# Chapter 88

## Proposal for a simulator for a higher professional research course in distance mode

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**ABSTRACT**
A proposal for a professional simulator is presented to be applied as a learning activity in a higher course of technology in professional research. Through the simulation of cases based on reality, students can align theoretical knowledge with the personal day-to-day experimentation of a private detective. The game experience seeks to mix the entertainment and education proper of games with an educational item. Based on the premises and a storyboard process, the game is developed in a way to simulate random experiences, linked to real problems, and provides a challenging level in a way to maintains an experience of flow on the student's part.

**Keywords:** technology applied to distance education, educational simulation, games in ead, professional research, digital educational resources.

## 1 INTRODUCTION

Nowadays, the use of games in education seeks to explore the student's motivation for new ways of learning and retaining information, dealing with the playful aspects of games and simulators. One can then ask: what is the effective contribution of games to education?

According to Huizinga (2017), play is a voluntary activity or occupation, exercised within certain and determined limits of time and space, according to freely agreed rules, but obligatory, endowed with an end in itself, accompanied by a feeling of tension and joy and an awareness of being different from "everyday life".

Therefore, the game is nothing more than an activity that has a duration within a space and that has rules that delimit the actions and postures of the players.

For Huizinga (2017), in the game, there will always be something "at stake" that will eventually transcend the immediate needs of life and give meaning to the action. Every game means something. Nothing is explained by calling "instinct" the active principle that constitutes the essence of the game; to call it "spirit" or "will" would be saying too much. Whichever way you consider it, the mere fact that the game contains a meaning implies the presence of a non-material element in its very essence.

It can be said that a game should show through its objective what will be the bonus and the burden involved in each move. This would be a way of demonstrating the importance of the meaning of the game for the

players, that is, what makes the game fun, what motivates the player to play a respective game, such as, for example, the players who play soccer games.

Thus, games consist of situations in which the player must make decisions about which side to choose. Such decisions tend to influence the entire development of the game: if you prefer to follow path B, you leave aside everything you would learn in path A. To know path A, you need to start a new game. Each experience is a new learning experience. (Wusch and Fernandes Junior 2018, p. 108).

For Mattar (2010), one of the characteristics of games is that players determine how they learn. In in-game environments, users themselves are free to discover and create learning arrangements that work for them.

According to Kapp (2012), when used properly, gamification has the power to motivate, inform and educate. In this way, gamification is the process that aims to insert elements of games in gamification education, which can be: scoring, and badges, among others.

In education, however, the concept has been used, in many cases, in a simplified way – usually associated with the idea of rewards as a form of motivation. By giving trophies and medals to students, they can end up stimulating behaviorist teaching behavior – stimulus-response learning.

The gamification of education should not, therefore, be thought of in a restricted way to motivate students with prizes for their grades. (Mattar and Nesteriuk 2010, p. 100).

According to Aldrich (2004, p.14), if someone wants to understand simulations, the only way to become familiar is with computer games. Games are not simulators, but they can introduce several elements, structures, patterns, and techniques used in simulators today. However, it is not simple games that provide relevant experiences. It is necessary to know several techniques that provide a level of attention and playability appropriate to a task that will unite the ludic with the educational.

We have game-based learning or Game-based Learning (GBL) is a pedagogical methodology focused on the design, development, use, and application of games in education and training. This learning can be integrated into the denomination of Serious Games, therefore, these games have as their main objective that are not entertainment and is successfully applied in several areas of knowledge such as health, and advertising, among others.

For Zyda (2005), Serious Games or Serious Games, which end up being part of educational games that promote game-based learning, can be defined as a competition using a computer with specific rules such as the use of entertainment for educational purposes.

According to Michel and Chen (2006), these are games that do not have entertainment, pleasure, or fun as their main objective. According to Riys (2013), the use of games for learning is effective because they promote the solution to situations considered problematic with the application of concepts aimed at practical situations and, they can be collaborative, promoting respect among the participants, teamwork, and collaborative learning in this way allow for a permanent motivational environment.

Learning happens not only with the use of the game, but this result can also be obtained through the use of simulators that represent situations close to reality. Unlike the use of a game that often brings only entertainment.

