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**Title** Educational Digital Games RPB: development of applications for education of public security forces with design-based research - DBR

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**Abstract** The research group Sociedade em Rede (Network Society), at UNEB, has been carrying out research using Design-Based-Research – DBR since 2010 in Brazil, which characterizes it as one of the pioneers in the use of development of such methodology in Brazil. This article presents the development of one of the solutions that we have been working on and developing with DBR since 2012. It is the DBR development of the use of an educational RPG digital game for training the Polícia Militar do Estado da Bahia – PMBA (This is the name of an institution. The Translation into English is: Military Police of Bahia State. We will call it PMBA from this point on). We present this development in three phases, which we interpret as three major, more comprehensive DBR cycles, carried out by three doctoral studies, respectively by Josete Ribeiro, Nívea Rodrigues, and Igor Urpia, who followed each other in developing the application in focus. Each doctorate, or more comprehensive cycle, was in turn composed of its own DBR development cycles, of its parts in the proposed solution. We thus present not only the DBR research, but a proposal for organizing the work carried out from doctorates and the learning communities involved, in smaller internal cycles of each doctoral research, interrelated by a broader research problem, which integrates them into the main proposal of DBR.

**Keywords** Design-Based Research  
Educational Digital RPG Games  
Public Safety Education  
Social Constructivism  
Military Police Education

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# Educational Digital Games RPG: Development of applications of public security forces with design-based research - DBR

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## 1.0 Introduction

The research group Sociedade em Rede, Pluralidade Cultural e Conteúdos Digitais Educacionais of Universidade do Estado da Bahia –UNEB<sup>1</sup> has been developing applied research work since 2010. The educational approach is social constructivism, according to Vigotski (2021) and Freire (2005), which assumes, in short, that the teaching-learning process is a collaborative achievement of involved subjects, and with a focus on mediating relationships between them, on their common needs. The various projects we develop are considered as DBR cycles of developing our knowledge and proposals for the application of social constructivism.

In this work, in order to show the functioning of our research group in its use of DBR in the development of applied research, we will present, descriptively and analytically, the following problem:

**What applied educational Digital Role-Playing Games (RPG) solution is suitable for carrying out the formation and training of PMBA security forces?**

For this purpose, we will begin by analyzing the general design of the DBR that we carried out in our research. Next we will present the development of the 3 doctorates articulated by the problem presented, and in this way our work with DBR and the result of the development of this digital game.

## 2.0 How we use DBR: a methodological explanation

It was in 2010 that we woke up to the study and adoption of DBR as an applied research methodology. Since then we began to deepen readings and debates, which took place mainly with the influence of authors such as Reeves (2006), McKenney, Nieveen & Van den Akker (2006), McKenney & Reeves (2012) and Plomp & Nieveen (2010), among others. Following the influence of these readings, we produced

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<sup>1</sup> This is the name of a research group at the university. The English translation is: Network Society, Culture Plurality and Educational Digital Contents of University of Bahia State – UNEB.

our own studies on the methodology, the first in 2014 (Matta, Silva & Boaventura, 2014), and the main one, a book in 2018, an expanded edition, from previous work by Plomp and Nieveen (Plomp, Nieveen, Nonato & Matta, 2018). We have worked with DBR as a methodology for investigation and consequent construction of scientific, practical, applied solutions, capable of mediating the needs of the involved practice community, which includes university researchers. In accordance with our approach, we use DBR which is the main feature, present in our research:

We mainly use aspects capable to lead a practical educational innovation that includes five fundamental features:

**1. Theoretical and design-oriented:** We consider theoretical-conceptual bases that lead the development of the proposed educational design. This association of concepts and theories is used as a framework for the practice and the research purposes, and it can be adapted and improved by its implementation.

**2. Implemented and results-oriented:** We aim to develop and implement practical results, such as instructional aids and educational policies, that respond to the educational and community needs, as opposed to methods more isolated or only theoretical.

**3. Collaborative:** We encourage an engaged integration between researchers and participants by focusing on a collaborative structure of implementations, with the commitment of teachers, students and other people involved, and ensuring that the results are approved in context.

**4. In accordance with the context:** A methodology needs to be in a permanent interaction with the context in which it is being implemented, by adjusting the implementation according to feedback and emerging needs. Thus, researchers must take into account the issues on educational environments and the interaction between theory and practice.

**5. Repetitive:** We also adopt continuous stages of development and refinement, where each interaction allows for adjustments based on feedback and obtained results in each previous stage. This ensures that these practices can be enhanced and adapted continuously. In addition to these main topics, the approach esteems the aspect of contextual replication and not only a common generalization and suggests that the proposed solutions can be adapted in different contexts with new stages of validation, as described in documents analyzed.

