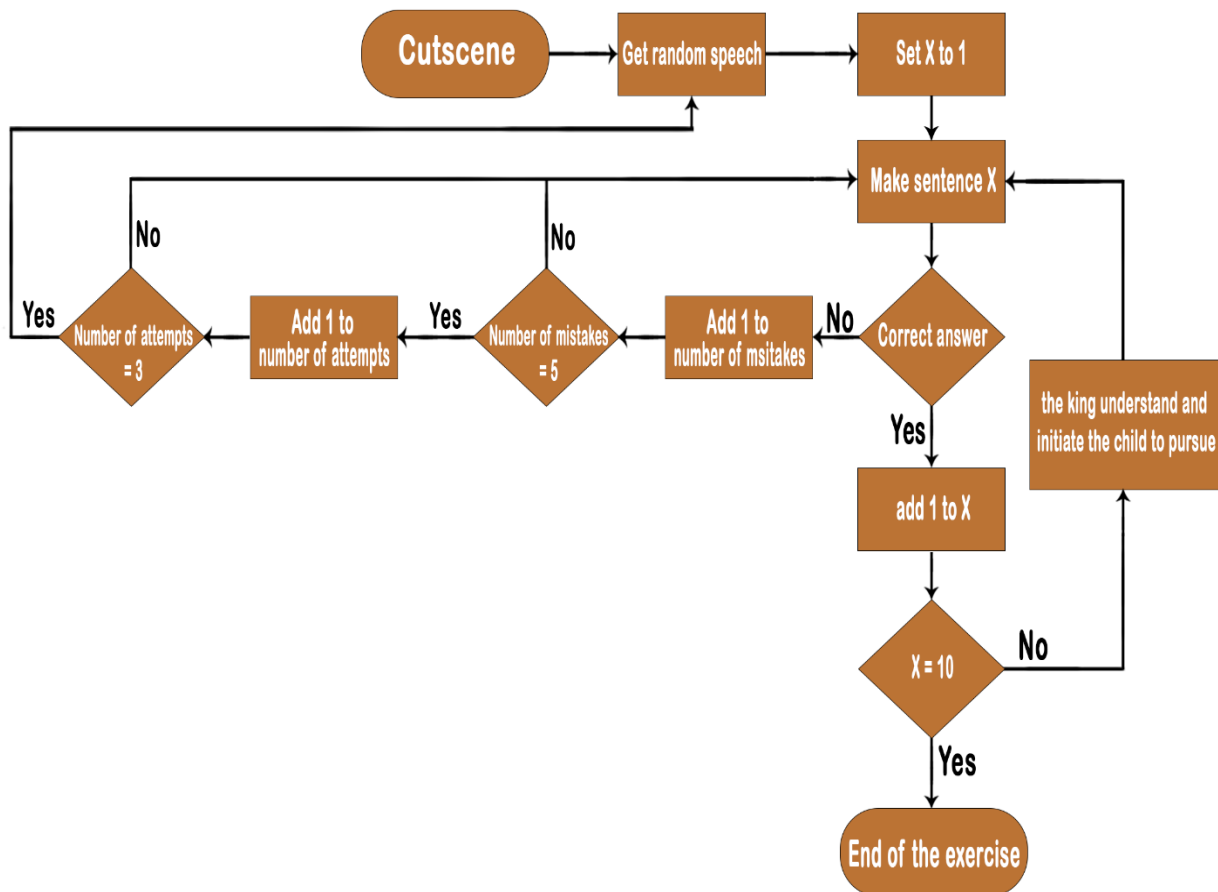


Figure 0.9 Flowchart representing the flow of actions of the first level.

3.7.5 Writing the letter

Before this level comes a small scene where the child hears the narrator’s voice telling him that he must write the letter correctly in order to pass it on to the soldiers. All the child has to do is enter the appropriate words for each sentence.

We have modeled a flowchart in order to clearly summarize the second level (see figure 3.10).