Simulators are developed to be used in some areas such as civil aviation, for example. These simulators do not necessarily have to have a beautiful aesthetic, but they must be efficient, consequently bringing the proposed benefits to their purpose. Therefore, the action and reaction to be obtained when facing simulated situations must prevail. Some simulators have commercial appeal, for example, the Flight Simulator used by experienced pilots and academic students.

In education, there was the implementation of some simulators that allowed those involved, the students of specific courses, to have contact with simulated situations that they could deal with in the future when exercising their profession. There are simulators for teaching physics, and accounting sciences, among others.

For Lara and Martins (2017), virtual simulators in education are resources that improve teaching and learning practices, since schools do not satisfactorily meet this requirement in many establishments technological resources are not yet present.

There is a need to define the term simulation, which for Kapp and O'Driscoll (2010) has several meanings. The best known includes the use of software that seeks to emulate current equipment for training, as in the aforementioned Flight Simulator, where pilot apprentices learn to fly using a realistic environment.

The system reproduces a real environment, which the learner will know, learn and practice. There is also the simulator classified as a social simulator, consisting of people using an integrated system to interact with other people. These systems seek to encourage people to learn to interact in an artificial environment.

Social simulators use photographs, videos, or, more recently, three-dimensional components. According to Kapp and O´Driscoll (2010), a new generation of learners, immersed in these technologies that involve the use of text messages, social media, and video games, is emerging every day.

For Kapp and O´Driscoll (2010), these students are emerging in academic circles and companies themselves, with a different focus, mindset, and a different learning style about the generations that preceded them. For them, this generation of students and workers cannot see the difference between virtual and physical environments, they feel equally comfortable learning in both worlds – real or virtual.

As noted by Kapp and O´Driscoll (2010), these students have a different learning style from previous generations, therefore, for them, it may be easier to learn by using a simulator, for example.

Aldrich (2009), on the other hand, delimits educational simulations as structured environments, abstracted from some real-life activity, which allows participants to practice their skills in the real world, as they provide appropriate feedback in an environment whose results are controlled and predictable.

Herbert Simon (1981) raised important questions regarding the use of simulation as a source of new knowledge: what should a given simulation say about something that is not yet known? To account for this, Simon presents two propositions, one of them referring to the fact that the simulation is not better than the assumptions that are embedded in it; and the other related to computers that do what they were programmed to do (MEDEIROS et al, 2015, p.20).

The difference between serious games and simulators can be exemplified by the flight simulator, which is an educational simulator whose purpose is to train pilots and students. Serious games can be used as an example of Simcity.

Serious games are sometimes confused with gamification however, the definition of serious games Per Hagglund (2012), is a game designed for a primary purpose other than pure entertainment. The adjective "serious" is usually prefixed to refer to products used by sectors such as defense, education, scientific exploration, healthcare, emergency management, urban planning, engineering, religion, and politics (DERRYBERRY, 2007).

Serious games are designed to enhance some specific aspect of learning. There is a similarity between gamification and serious games both use game design thinking to enhance learning. Serious games are games used for teaching-learning or training purposes and not just for fun. It is successful in areas such as health, and business, among others. A serious game can be a learning and training tool or motivation for learning, as well as providing support for the assessment carried out by instructors.

However, for learning to be effective, it must be active, experiential, contextualized, problem-based, and provide immediate feedback (principles of effective learning).

Gamification can often enhance learning, not by making something a game, but by using game mechanics to make something more motivating and fun. However, when we talk about serious games we are referring to real-world problems designed into a game so that they can be more easily understood and enjoyable to solve.

In education, gamification, however, the concept has been used, in many cases, in a simplified way – usually associated with the idea of rewards as a form of motivation. By giving trophies and medals to students, they can end up stimulating behaviorist teaching behavior – stimulus-response learning. The gamification of education should not, therefore, be thought of in a restricted way to motivate students with prizes for their grades (MATTAR E NESTERIUK, 2010).

It is necessary to take into account that the use of games contributes to the development of a series of students' skills, among them: i) the engaged search for problem-solving; ii) the experience gained even if some decisions are wrong, allowing them to deal with frustration; and iii) the player's ability to evaluate the entire scenario before making a new decision after a failure, which makes it possible to generate competitiveness among players in the search for the final prize. Therefore, the use of games enables students to improve their academic performance regardless of the teaching modality to which they belong.