We develop our DBR surveys in the following four phases:

**Phase 1 – Seeking an understanding of the contextuality of the subjects involved in the proposed research.** When seeking to understand, as much as possible, the complexity of the relationships between the subjects involved in the practical solution to be constructed through DBR. The subjects involved are both the university's research team

and those participating in the community, its culture, its historical determinations, and most importantly its social tensions. A historical-dialectic investigation that interprets the needs of the subjects involved, giving them legitimacy for dialogue.

**Phase 2 – Proposal of conceptual, theoretical and knowledge articulation capable of providing a basis for designing the modeling and/or design required by the proposed applied research.** Phase in which potential references for content, strategy and material and practical support are gathered by researchers and the community, which will be taken to the organization and planning of modeling the proposed product/solution/practice. We emphasize that the entire conceptual discussion requires validation from the collective involved.

**Phase 3 – Modeling and production of the required product/solution/practice.** It consists of developing the practical solution itself. Based on the conceptual proposals to be adopted, found in Phase 2, and taking into account the context analysis carried out in Phase 1, also the dialogue between all those involved, we are up to start the elaboration and modeling of social technology, from the digital artifact, applied mediator of the concrete intervention proposal to the moment dedicated to producing the desired applied practice.

**Phase 4 – Cycles of improvement, evaluation, analysis and new proposition.** Focus on developing doing, not knowing. The purpose to continually refine the proposed practical solution, evaluate and improve according to the participants. The proposed solutions will always be unfinished and dynamically linked to their successful application. The purpose is to enter into a process of continuous improvement, at each practical cycle and depending on evaluations. The fourth phase establishes the return cycle to the first phase, and the sequences of context redefinition, review of conceptual articulation, and development of modeling and practice.

These features have been worked on since 2011. They came out from the need of developing educational digital tools for many fields of implementation; they evolved as a social technology to the extent that our DBR implementations, from the outset, have always aimed to enhance and lead an implemented investigation in community partnership and collective authorship. The mentioned features are the result of more than a decade of research and have resulted from dialogues and stages of implementation of DBR that we have carried out in partnership with many popular communities which were capable to teach us and refine our own methodology development parameters.

The research we carried out on the construction of an educational RPG digital game practice for the PMBA will be presented with this DBR model. It was a game produced for public safety education and police training, and which continues to be developed, as corresponds to the DBR methodology.

### 3.0 Educational RPG Digital Game for PMBA: proposal and contextuality

The development of the educational RPG digital game for the PMBA was applied research that we began developing in 2012.

Between 2010 and 2015, our research group coordinated the training courses for PMBA officers, thus having access to analyze the many deficiencies that existed in police training carried out by the Academia Militar de Polícia do Estado da Bahia<sup>2</sup> (Universidade do Estado da Bahia, Polícia Militar da Bahia, 2011).

We noted the difficulty of the Bahia State police in organizing their training processes taking into account the complexities of social relations in the state's society, the history of the corporation and the challenges of the policing profession. Based on this observation and the initial dialogue with those involved, the PMBA, its command, the command of its teaching sector, contact with officers and soldiers, and even the daily dialogue with the actions of police officers and their relationship with the community, we aimed to develop an applied research problem focusing on the development of pedagogical practices for the training of police officers.

PMBA's action is very comprehensive. It was necessary to choose a section to build our educational proposal. The state of Bahia is famous for its tourist attractions, historic center and popular festivals. One of the PMBA's most important demands is policing related to tourism and tourists as well as the related policing of major events, the extreme peak of which is Carnival, which easily brings together 1 million people, including tourists and Bahians. On the other hand, we had already been working with the production of educational RPG digital games since 2007 (Cabalero et al., 2011) and we realized that it could be an important contribution to this demand. Our research problem was born, triggering the process, which we present below:

**How can a proposed pedagogical application of the Educational Digital RPG game, structured for the simulation of public security incidents, enable the training of professional practices in military police officers of the Batalhão de Polícia Turística – BEPTUR<sup>3</sup> of PMBA?**

This was the research problem that fueled the 5-year research work, between 2011 and 2016, which led to Josete Bispo Ribeiro's doctorate, initiating the use of the DBR methodology to carry out the applied study.

Before presenting how the four phases of research were conducted in this work, it is necessary to understand how our research group has developed the work from carrying out doctoral research. The researcher who is doing his doctorate becomes the protagonist in organizing the engagement of all others involved. Furthermore, he is the one who centralizes the agenda of meetings and events, and will al-

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<sup>2</sup> This is the name of an institution. The translation into English is: Military Police Academy of Bahia State.

<sup>3</sup> This is the name of an institution. The translation into English is: Touristic Police Battalion. We will simply call it BEPTUR from this point on.

ways be the one who will create the document that will be the research report, and which will also be his/her doctoral thesis.