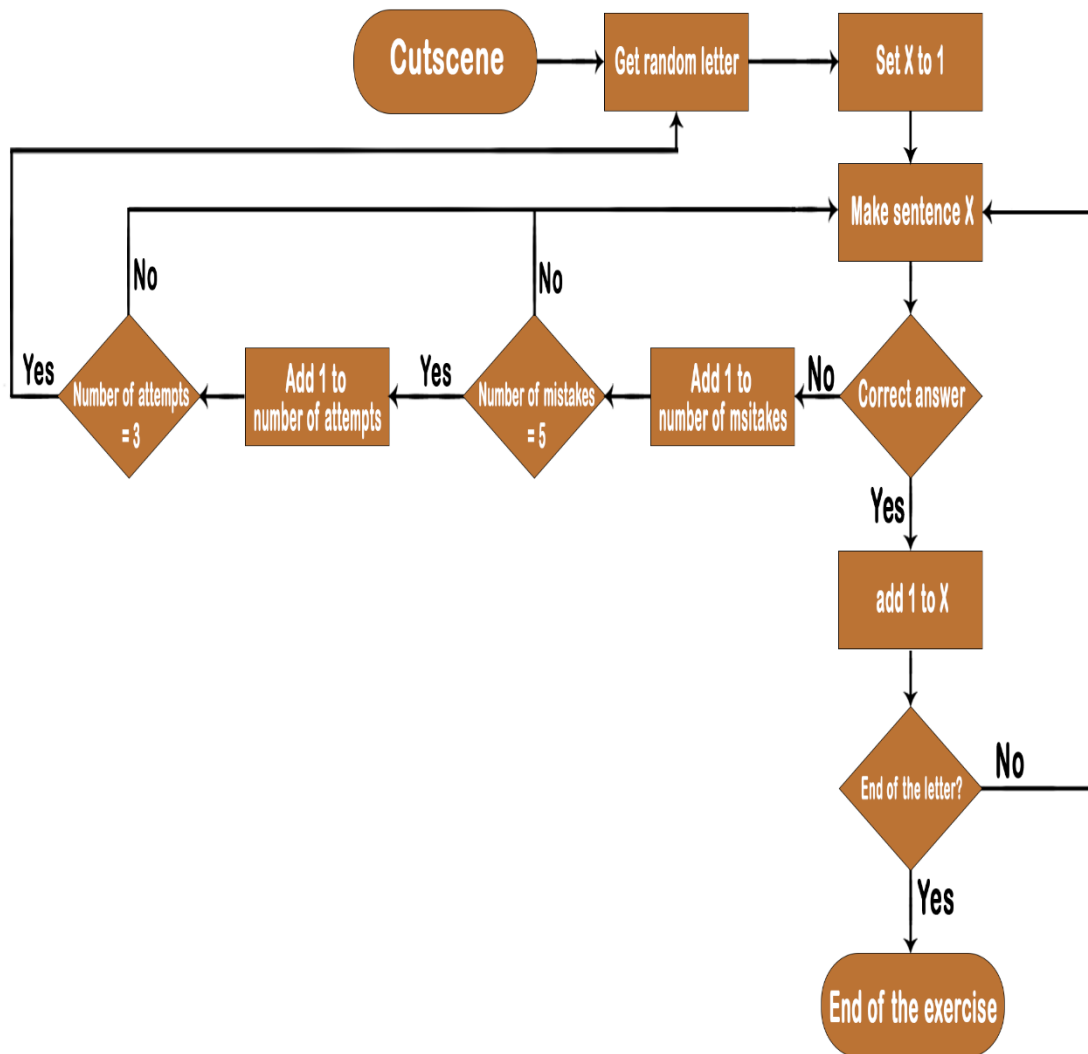


Figure 0.10 Flowchart representing the flow of actions of the second level.

To pass this level, the child must enter the appropriate word in the entry field for each sentence, (see figure 3.11). So that each sentence comes with a different question than the one before it.



Figure 0.11 Screenshot of writing the letter.

It may be useful to recall that the transition to a more difficult level in learning has been changed, which is to replace the way to answer questions from choosing the correct answer to enter the correct answer.

In this exercise, if the child commits the maximum number of attempts allowed, a large red window appears that states that he has already lost all his attempts with a button in the middle when pressed to return him to the beginning of the game (see figure 3.12).



Figure 0.5 Screenshot of loss all attempts.

In the event that he has completed the writing of the entire message correctly, a green window appears on it that says that he is a clever and intelligent child, and that he has written the letter correctly with a green button in the middle when pressed, he will transfer it to the next witness so that he finds the narrator’s voice explaining to him the third and last level (See figure 3.13).



Figure 3.6 Screenshot of writing the entire message correctly.

In this level and level Three a button has been added next to an exit button through which the child can save his progress in case he wants to exit from the game, when pressed it a small window appears to enter the details of his first name and last name, and the level information and the child's information are saved in the phone database (see figure 3.14).



Figure 3.7 Screenshot of save the progress.

3.7.6 The final battle

Finally, the child found himself in front of the villains who attacked the village. Before entering this level, a short scene comes in which the narrator speaks to the child. He explains to him what will happen in the final war and how to fight the villains. So, the soldiers will save the villagers and the child will save the king's castle from the villains who controlled it.

We have modeled a flowchart in order to clearly summarize the final level (see figure 3.15).