In contrast, serious games are used to provide an educational or training experience, using the benefits of the entertainment aspects of video games. In addition, they tend to be used for the advantages they provide in terms of security and costs. They have been used to train individuals in complex situations that may be too risky or too expensive to provide in a real-world environment.

For gamification to be applied, it is necessary to know this methodology, as stated by Gomes (2017, p.57) "the use of gamification is closely associated with the use of games in teaching and learning, however, we make it clear that gamification is much more than just the practice of games and digital games at school".

The challenge of building a game or simulator must consider the concern with the state of player flow.

> According to Csikszentmihalyi (1990), the state of flow is "the way people describe their state of mind when consciousness is harmoniously ordered and they want to follow what they are doing for its good".

According to Diana et al (2014), the concept of flow was elaborated from the definition of a state in which people are involved in activities in such a way that nothing else around them is important, because the experience itself provides pleasure and a sensation of nice happiness. Therefore, a simulator with educational objectives must also be designed to provide student involvement experiences, so that the ludic enhances learning.

Thus, it should be taken into account that the use of games contributes to the development of student's skills, such as i) problem solving; ii) the experience gained, even if some decisions are wrong, will allow them to deal with frustration; or iii) enabling the player to evaluate the entire scenario before making a new decision after a failure generates competitiveness among players in the search for the final prize. Thus, the use of games enables students to improve their academic performance regardless of the teaching modality, whether face-to-face or distance learning.

Therefore, combining the content of the disciplines with gamification allows the student to understand that decision-making within the simulator is a process that seeks the best solution to the problem or opportunity, in addition to allowing him to apply in practice what he knows about theory.

Because of the above, we present the proposal of a simulator with an educational purpose where the student of the Higher Course of Technology in Professional Investigation in the distance learning modality, based on specific cases, puts into practice the learning acquired during the course. It should also be noted that the proposal is innovative in the sense that professional research has become a regulated profession since Law 13,432/2017. In addition, the simulator will be applied at the higher education institution that has the first higher education course in the area, with its first class in February 2018, which provides the game development context.

## 2 THE PROFESSIONAL RESEARCH SIMULATOR

This work seeks to present the main elements in the context of the development of an educational game of the simulator type, which aims to apply the knowledge obtained throughout the course through cases frequently solved by detectives. For the development of the game, its objectives were thought, then its script (storyboard) was elaborated and it is being developed to be made available to students of the Professional Investigation superior course.

To better understand the simulator, we present the diagram below that shows the game in a summarized way. The game's elements were designed under the dual character of the educational game, to serve education in its multiple possibilities while bringing pleasure to being played. With this, we also seek to inspire educators, thinkers, and developers to create similar content effectively, which mixes entertainment and education in wise doses; for if there is no education it is of no use, and if there is no amusement it is no game.
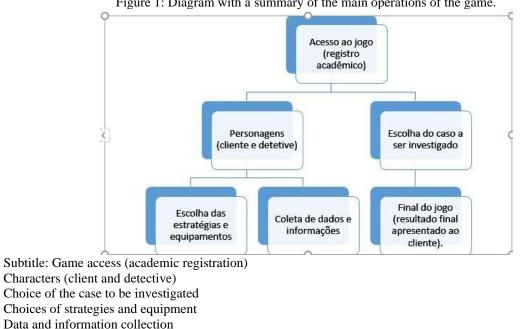
Figure 1: Diagram with a summary of the main operations of the game.



Subtitle: Game access (academic registration)
Characters (client and detective)
Choice of the case to be investigated
Choices of strategies and equipment
Data and information collection
End of the game (final result presented to the customer)

Os elementos do jogo foram pensados sob o duplo aspecto de jogo educativo, de servir à educação em its multiple possibilities while providing pleasure when played. With this, we also seek to inspire educators, thinkers, and developers to effectively create similar content that mixes entertainment and education.

The simulator was designed in three phases with three different situations to be solved by the player. In the descriptive script, some details were addressed, such as i) the insertion of the detective kit that the students of the course receive, as soon as they finish the first year; ii) the contract to be signed by the customer; iii) the disguise kit; and iv) the investigation strategies that must be traced by the detective to elucidate the case.