Josete Bispo Ribeiro, coordinator of the postgraduate program for training PMBA officers, with vast knowledge of the institution and its demands, was the one who took over this coordination of DBR research actions at that time. We set out to carry out DBR research work, phase by phase.

The first phase involved contextualizing the institution, its historical significance, institutional strengths and weaknesses. According to our DBR approach, this phase is essential as it not only allows us to understand the field of application of the designed solution, but also guides those involved to a position of collaboration and greater dialogue and mutual recognition of dialogue. This exercise of interpreting the context, with all the references consulted, description of dialogue procedures and collective validation, which generated the context described below, can be consulted in the doctoral thesis that we referenced, and is in an online repository (Ribeiro, 2017, pp. 29-45). Here we will focus on presenting the results of the discussions, their main contributions, and legacies for the next research cycles.

About the context of the PMBA: Studies pointed to a centuries-old institution. The PMBA had its origins in the 19th century, shortly after Brazil's independence in Bahia, more precisely in 1825. Until then, even in the long colonial period, Bahia had always been policed by military forces of the monarchy, or by private militias. These forces were very focused on maintaining the slave society inherited from colonization, and had the practice of persecuting popular people, mainly black people and the submission of the large number of enslaved people.

A society whose main criterion for dividing social classes was the difference in skin color, with black people, in addition to being subjected to slavery, always persecuted, even when free, and were considered inferior citizens. The Military Police that was born, initially, was an extension of the practices of subalternization and subordination of the lower classes, mainly slaves. It then operated with a practice of favoring the privileged, and explicitly defending the ruling classes of large landowners and large traders.

A police force accustomed to defending the privileges of a seigniorial society. Of course, in addition to this task of maintaining the seigniorial social order, the PMBA also policed the streets, participated in investigations and worked for security that enabled the functioning of society, but always with respect for the privilege of the lords.

In 1889, with the Proclamation of the Brazilian Republic, the PMBA began a long journey towards becoming a citizenship protection police. Society does not change overnight, and the same police officers who defended the privileges of masters, and persecuted slaves and black people before the Republic, were now on the streets seeking to be a citizen police. What was a mission during the empire, defending privileges, became a distortion. There have been decades of need for

a more professional police force, focused on maintaining an orderly and civil society.

Only almost a century later, in 1988, did the PMBA explicitly move to implement human rights as the basis of its operation. The difficulty of a police heir to all racial discrimination typical of slavery, in order to be able to implement a practice of respect for human rights and citizenship in society became increasingly evident due to the presence, even in the 21st century, of massacres, mainly of black people, many innocent people, as well as in the form of approach on the street, among other practices.

Our practice of context analysis is completed with the involvement of the community that we call those involved. When sharing what we were interpreting with the corporation, not only did they confirm that these were the difficulties in their context, but they added that the so-called POP, Standard Operating Procedure, which PMBA uses, was made for the state of São Paulo, which has another reality, more urban and with a more modern social structure. To make matters worse, POP is not accessible on the Internet. That is an additional issue for police officers' training, which is already involved in a historical context with lordly roots.

The police officer community said there were other incomplete sources of information: a Police Boarding from PMBA and subject programs from Police Academy training courses. Neither of them was complete.

Therefore, there are three sources of information and standardization of police procedures, diffuse and difficult to access and consult. This is to police a population of twelve million inhabitants, distributed in large cities, favelas, rural environments, natural environments, in a state with 500 thousand km<sup>2</sup>, which is still heir to old manorial relations, with their privileges and racial, religious discriminations and others. And this is by trying to organize in a civic, republican way, and in defense of human rights.

We also add that Bahia is a tourist state that receives thousands of visitors every year and that policing this activity, in this situation described above, is the professional task that we would like to improve, based on the practice of police education that we planned. Thus, the contextual Table 1 is presented below;

Table 1

Summary of the contextual analysis of the Bahia Military Police (PMBA)

Manorial Heritage: defense of privileges and attacks on current subordinates, including racist practices.
Need to carry out citizen policing and respect human rights.
Need for professionalization of the police.
Organization of guidance documents and standards that are dispersed and difficult to access. Not always consistent with the context.



Source: Ribeiro (2017, pp. 41-45)

This table shows the social-historical profile of interpretation of the PMBA context which we would take to understand the police apprentices for whom we designed the educational digital games.

#### 4.0 Defining modeling concepts and first application cycles

In Phase 2, it was time to focus on the analysis and definition of concepts to be used in modeling in the next phase, Phase 3. Over the years of applying DBR, we learned that Phase 2, conceptual articulation, is better structured. when we develop it in three blocks, or dimensions. We can present these three dimensions in the form of three questions; at the same time we will present the answers given for the development of our digital pedagogical game in focus.