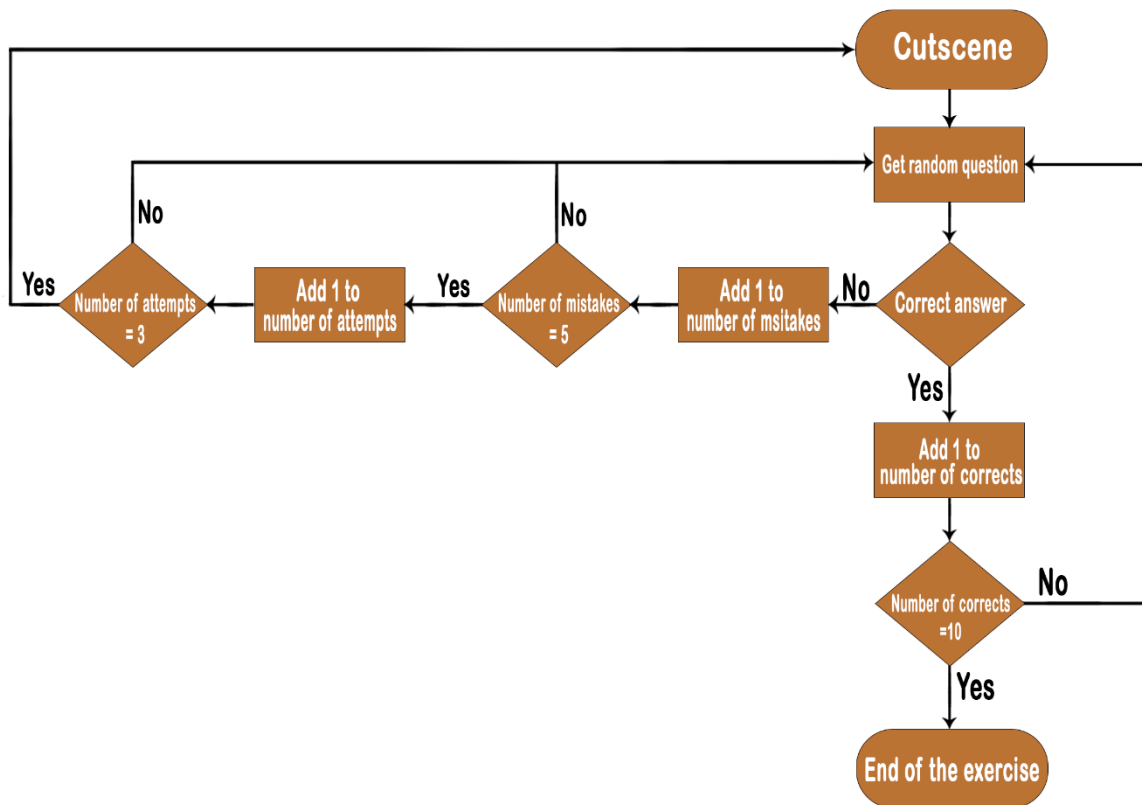


Figure 0.15 Flowchart representing the flow of actions of the final level.

In this level we increased the difficulty level in the exercise. So that we have merged the types of questions (selection and input) with the addition of the time countdown feature.

The child appears against the villains carrying a shell next to a cannon aimed at them (see figure 3.16).



Figure 0.8 Screenshot of final battle.

In every stroke it appears a random question in Arabic grammar, he has only 10 seconds to answer this question (see figure 3.17 and 3.18).



Figure 0.10 Screenshot of a question of choice type. **Figure 0.9** Screenshot of a question of input type.

If the child's answer is correct, the shell will complete its path and eliminate one of the villains. But if the answer is wrong, the shell will explode in the air so he loses one of its five attempts.

In this exercise we put the number of questions with the same number of villains that surrounded the castle. If the child answers all of them correctly, this means that he succeeded in eliminating all the villains and a green window appears to him that he managed to successfully save the village thanks to his tremendous efforts. And if he loses all his attempts, a red window will appear to him that he has lost all his attempts with a button that returns him to the main interface of the game.

3.8 The advantages of the game

3.8.1 Motivational aspects of the game

First, the learning content is deeply embedded in a fictional story that should motivate the child. Indeed, the child must constantly use the grammar to be able to advance in the game. The characters (uncle, king, soldiers, etc.) appear regularly in children's stories. The child may wonder what the villains have done again and how we are going to be able to fight them this time. Then, thanks to the cutscenes, we tried to make the story clear and easy to understand. The child can easily identify the goal of the game. In addition, he immediately sees the consequences of his actions by receiving feedback from the king or from the interface.

Through all these elements, we think that the child will want to save this castle from villains and will therefore be more efficient in achieving the different levels of the game.

3.8.2 Feedbacks

Feedback is described by Rogers [11] as a dialog between the user and the interface. A player's action is received by the game, which then informs the player of his progress or lack thereof. The player continues the game taking into account this information.

We have seen before that the immediate reaction of the environment to the player's actions is important in a game. Indeed, the perception of feedback can influence the player's performance. Reinecke & al [39]. carried out a study in which participants were put into two different experimental conditions: positive feedback versus negative feedback. All participants had to play a game and received one or the other type of feedback without taking into account the veracity of their actions in the game. This study showed that negative feedback affected people in terms of skills and of autonomy.

In “أنفذ قريتك!”, You can find different types of feedback: oral, written, in the form of counters, etc. The oral and written feedback comes directly from the environment, they are fictional, which can have the effect of immersing the player even more in the game world. These feedbacks should all the more grab the player's attention because more evocative than simple true / false.

In first level, the child receives written feedback and oral feedback. Indeed, if he commits a fault, a red message appears at the bottom of the screen, and the king replies that he does not

understand. This reaction is both in written form (the king's bubble appears with the written sentence) and in oral form (the king says what he wrote in the bubble). The child must then take this feedback into account and change his response.

The child can lose if he makes a number of mistakes. In this case, the bubble of the king appears and he tell the child that he is sorry but that he does not understand what the child means and that he must go and ask for help in another place.

In levels 2 and 3, when the child makes a mistake, a red message appears also at the bottom of the screen. We have chosen to leave the wrong answer on the screen so that the child can read it again and understand his fault.

In all levels, when the child is about to lose (when there is only one mistake left), a red message appears telling him that he only has one chance. The purpose of this feedback is to help the child and to remind him to Try to focus in the last chance left for him and that he will lose all his progress if he lost it.