Currently, the simulator has the first phase completed, consisting of the first case called "adultery". With that, there is the first case that will be solved by the detective. The simulator already has a character: the detective. The first situation to be solved is a case of adultery and for the player to be able to start the simulator, he must access the server address and authenticate. Next, the simulator starts in the detective's office, with all the details of an office room. There is also the client who looks for the detective to clarify the case; the player will have to make decisions such as which equipment from the detective kit should be used in this case and which strategies should be used by the detective.

For the development of the simulator, some specific tools were used, which are HTML5, Javascript, JQuery, AJAX, and MySQL. So that the student can interact he must click on the scenario that, the mechanics adopted for the simulator was point and click. The part referring to the selection of objects is done by drag and drop, or drag and drop. In the past, this type of simulator was called Adventure, and there is also an aspect called Escape, but these are more characterized as point and click, where the protagonist is "stuck" somewhere.

The point and click name say to point and click this adventure or adventure games genre known as adventure games being considered according to Rolling and Adams (2003, p.43) as those that "are primarily about exploration and resolution of pixels. They sometimes contain conceptual challenges[...] they can include physical challenges as well, but only rarely. Although the genre is focused on solving pixels, it does not belong to the genre known as a puzzle game:

> Puzzle games tendem a ser variações de um tema de algum tipo, Sokoban é sobre movimentar blocos em volta de um espaço constrito; The Incredible Machine, é sobre construir engenhocas de Rude Goldberg para concluir uma tarefa particular. Os desafios são quase que inteiramente lógicos, embora, ocasionalmente exista um limite de tempo ou um elemento de acao (ROLLINGS; ADAMS, 2003, P. 43).

Rogers (2003, p.33) states that the adventure genre is: "[...] focused on solving puzzles, collecting items and managing inventory. Early adventure games were text-based "and the graphic adventure genre: "This subgenre has players using the mouse or cursor to click and reveal clues and navigate the environment. "

Regarding the visual part, images from Shutterstock were used to insert elements in the simulator with the painting of the wall.

Just detailing the simulator and how its development was carried out is not enough, there is a need to justify the use of simulation and game-based learning that are used in this product.

The justification lies in the use of these tools, which are justified due to the objective proposed by the simulator to enable students to apply the skills and competencies developed throughout the course and also due to their particularities. For a better understanding of each of these resources, we will deal with the applicability of each of them in the simulator:

a) The applicability of the simulation allows the student to apply the knowledge acquired in the investigation course and, thus, through the decisions taken, learn and correct any failures that may occur during the simulated investigations. That is, in the case of adultery, this applicability is seen, for example, when the student identifies with the detective character and has the mission to investigate the case and solve it.

b) applicability of learning based on games have as its main objective to stimulate the students to the point that they reason and make decisions according to the profession of detectives. Therefore, in the simulator, this is verified in tasks that require decision-making and the reward obtained for failure or success in each step of the process.

The applicability of these resources results in a differential for students through the results they obtain at the end of the case and/or investigation. They enable the research course student to apply the skills and competencies developed during the undergraduate course.

The development of the simulator follows some stages, among them we have the elements of reality or playfulness that result in the simulation and learning experience.

## 3 ABILITIES AND SKILLS IN QUESTION

The skills and competencies to be developed in the student of the Professional Investigation superior course were listed regarding the application of theory in practice. The skills to be developed by an investigator, according to this reflection, converged on some main points:

· Knowing and applying the learned legal knowledge;
· Understand the planning and choice of strategies;
· Knowing each piece of equipment to be used in the exercise of their profession;
· Identify and apply the best research strategy;
· Collect data and information;
· Prepare and issue reports.

Based on the skills and competencies listed above, which are among those expected in the training of professionals who carry out graduation courses, situations consistent with the practice of private investigators were thought of using basic tools: an internet browser (to run the game and perform most tasks) and an Office package (to perform some tasks within the role of the private detective).

# 4 REALITY ELEMENTS

A constant concern in the design and development of the game is immersion: the adoption of dialogic resources and elements typical of simulation games so that the game is not just one task followed by another, but a real experience in which, In the end, the player feels victorious for the learning and results obtained or, on the other hand, willing to play again to obtain a better result.