The first question refers to the content of what will be modeled. What is the content, what is the object of the purpose for which we are planning the practical solution to be built. In the case of the digital game we developed for PMBA, the question will be:

What content do you want to pass on to the projected education system?

The problem constructed indicated that an educational digital artifact was being modeled. Every educational system needs to have content, a subject that must be delivered and organized didactically so that it is possible to learn the desired skill. The purpose of the project was to build a digital game capable of carrying out a learning procedure on the skills and competencies of the work of military police officers on the Standard Operating Procedure and Approach Manual, and other content of police action. As the project was centered on the tourist policing troops, in addition to the manuals and procedures, practices and cases recorded by the BEPTUR were considered.

The discussion about the content to be considered was fueled by the survey of the scattered sources mentioned. As indicated by the participants of the police collective of our group, the determinations of professional competencies of the Matriz Curricular Nacional para Profissionais da área de Segurança Pública (Curricular Matrix for Formative Actions from Professionals of the Public Security Area) of the Justice Ministry and of the Secretaria Nacional de Segurança Pública – SENASP<sup>4</sup> –were adopted, an effort by the Brazilian federal government for the construction of a reference curriculum for training in public security, at the federal level, which was ready at the time of the research and built with input from all sectors of Brazilian society.

A summary of the content we adopted is presented in Table 2:

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<sup>4</sup> This is the name of an institution. The translation into English is: National Department of Public Security.

Table 2  
Summary of the professional competences of the Matriz Curricular  
Nacional para Profissionais da área de Segurança Pública – SENASP

COMPETENCES	CONCEPTUATION	DESCRIPTION	
COGNITIVE	Development of thinking is required. It enables people to think, position themselves, communicate and take conscious actions.	Analyze statistical data that make it possible to understand Brazilian reality scenarios regarding crime and violence.	
		Describe the public security system and the role of its institution within the general framework of a Brazilian public security system.	
		Understand the need for integrated and community management of public security.	
		Establish a general overview of the country's legal system.	
		Relate the use of force and firearms to the principles of legality and necessity.	
ATTITUDINAL	It is necessary to stimulate the perception of reality, and the development of individual potential: awareness of their interaction with the group and ability to coexist in different environments.	Demonstrate: a) emotional control, b) resourcefulness, c) creativity, d) patience, e) insight, f) ability to deal with situations, risk and uncertainty, g) discipline, h) resistance to fatigue, i) firmness of character.	
		Stay up to date.	Maintain ethical professionalism.
		Comply with internal rules and regulations.	Maintain good presentation.
		Maintain physical fitness.	Act: a) civilly and respectfully, b) with common sense, c) discreetly, d) with initiative, e) with impartiality.
OPERATIVE	It is required to know how to apply conceptual knowledge, reflected and conscious.	Protect people.	Be safe.
		Handle non-lethal and lethal weapons.	Collect information about incidents.
		Have techniques of: a) approach, b) self-defense, c) first aid d) negotiation.	
		Transmit messages via radio.	
		Manage equipment effectively.	Obtain or capture information about the occurrence.
		Use personal protective equipment.	Interview people and call witnesses.
		Select equipment according to the incident.	Take the parties involved in the crime to the police.
		Practice physical exercises.	Comply with court orders.

		Relate to the community.	Prepare documents and reports relevant to the incident.
		Work as a team and multiple teams at the same time.	Produce statistics.
		Isolate crime scene.	Typify criminal conduct.
Own elaboration based on the source: MCN – MJ/SENASP (2008)			

Source: Ribeiro (2017, p.218)

In addition to this general framework of public security training needs, specific content on policing large events and tourist activities was obtained from police officers participating in the research team, belonging to BEPTUR.

Dialogues about the specific content were carried out around the Creation Project of the Tourism Police Battalion (Brandão, 2012); from that we were able to highlight the specificities of content about this specialized policing which were briefly determined by the research group:

- 1) Tourist policing is essentially preventive.
- 2) It requires expertise in territorial knowledge, especially social-political and cultural, of an interurban, inter-regional and even international nature.
- 3) It requires knowledge about tourist attractions and their interaction with the public and tourists.
- 4) It requires knowledge of the regularity and features of popular festivals during the high season.
- 5) The high concentration of residents and tourists, national and foreign, in public spaces where these events take place requires attention.
- 6) It requires the recording of a wide variety of occurrences of different types and full of complexity, in a short space of time and territory.
- 7) There is a need, difficult in Brazil, for bilingual police officers.
- 8) It requires knowing how to deal with a large concentration of people, in a relaxing situation, dancing, music and with alcoholic drinks present.