Since children sometimes only have a limited amount of play time, we have set up a system of safeguards. So, the child can play without having to start all over again the next time (review the cutscenes, redo the exercises, etc.). The backups are done by session, that is to say that each child has his own parts recorded, they are not common to the whole class or to all the sessions of the same device. Everyone can record their game. All he has to do when saving the progress, is to enter the first and last name details in order for the data to be saved.

3.8.3 Backups

Since children sometimes only have a limited amount of play time, we have set up a system of safeguards. So, the child can play without having to start all over again the next time (review the cutscenes, redo the exercises, etc.). The backups are done by session, that is to say that each child has his own parts recorded, they are not common to the whole class or to all the sessions of the same device. Everyone can record their game. All he has to do when saving the progress, is to enter the first and last name details in order for the data to be saved.

3.8.4 Game summary screenshot

We have created a screen shows mistakes that the child made while playing in every level. These mistakes can be saved in the database if the child wants to them (see figure 3.18).

أتعلم من أخطائي
<p>أخطاؤك في المرحلة الأولى :</p> <p>1- الجملة: إن أهل القرية منك المساعدة. إجابتك كانت: يريدو . الإجابة الصحيحة هي: يريدون. 2- الجملة: علينا أن نساعدهم. إجابتك كانت: أجب . الإجابة الصحيحة هي: يجب. 3- الجملة: أنت أنا بحاجة اليك. إجابتك كانت: يعرفون . الإجابة الصحيحة هي: تعرف.</p>
<p>أخطاؤك في المرحلة الثانية :</p> <p>1- الجملة: إن يحمل بعضهم بعض. إجابتك كانت: عين. الإجابة الصحيحة هي: عبء. 2- الجملة: وأن إلى مساعدة بعضهم ما استطاعوا إلى ذلك سبيلاً. إجابتك كانت: يبادرو. الإجابة الصحيحة هي: يبادروا.</p>
<p>أخطاؤك في المرحلة الثالثة :</p> <p>1- السؤال: حدد ظروف المكان: صباح ، وراء ، تحت ، دون. إجابتك كانت: وراء ، صباح ، تحت. الإجابة الصحيحة هي: وراء ، تحت. 2- السؤال: حدد ظروف الزمان: حين ، فوق ، أمام ، ظهر. إجابتك كانت: ظهر ، فوق. الإجابة الصحيحة هي: حين ، ظهر. 3- السؤال: أدخل جمع كلمة (قارئ). إجابتك كانت: قارئون. الإجابة الصحيحة هي: قراء.</p>

Figure 0.11 Screenshot of game summary screenshot.

This makes it easy for the teacher to know when the students are making the most mistakes, and can therefore tailor their conjugation lessons accordingly. For example, if he sees that the children made a large number of mistakes in the conjugation, he will know that the children need to perfect it.

3.9 Experiment result

In this part we will be doing field experiments on some children studying a fourth year of primary school in order to find out whether our game really has a positive or negative impact. We wanted to do these experiments in a primary school class, but given the circumstances the country is going through because of the quarantine caused by the "Covid 19" virus, we have not had the opportunity to do so. So, we selected some children from the family and neighbors to do the experiments.

3.9.1 The first experiment

In our first experiment, we took a group of children, classified them by gender (male and female), and we disabled the mistakes review feature in the game. We did the experiment over a week, letting them play for 30 minutes a day. Every day, we must know what level the child

has reached during play after the 30-minute period has ended. The results we obtained have been translated into the figure 3.18:

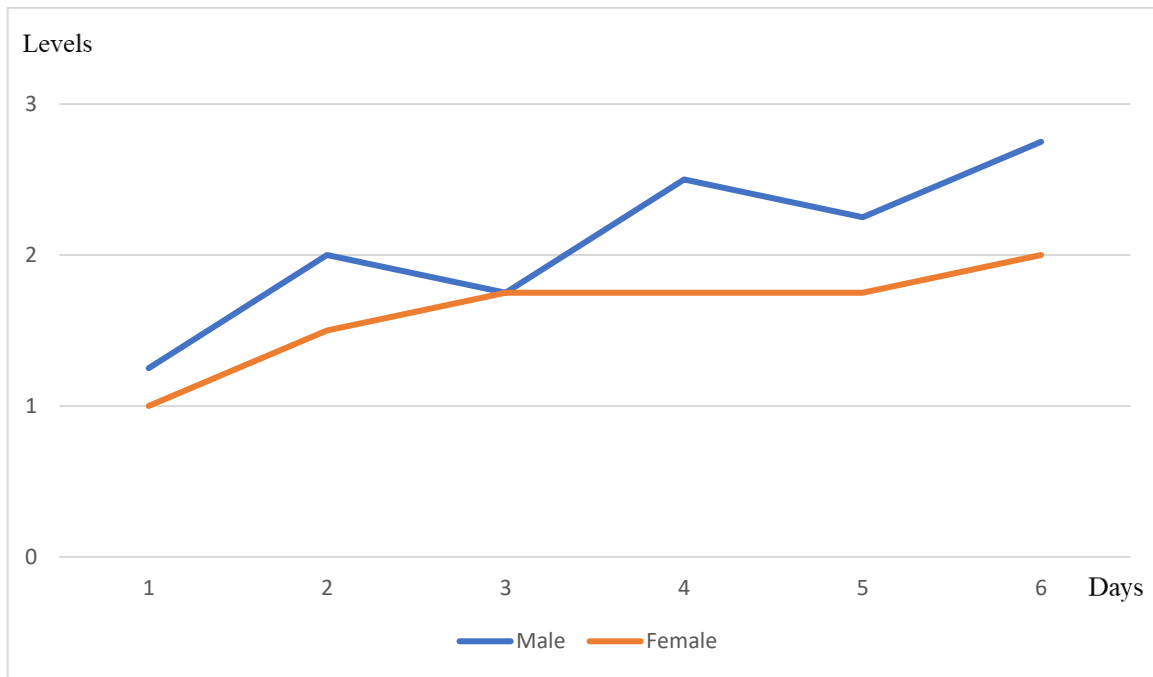


Figure 0.12 Distribute the results of the first week of play.

The first thing that we noticed in the figure was that both sexes could not reach the third level of the game. Through the figure we also note that the males were more successful in playing than the females.

After that we carried out the same experiment with the activation of the mistake review feature in the game and the results obtained were translated into a graph curve in the figure 3.19:

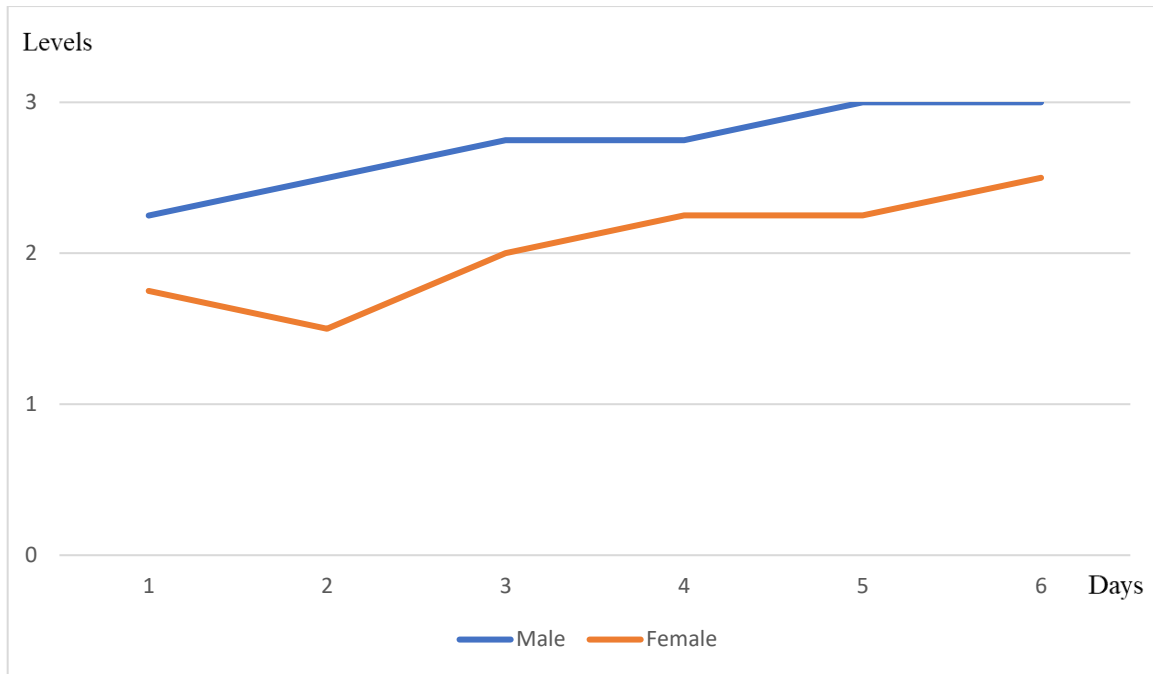


Figure 0.13 Distribution of the results of the second week of play.

We notice an improvement in access to advanced levels in the game for both genders. And male survival is more effective with the game than females.

The result:

From the work of the previous two experiences we can get the main result, which is that the feature of reviewing errors in the game makes the child learn from his mistakes and avoids making such mistakes again, which confirms to us that it is good to include the feature of reviewing errors in our game.

We also conclude that males are more effective with war games than females, which gives us the idea of producing females and male games in the future.

3.9.2 The second experiment

We have make this experiment to find out whether the game has an impact on the child's level in Arabic grammar or not. The first thing we did was write a test for students. The point of this test was on 10 consisting of ten questions in the grammatical rules of the Arabic language (We did these exercises with the help of a director in a primary school using the Arabic language book for the fourth year of primary school). Each question is punctuated with a point, which

means the total score is 10. Then the children had 7 Minutes to complete the test. The results of the test and the points obtained are translated in the figure 3.20:

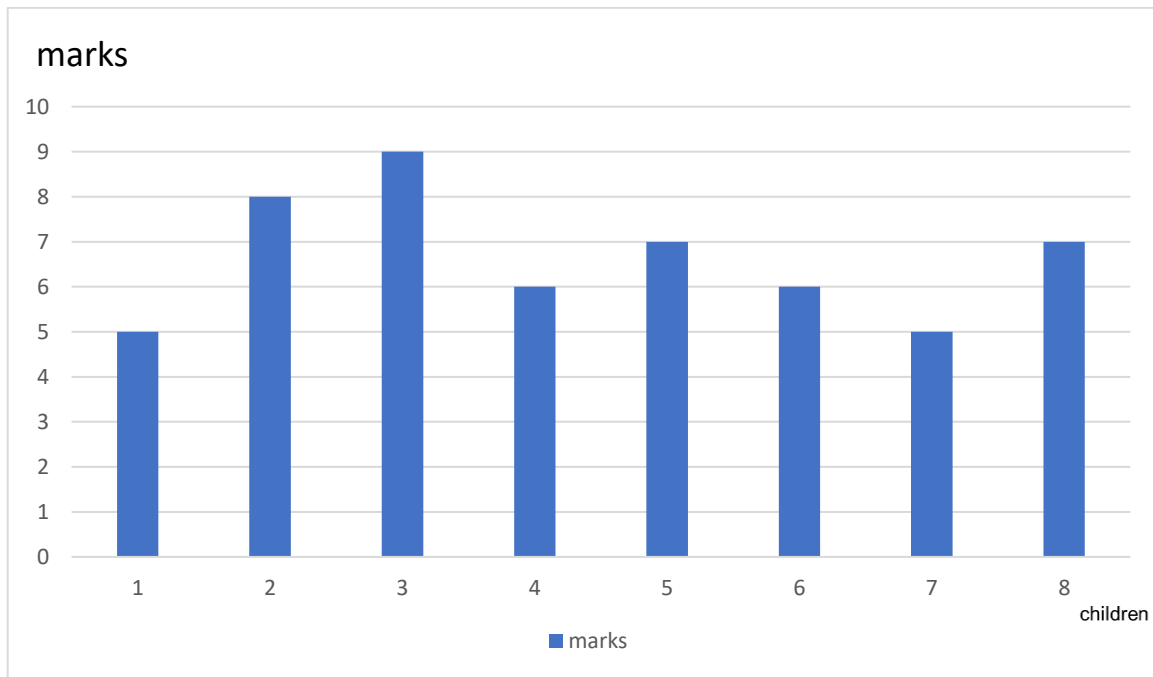


Figure 0.20 Distribution of pre-test results.

After that the game is presented to children for 30 minutes every day for a week. After this week another written test is presented to the students (The first and second test for this experiment are included see annex 1 and 2), which consists of questions at the same level as the previous test questions. The obtained results are translated into the following diagram:

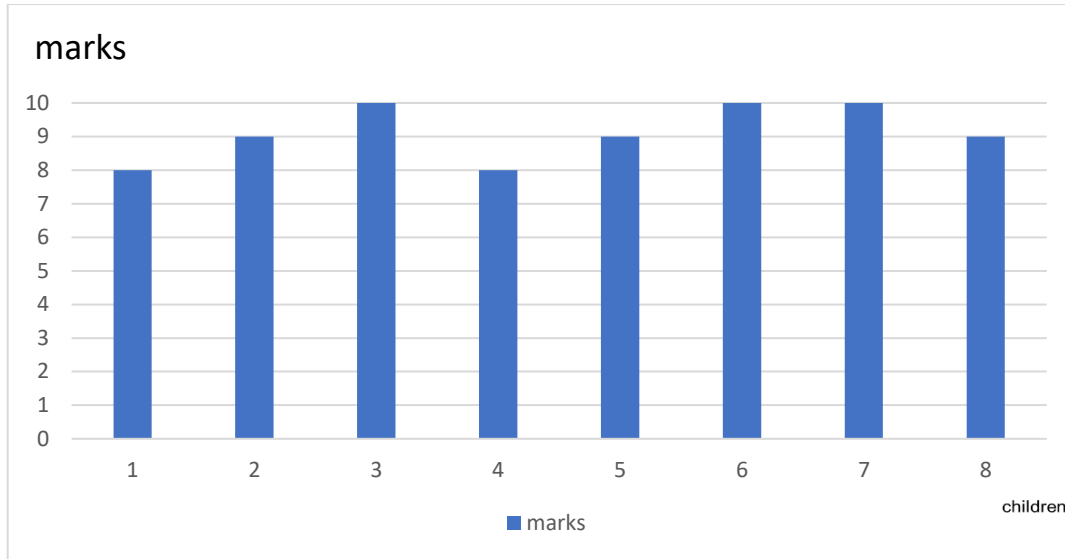


Figure 0.20 Distribution of post-test results.

We note that the children got better scores than the scores they had in the previous exam, as the lowest score was 7.

The result:

From previous experiment, we can conclude that “أنقذ قرينك!” game was useful in improving the marks of the post-test that the children took after the week of play. This confirms the theory that video games have a positive impact on a child's school life.

3.9.3 Discussion

In this work, we wanted to create a video game to improve the learning of a difficult subject to teach and learn. we observed that there was indeed a marked improvement in the scores between the pre-test and the post-test.

This improvement can be explained by the answers to the questions in the post-test. In fact, all of the students gave a very positive evaluation of their experience of the game. The participants, for example, declared that they liked the game, the story and the characters. In addition, all of them were motivated by history and felt involved in the game. None of them claimed to be bored and deconcentrated throughout history. A third of the students felt that the game was rather difficult while the rest of the participants perceived the game as rather easy. However, they all thought they had a good game

CONCLUSION

In our work, we sought to show whether an educational video game could strengthen children's skills in a subject that is difficult to teach and learn: Arabic grammar. Indeed, this subject poses many problems for both children and teachers. They are increasingly looking for ways to move away from traditional teaching methods that are ineffective and can discourage children.