These elements of playfulness and reality capable of generating a better game experience and effective learning, adopted in the elaboration and development of the "Detective Investigation", are:

a) **a) Real language:** the main interaction is between the player and the investigation he must carry out and the game had a script prepared by a teacher who works in the course as a tutor with the help of her peers. The protagonist of the game, which simulates the player in first person, is the detective "Brisco".

b) **Situations of randomness:** so that the simulation does not form a cycle of missions to be accomplished, elements of reality were added that do not affect the result.

c) **Immediate feedback and rewards:** even for tasks that require greater complexity in their execution, after sending the work, they are automatically corrected by the system. Thus, the immediate return on errors and successes, especially if associated with rewards in this case, the score provides an opportunity to improve the level of engagement with the execution of the task and, consequently, provides greater chances of learning.

d) **Challenge:** a game that is not challenging is still a game, however, not educational, but a hobby. A game that has the (fair) pretension of serving education must bring up problems that require attention and reasoning. Bloom's taxonomy (1956) is a good help in this regard, when one thinks that the game can demand from the simple evocation of memory to the application of knowledge, such as analysis and critical judgment of knowledge. In the game in question, this is done at an increasing level of difficulty, in order not to demotivate the players at first and, also, to captivate concentration and increase the desire and taste for winning at the end of increasing challenges.

e) **Connection with real problems:** if an educational game has all the above characteristics, but has no connection with reality, it will have greater difficulty in being used in higher education, although it may be much more appropriate in other levels of education.

In the simulator, the problems are believable. They involve working with research in its essence, and decision-making in specific cases, among other particularities. Although quite simple in terms of structure, it is not the complexity per se or the graphics that matter, but the awakening of interest and the questioning, the challenge, in the simulated context. Living in the simulator gives future professionals greater security when they need to face cases like these in the exercise of their profession, as well as creates the need to learn the content of the subjects to solve problems in the simulator.

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The element "connection with real problems" comes from the fact that reality is fantastic when we can experience it as a game; thus, almost nobody likes to declare the Income Tax (IR), but it would become a more fun task at the beginning of each year if, a few months before, the taxpayer played a simulation to declare the IR of a certain famous person, with a score of each item in the correct field and other elements described in this topic.

As can be seen in most educational games, problems and situations are conveyed in a way that is dissociated from the reality in which the game takes place, for example, building and managing a fast food in games with questions and information boxes, or a game of quiz type, or other games that can be used to deal with any type of topic. It can be difficult to think in real context for certain learning challenges, and perhaps impossible when we want to encourage memorization of information thus ensuring the learning experience in real contexts is worth the effort.

**f)** *Replay value*:  (or replayability, "replayability") means the value that a game as if it is played again. This value is obtained mainly through the challenges and consequences obtained with the results obtained by the player during the game. Therefore, in the game "Detective Simulator", the player's work will take him to an investigative world that will bring two types of ending (which consists of the closure of the case by Detective Brisco, one successful and the other unsuccessful). If he doesn't get the best score, he can try one more time to get the best feedback. If you play again, you will have the opportunity to do a new investigation in this way, encouraging the student to play again and, consequently, significantly reinforcing learning.

The lines for the player are conveyed by the character and text balloons; instructions are inserted at each stage of the game during investigations; with every decision-making and every closing of the case, as well as videos recorded specifically for the game.

> The elements of reality mentioned here do not directly affect the learning of content, however, they are in line with Souza and Mansur (2016, p. 6); the authors state that the use of technology and vivid resources — the simple use of media — is not enough, but depends on getting into the student's mind: "mere images, without direction and clarity, also make it difficult for the student to understand. The question is linked more to how the person's cognitive apparatus works, than to the material itself."

Absolutely every player advance, no matter how small or seemingly, is not in vain, but has a thought-out objective or is based on the skills and competencies to be developed, or how to engage the player in the simulation.

## 5 EXPECTED RESULTS

The player accesses the game through their academic record, in this way, the game starts in the detective's office, there is also a bar at the bottom of the screen that shows the value received or lost by the

detective, in addition to the number of days the investigation is in thus, the player monitors his performance during the simulation. The client looks for a detective to help him solve a certain case.