With these 2 groups of general and specific content about what they wanted to build in the learning process, the group closed the content proposal. Still in Phase 2, we needed a pedagogical model on which the cognitive design of our modeling was made in Phase 3, the following.

The group's work, experience with social constructivism and the social-constructivist design of learning, led us to present the proposal for a pedagogical design in this pedagogical approach. The proposal was well accepted by the participants, as it seemed appropriate to organize the process in accordance with the principles of social-constructivist design according to Matta (2011).

According to this study, we need to model pedagogical solutions, including digital artifacts, and practical situations:

- 1) Contextualization modeling – Build solutions implicated in the context of people's lives, capable of engaging them, due to their own needs, in the developed process.
- 2) Mediation Modeling – This involves modeling the practice, the artifact and the organization which is intended to be the solution to a need of the people involved in the contextualized situation. Always model mediating solutions for practical encounters between human beings.
- 3) Interaction Modeling – It is necessary to model the moments and situations in which those involved meet, and then interact, perceive themselves as cognitive partners around what they are going to work on.
- 4) Modeling Collaboration – It is necessary to model moments and situations of collaboration, sharing, being with others, in the midst of the mediating process that is being developed.
- 5) Modeling Control and perception of metacognition – also modeling the ways of perceiving exceptions. Model sensor instruments, identification situation, absences, subject.

The last conceptual construction was about digital games, in particular Role-Playing Games – RPG games. The need to understand the technological support of what we would produce, and the characteristics of possible computational modeling. We work with the idea that contemporary society is increasingly becoming a network society – and increasingly supported by the Internet network. There is also the idea that digital games contain many working qualities that are in line with the social-constructivist design of learning that we were adopting.

The RPG game in particular, a role-playing game, which we consider to be played based on the collective writing of plots of a story, to be experienced by the players, has all the characteristics of being able to contain the contextuality of the contents, being designed as mediating artifact, populated by a situation of interactivity, collaboration, and metacognitive control. We developed an entire discussion that we present here in the form of its final (Ribeiro, 2017, pp. 46-85).

The basic concepts of the RPG game (Peixoto & Pinto, 2011, Vasques, 2008, and Cabalero et al., 2011), already organizing them for the formation of the police officers, are:

- a) the players: They are the participants in the narrative, they create characters who will participate in the simulations. Apprentice police officers will be players in the simulations, making decisions for their characters;
- b) the master: He/she participates in the game playing the role of the universe, the environment where players will encounter their challenges. He/she will have the role of instructor, he/she must be a graduated police officer experienced in the simulated situation. He/she must be an expert in the plots to be simulated, to guide the apprentice police officers, players;

- c) the system of rules: There are rules for players and masters to conduct narratives in the midst of in-game simulation;
- d) the scenario: It's the world of simulations, where the master will simulate the situation of public security collapse that will be experienced by the police officers. Players live the scenarios, face collapsing situations, and make decisions, bearing the consequences. Decision-making and consequences are the moments in which learning takes place. These are intense and contextualized interactions;
- e) creativity and imagination: The police-players, moving their characters, have the opportunity to use all the creativity and knowledge they have to solve the challenges of the stories and their breakdowns, making decisions and constructing the textual narrative of the situation simulations. Everyone can and should study in advance, depending on the instructor's guidance. RPG encourages reading and writing habits;
- f) interactivity: Players are constantly interacting with each other and the Game Master;
- g) interdisciplinarity: A single simulation can address topics from several disciplines;
- h) an RPG is not a game in the broadest sense, **it is a method for collectively building stories within universes that are being explored collectively**. The small and large battles, the true emotions occur in the unfolding of a story, a simulation, created and experienced by the group of players;
- i) the endings are not predictable, and each character has a certain autonomy, almost like in real life. They are excellent means of simulating incidents.