The game we created tells a story and our learning content is strongly embedded in it. From the initial situation to the final situation passing through the intermediate stages, the player is the hero of this story and must pass the different levels using his knowledge in various grammar. The child is constantly immersed in history and is only interrupted by help or explanations if desired. Indeed, "أنفذ قرينتك!" is a succession of cinematics and levels where the child must do exercises that advance the history of the game. In addition, this universe becomes more alive thanks to these videos, but also thanks to the music and the voices lent to the different characters. As a result, the child may feel completely immersed in the game.

During our experiments, we were able to note a marked improvement in the scores of the learners. That said, we observed that this improvement was not due to the initial motivation of children to play the game, their conjugation skills, or their habit of video games. We believe that the strong learning effect of our game may be due to many factors. such as: the kids all had a great time playing "أنفذ قرينتك!" and they were very motivated by the story, the characters, etc. And it could be estimated that the fact of offering to learn grammar via a new tool can have an effect on the motivation of children and therefore on the effectiveness of their learning.

Remember that Get out, witches! was not developed for a particular use and although we have not tested it in an extra-curricular framework, we believe that it can be used in the classroom as well as at home. We do not pretend to substitute our game for current teaching methods in Arabic grammar, but rather to make it an original additional asset. Indeed, the results of our experiments have shown that it could be a good tool for both teachers and parents in order to consolidate the knowledge of children in Arabic grammar.

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ANNEXES

1. The first writing test
2. The second writing test
3. Game script

Annex 1: The first writing test

1. صرّف الفعل "تجول" في الماضي مع الضمائر التالية:
أنا: هو: أنتم: هن:
2. حول الجملة "دعا الأب أبناءه إلى فعل الخير" إلى المضارع
.....
3. حدد ظروف الزمان :
تحت
ظُهر
حيث
أمس
4. حدد ظروف المكان :
حين
أمام
ساعة
دون
5. سطرّ تحت جمع المؤنث السالم في الجمل التالية:
• زارت الفتيات صديقتهن سعاد في بيتها.
• لقد أوصانا الله برحمة الوالدات وطاعتهن.
• يحترم الجزائريون المجاهدات اللواتي حاربن المستعمر.
• يحب الأب البنات كما يحب أبناءه الذكور.
6. حول الجملة التالية إلى جمع مؤنث:
تحاول المعلمة بذل جهد كبير للعناية بتلميذة جديدة لتحسين مستواها.
.....
7. سطرّ تحت جمع المذكر السالم في الجمل التالية:
• إن المؤمنين في جناتٍ ونعيم .
• أحال القاضي المتهمين إلى محكمة مدنية.
• ظلّ الحاضرون منجذبين إلى المحاضر طيلة الوقت.
• احترّم الممثلين الملتزمين.
8. حول الجملة التالية إلى جمع مذكر سالم:
يعمل الأب ساعات طويلة في اليوم من أجل كسب قوت عائلته.
.....
9. ما هو جمع الكلمات الآتية: فأس: سماء: بنر: فنة:
10. ما هو مفرد الكلمات الآتية: رؤوس: آراء: مآذن: رؤساء:

Annex 2: The second writing test

1. اختر الإجابة الصحيحة : السماء - السماء - السمؤ
حلق الطير في
2. صرف الفعل "قرأ" مع الضمانر التالية:
أنا: هو: أنتم: أنتن:
3. حدد ظروف الزمان :
 يوم
 تحت
 وراء
 سنة
4. حدد ظروف المكان :
 حين
 أمام
 ساعة
 دون
5. سطر تحت جمع المؤنث السالم في الجمل التالية:
• إِنَّ الْحَسَنَاتِ يُذْهِبْنَ السَّيِّئَاتِ.
• الْأُمّهَاتُ أَوْلَاتُ فَضْلِ.
• فَالصَّالِحَاتُ قَانِتَاتٌ حَافِظَاتٌ لِّلْغَيْبِ.
• يَلْعَبُ الْأَطْفَالُ بِالْكَرَاتِ.
6. حول الجملة التالية الى جمع مؤنث:
تنهض الأم باكرا لتجهيز أولادها للذهاب الى المدرسة.
.....
7. سطر تحت جمع المذكر السالم في الجمل التالية:
• دعا الإمام المصلين إلى الانتظام
• لبت المواطنين يُقَدِّرون عَمَلِ النّظافة.
• أتعب صوت المغني الأَجَشُّ المستمعين!
• يحبُّ الناسُ الشبابَ المبادرين.
8. حول الجملة التالية الى جمع مذكر:
يضرب اللاعب الكرة بعيدا عن المرمى.
.....
9. ما هو جمع الكلمات الآتية : ماء: منذنة : عالم: قريب:
10. ما هو مفرد الكلمات الآتية: رُسل: أمراء: أثواب: وديان :

Annex 3: Game script

Narrator's Voice:

كان يا مكان في قديم الزمان، كانت هنالك قرية صغيرة، سكانها طيبون يعيشون في هناء وعيش رغيد، وحياتهم تسير بهم كما يشتهون.