The simulator allows the player to choose one of three cases. For example, the player chooses to investigate the extramarital affair, the detective signs a contract with the client to investigate this case, then the player chooses the strategy to be followed, as well as whether it will be necessary to use disguise and the necessary equipment for the investigation. The player who chooses the right strategy and equipment for that investigation gains a bonus, he has two attempts, however, each time he makes a mistake, part of the bonus is deducted. If he fails both attempts, he must restart the game.

Passing the initial phase, the player enters the so-called results stage where he searches for data and information in the form of clues to prepare a consistent report and bring the final result to his client. After consolidating the data and the final report being prepared by the detective, he will have the final meeting with his client, which can be positive or negative. If positive in the extramarital affair, the detective ends his work and if negative, the simulator directs him to choose a new case or play later.

## 6 ANALYSIS OF PROPOSED OBJECTIVES AND OBTAINED RESULTS

> We can say, with Florêncio da Silva and Oliveira (2017, p. 9) that "the already established methods of instructional design used in the creation of didactic materials serve perfectly for the conception of educational solutions in the game format". The way of creating material for distance learning has been developing, and new ways of thinking about content and interaction with the student are also applicable, as master lines or guidelines, also to innovative ideas.

We know that an educational game must mix entertainment and education because, without an educational objective, it is useless, and if there is no fun, it is not a game. The elements described in this article, adopted by the simulator, can be considered for implementation in practically any educational game, and it is expected that they will be implemented and that their developers will measure and share the results in learning.

The process of creating quality content, any kind of content, is laborious and involves the work of other people from different areas. For a game, in all its complexities and programmed interactions, even more so. The ideas, the script, and the technological implementation have gone through and certainly will still go through discussions and reformulations, until, in the end, the best possible product is obtained for the practical improvement of the students.

The game worked on in this article has a finished script and is currently in the technical development phase. This aims to enable course, students, to apply their skills and competencies developed during the Higher Course in Professional Research Technology.

Using the most common types of cases and frequently solved by detectives or private investigators, five specific objectives were considered, in which, through the theoretical bases of the use of simulators in education for the foundation of the game development project, they could guide the research, being they:

-Investigate and promote the application of skills and competencies developed by students during the Higher Course in Professional Research Technology;

-Survey of the most common cases frequently solved by detectives or private investigators;

-Define and design each stage of the simulator based on the chosen cases;

- Creation of the descriptive script, as well as collection and analysis of the data obtained through the application of a questionnaire to the students of the course and specialists in the area after they use the simulator.

With the creation and development of a simulator, we can see its educational purpose where students of the Higher Course of Technology in Professional Research EAD, based on specific cases, can apply in practice the learning obtained during the course. The simulator can meet the existing demand by meeting the needs of the students of the course, which is a differential that promotes the student and brings innovation through a tool.

Therefore, considering the results obtained and the analyzes carried out, it is observed that the general objective of this research, in elaborating and creating an investigation simulator to allow the students of the course the possibility of applying the skills and competencies developed in the course of the Professional Investigation Technology Superior Course through the most common types of cases and frequently solved by detectives or private investigators.

Finally, the possible contribution of this research is concluded as a source of possibilities for future studies relevant to the subject in question, making the link between theory and practice in the Professional Investigation course viable.


## 7 FINAL CONSIDERATIONS

This research presented an investigation simulator to enable the students of the course to apply the skills and competencies developed during the Superior Course of Professional Investigation Technology, through the most common types of cases frequently solved by detectives or private investigators.

This simulator meets the possibilities of helping the teaching and learning process within the scope of the course, allowing the student to have access to specific cases that are recurrent in the exercise of their profession.

The proposal of a simulator for a Higher Professional Research Course in the distance modality aims to meet the demand of bringing students closer to the job market. So that this research was not limited to theory, we made available to students and specialists in the area the first phase of the simulator so that they could analyze the feasibility of the tool.

It is important to point out the lessons learned, due to the development of skills and knowledge that were not available before starting the research. It is hoped that this research will serve as a basis and encourage teachers or those interested in the simulators area to carry out more research involving the creation of specific simulators that will meet the demand and contribute to society in general.

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