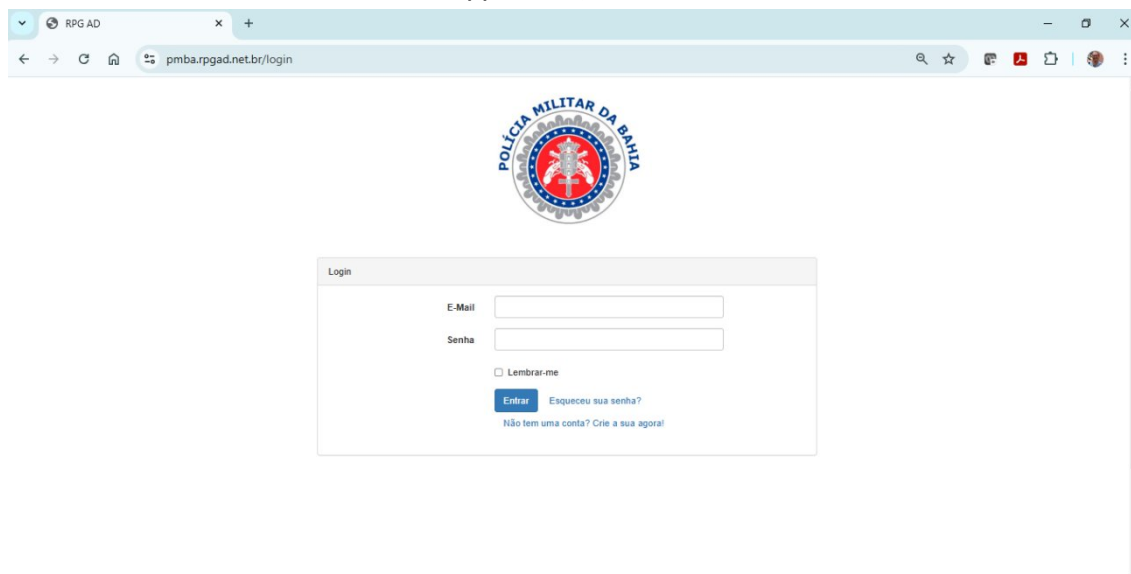
Once the approaches of tourism police content, adoption of social-constructivist pedagogy and analysis of the characteristics of the RPG game as a requirement for a digital gamification (game-making) system were granted, Phase 2 was carried out.

Phase 3 is dedicated to modeling the initial version of the proposed digital game. In this phase, the content was organized in the form of two RPG simulations, which must be experienced as a simulation of a collapse situation by the police officers engaged in the proposed learning process. The simulation situations constructed for the educational game were:

- a) Festa do Senhor do Bonfim – simulation of a situation of tourist security collapse, on the festival of Nosso Senhor do Bonfim, a traditional religious celebration, accompanied by a parallel secular festival, and with a large concentration of tourists and residents;
- b) popular demonstrations – simulation of confronting a situation of political demonstration and protest, and social activism, in which police officers must preserve the permitted legal and constitutional situation.

The elaboration of the simulation plot is part of the modeling of the solution, especially because one of the RPG training options does not depend on the digital medium, as RPG games can also be played in person, if necessary.

A computational system was developed to manage an educational digital game that supported an educational RPG gamification, as shown in Figure 1. Systems analysis and programming techniques were used to make the modeling of the proposed educational software effective, including the modeling of the social-constructivist approach to the chosen content. The analysis is accessible in the online thesis (Ribeiro, 2017, pp. 79-85).



Source: Sociedade em Rede (2024)

*Figure 1. Home screen of the RPGAD PMBA System, RPG game manager*

The first version of the system, and the proposed game plots, were developed in Phase 3, based on the elements constructed in Phase 1 and Phase 2, and it was implemented as a formative pedagogical procedure.

Phase 4 is dedicated to the proposed practice. We currently carry out two application cycles.

The first cycle brought together 5 BEPTUR soldiers selected after a session that explained the game, the training process, and presented basic questions about the Bonfim festival. This session proved to be important for engaging participants even before the game started. In fact, this previous moment of ambiance proved to be quite relevant and was added to all the research group's RPG applications.

There were three days of intensive gaming process. We started playing on the digital system, but it started to fail to connect and we were forced to play in person.

This first application ended up being much more in-person. Only the first day was digital. The cycle served, however, to monitor the learning process in the RPG, thus testing only the game part itself, leaving the digital system for later improvement.

To evaluate the simulation and its effectiveness in learning, we had defined some categories for recording and analysis, and at the end of

the three days we obtained the following, according to the analysis of the entire team and participants, as verifiable in the thesis accessible online (Ribeiro, 2017, pp. 103-165):

- 1) Encouragement of reflection: The group of police officers presented complex reflections and reasoning related to the simulated case, thus showing the acquisition of expected professional skills.
- 2) Promote Interaction and stimulate feedback: The development of explanatory interactions and the construction of collective action among police officers in training also took place; another professional skill expected to be acquired.
- 3) Awareness of the military police hierarchy and rules: The apprentice police officers demonstrated full practical acquisition of the rules of driving and interacting with the military hierarchy during the simulation.
- 4) Content Approach: Regarding the specific content of policing large events, police officers in training presented a strong record of acquired specific technical knowledge on policing mass events, in particular relating to the Senhor do Bonfim festival.
- 5) Collapse and help strategies: Several technical problem-solving strategies acquired by the police officers during the simulation were noticeable and recorded.
- 6) Sustainability and scalability: The solution was not ready for application at scale. The digital RPG management solution was partially functional: It recorded the moves, but with difficulty in multiple access on the internet, in real time.
- 7) Ease of Adoption: The simulation system and digital game are easy to learn and intuitive to operate. Those who participate soon learn how to operate and use it as a learning environment. The digital game's web page, however, was difficult to access on the network, unstable, and this made practical operation difficult.
- 8) Remote Operability: Network difficulties meant that the system was used in person. There was no success on this criterion.