وفي إحدى الليالي تعرضت القرية لهجوم من عصابة قطاع الطرق ، فأخذوا يقتلون رجالها ويستعبدونهم، وحاصروا القرية ومنعوا عن أهلها الغذاء والمؤونة .

ذات يوم، استطاع العم "عبد الله"؛ أحد سكان القرية؛ أن يهرب خفية رغم الحصار الشديد، ففّر متجها الى القرية المجاورة لطلب الاستغاثة .. وفي طريقه التقى بمازن ودار بينها الحوار التالي :

مازن: أراك في حالة يرثى لها من التعاسة والتعب ما الأمر يا عم ؟ !

عبد الله : إنها مصيبة يا ولدي، لصوص هجموا على قريتنا يقتلون السكان ويعذبونهم

مازن: يا إلهي!! ما الذي يتوجب علينا فعله الآن؟

عبد الله : يجب أن نذهب الى ملك قريتك لطلب المساعدة.

مازن : حسنا.. هيا بنا

Narrator's Voice:

يجب عليك يا مازن ان تكمل الجمل بالكلمات المناسبة حتى يتمكن الملك من فهم كلامك.

The beginning of the first exercise.

After successfully completing the first exercise:

الملك : حسنا.. سأساعدكم بالتأكيد لكن بشرط

مازن : ماهو شرطك يا سيدي؟

الملك : الكاتب الخاص بي مريض، ولا أحد هنا يعرف الكتابة غيره، يجب عليك أن تقوم بمهمته في كتابة رسالة الجنود

مازن : حسنا انا موافق أيها الملك

Narrator's Voice:

الآن يا مازن ، يجب عليك كتابة الرسالة بشكل صحيح لكي تنقلها الى الجنود ويرافقوك مع العم عبد الله لإنقاذ القرية .. كل ما عليك فعله هو إدخال الكلمات المناسبة لكتابة الرسالة.

The beginning of the second exercise.

After successfully completing the first exercise the narrator says:

أحسننت يا مازن .. يبدو أنك أهل للشجاعة والشهامة ويمكن الإعتماد عليك.

بعد رؤية الجنود للرسالة المكتوبة، تجهزوا جميعا للإنطلاق لتحرير القرية الجارة من الطواغيت اللصوص.

إستعد يا مازن سيهجم الجنود على اللصوص في القرية وانت ستتكفل باسترجاع قلعة الملك .. في يدك هذا المدفع .. في كل ضربة سيواجهك سؤال بوقت محدد للإجابة عليه .. إذا كان إجابتك صحيحة، ستضرب العدو، وإذا أخطأت، ستضيع الطلقة في الهواء وتخسر محاولة .. لديك الحق في خمسة أخطاء فقط .. هل أنت مستعد؟ فلتبدأ الآن.

The beginning of the second exercise.

After successfully completing the last exercise the narrator says:

أحسننت يا مازن لقد استطعت انقاذ القرية وهذا بفضل براعتك.

تلخيص

تركز هذه الرسالة على تطوير لعبة فيديو تعليمية ذات محتوى تعليمي مدمج بقوة في قصة للأطفال، والتي تهدف إلى تحسين تعلم موضوع يصعب تعليمه وتعلمه في القواعد النحوية للغة العربية. الهدف من هذا العمل هو جعل الأطفال يتعلمون بسرعة ويتفوقون للعديد من الأشياء اللغوية المتعلقة بمستواهم. وبالتالي، قمنا بدراسة لمختلف الأساليب في كل من الألعاب وألعاب الفيديو التعليمية، ثم قدمنا عملنا بالتفصيل. ونتيجة لذلك، اختبرنا اللعبة على بعض الأطفال لتحديد ما إذا كان هناك تأثير تعليمي بعد استخدامه، وقد لاحظنا أن أداء الأطفال كان أفضل بالفعل في الاختبار اللاحق من الاختبار السابق.

Summary

This thesis focuses on the development of an educational video game with learning content strongly integrated into a children's novel, which aims to improve the learning of difficult subjects to be taught and learned in Arabic language grammar. The goal is to get the children to learn quickly and yearn for many of the linguistic things related to their level. Hence, we have interested in different approaches of both the game and educational video games, and then we have presented our work in details. As results, we tested the game on some children to determine if there was a learning effect after using it and we have observed that the children did indeed perform better in the post-test than in the pre-test.

Résumé

Ce mémoire se concentre sur le développement d'un jeu vidéo éducatif avec un contenu d'apprentissage fortement intégré dans un roman pour enfants, qui vise à améliorer l'apprentissage d'un sujet difficile à enseigner et à apprendre dans la grammaire de la langue arabe. L'objectif est d'amener les enfants à apprendre rapidement et à aspirer à de nombreuses choses linguistiques liées à leur niveau. Par conséquent, nous avons étudié les différentes approches à la fois sur le jeu et les jeux vidéo éducatifs, puis nous avons présenté notre travail en détail. En conséquence, nous avons testé le jeu sur certains enfants pour déterminer s'il y avait un effet d'apprentissage après l'avoir utilisé et nous avons observé que les enfants avaient effectivement de meilleurs résultats dans le posttest que dans le prétest.