The evaluations of the first cycle carried out resulted in the first DBR redesign definitions of the pedagogical game solution, generating the following referrals:

- 1) Implement improvements in the functionality of the digital game, specifically in the management of uploading and downloading media into the system, which requires the use of maps and military police insignia.
- 2) Improve player access via the internet.
- 3) Incorporate situations of explicit feedback and correction into the game, and during the game experience. The community of police officers in the game demanded it as a way to reflect on the military police procedures adopted in the experiment.
- 4) Adjust the operating system for use with a greater number of participants per experiment, aiming to improve scalability and sustainability indicators.

After this first cycle we had two more experiences: A second cycle of practice was carried out completely remotely and asynchronously, each police officer coming in and performing his move at some point

during the day, and after the master's provocation and move. This second cycle was carried out with the Popular Manifestations simulation.

A third cycle was a second performance with the Bonfim Feast simulation, with another group of student police officers.

These new cycles further explored the situation of distance training, and with asynchrony: the game's ability to serve to train police officers, without them moving from their work stations, carrying out distance training.

These cycles have already undergone the redesign intervention: There were improvements in the coding and performance of the system as well as changes in the mediation practice aiming at the recommended improvements.

At the end of three cycles of improvement and practice, the proposed digital game reached the following result as recorded in the online thesis, defended as a result of the research so far (Ribeiro, 2017, pp. 163-171):

- 1) The digital game proved to be full of difficulties regarding media management and network operation, in all cycles, indicating the need to invest time and resources so that it could improve its operability. However, it did not stop being used and showing its potential for educational use.
- 2) The game proved to be effective as a mediating process capable of carrying out learning procedures required by police officers. Consistent stimuli for reflection, promotion of recommended interaction and implementation of the established system of rules were observed.
- 3) Content learning, referring to the police techniques that should be learned, is the most successful field investigated in the research carried out. This shows the success of adopting simulations of collapse situations in a game to be experienced by police officers, as a way of efficiently training their knowledge. The police officers themselves declared the usefulness of the course when they were practicing party policing.
- 4) There was another negative feedback, regarding the asynchronous game procedure carried out in Cycles 2 and 3. The game in these asynchronous cases proved to be slower than expected, which implies revisions of the strategy for carrying out the educational game procedure in the asynchronous mode.

The DBR applied research that we carried out to develop the educational game had as practical results the production of the first versions of the Digital RPG Game and the verification of its effectiveness as a police training procedure. The construction of the digital game also proved useful for recording the action patterns of the military police, who, as we saw, were dispersed.

Even though some difficulties are well recorded, and require review, there was a record of police training carried out through the process. Finally, the record of successful elements of the social-constructivist



approach, in the training of police officers through simulation and collective construction of narratives, was carried out in the system.

## 5.0 Continuity of development of an Educational RPG Digital Game for PMBA: training in human rights

The research work carried out until 2017 was carried out mainly as part of Josete Bispo Ribeiro's doctorate, and in fact its results, successes, needs for new designs are all reported in her thesis report. The difficulties we have in Brazil, in terms of financing and structure, make us recognize even more the qualities of DBR, since thanks to the methodology we can continue the research, based on new research problems related to the previous one, and thus improve applications in new research situations which serve as a pretext and proposal for making new advances and DBR research cycles.

The PMBA educational RPG digital game reached 2017 with success in educational results and adequate registration of proposed educational results, but with problems optimizing the system in relation to its use on a wider scale, necessary for PM, for adoption. There was also some aim to improve the instructor's didactic mediation strategy.

The then Corporal, now Sergeant Nívia Rodrigues, joined our research group in 2020. Her research interest was in the serious problem of providing the Polícia Militar da Bahia with a standard procedure, already legally existing, but in practice very circumvented, of defense and dissemination of human rights.

It was an opportunity for a new contribution to the PMBA RPG, and a new opportunity for new DBR cycles. A new team of military police officers was formed willing to participate in the DBR research, and we had the important contribution of now doctor Josete Ribeiro, who had completed a doctorate on the subject. The presence of Colonel Ewertton Pontes from the Brazilian Army was also added, with important knowledge about military training, coming from the Army. The project was carried out with the same four phases.

Phase 1, context, was simplified as the context was the same as the previous research, with the exception of the application. Since we would now work with human rights education for the PMBA, we completed the existing context by analyzing the often adverse behavior, with the application of human rights being disregarded by some police officers in the context of professional police action, which in many aspects could be analyzed as a survival of behaviors, values, and social structure arising from colonization and slavery. This added understanding to the problem of the difficulty in using human rights by the troops.

Phase 2 was also like a review, so that the new researcher, in her doctorate, could focus on the issues we had already been working on. The new concepts to be added were those derived from the focus on the principles of human rights as content to be part of the practical knowledge of a military police officer. Furthermore, the social-constructivist principles, already adopted, were more strongly oriented to the

thought of Paulo Freire (2005), and the RPG game is subject to the remodeling needs gathered from the previous application as well as the new constructions of didactic and relational guidance which also contributed from previous cycles. These contributions and news can be seen by interested parties online, in the corresponding thesis (Rodrigues, 2022).

An educational simulation was then created to help military police officers learn about the practical use of human rights:

The new simulation: PLOT: POLICE THE CITY, THE CITIZEN AND YOURSELF (RACISM). Simulation: Call via the Integrated Communications Center (CICOM) for vehicles from the 100<sup>th</sup> Independent Company of PMBA (100<sup>a</sup> Companhia Independente da PMBA).

The simulation was worked on in three cycles, in a system already remodeled according to the feedback given by the cycles carried out until 2017. The simulation was divided into three parts, and each part was experienced as an RPG game, and thus being considered as a cycle of practice. So it was possible to monitor in detail the difficulties and needs and redesign what was occurring.

In these applications, the digital game worked better, eliminating inconsistencies in the previous application, signaling programming and network processing corrections; but it still presented problems. However, there was a need to develop a version for cell phone devices. This is because, in addition to becoming very popular, if we wanted to work with the police asynchronously, remotely, and at a low cost, a cell phone version would be more appropriate. The entire research procedure and evaluation of the analysis variables can also be consulted in the online thesis (Rodrigues, 2022, pp. 141-187) as well as the entire narrative of the simulation constructed by the participants, and the evaluations that led to the results.

The system advanced in several aspects, such as enabling the printing of narratives in PDF format for group evaluation and study, as illustrated in Figure 2.



Note: Source: Rodrigues (2022)

Figure 2. PDF printout of part of the narrative constructed by police-players experiencing the simulation for learning the use of human rights from RPGAD PMBA,

These cycles carried out in the study of Nívia's thesis were important for attributing consistency to the RPG digital system, which gained stability, gave new perspectives for improvement, and added quality and results that added to the previous ones in indicating the suitability for the adoption on a scale of this police training solution.

Table 3 presents a list of results highlighted by this research and its cycles:

Table 3  
Summary of the results with the application of DBR and Digital RPG at PMBA for training in human rights

1)	It encouraged the discussion of EDH in a practical, reflective and collaborative context.
2)	It enabled discussion on the use of instruments with less offensive potential, as recommended by the Lei (law) 13.060/2014.
3)	Based on the use of the Digital RPG game, it enabled the search for reflection on police-military knowledge and actions in relation to the application of EDH.
4)	It guaranteed the successive review and constant adaptation of training in relation to learning needs.
5)	It guaranteed to the participating police officers a break with the traditional educational model that is commonly applied in PMBA school classes which favors confronting the archaic models still present of a police action profile.
6)	The simulated activities proved to be coherent with the daily lives of military police officers, which was expressed by them in the research records.
7)	There was a need to develop a version for use on cell phone equipment.

Source: Rodrigues (2022, pp. 175-185)

The work showed advances in the quality and effectiveness of the software built for the digital game, showed new applicability, and received new indications for evolution and redesign.

## 6.0 Current moment of the Research: pedagogical maturity and expansion of scalability

The most recent cycles, which gave the project its current status, were carried out in yet another doctoral work. In conditions of limited resources and personnel for research, like ours, it is doctorates that organize the practices of the development cycles of the initial proposal, and improve it towards applicability. The work added another simulation on the use of human rights by PMBA to the previous two simulations on policing major events. This accumulation of simulations strengthened the perception that the game, in addition to its didactic functions, has the potential to organize the PMBA's action pattern records, which, as we have seen, are dispersed.

The work with doctoral student Igor Uripia, Captain of PMBA, began in 2018, and ended in May 2024. Uripia was attracted by the study on digital gaming and police training, which we had been developing since 2012, adding then his proposal to build simulations for the training of military police officers from the School Police Battalion in order to act in incidents related to the misuse of narcotic substances by children and adolescents in public and private schools in the capital of Bahia. A difficult job which requires a lot of tact, pedagogical knowledge, and human rights for the police officer involved.

Each time we start a new application, that is, a new set of cycles of pedagogical practices within a larger game development cycle, we redo all phases of the DBR.

The context phase in this case considered the constructions in the previous theses, adding study on public policies on drugs in Brazil as well as on issues specific to the life problems of young people of school age in Brazil, including the constant threat and harassment from drug dealers.

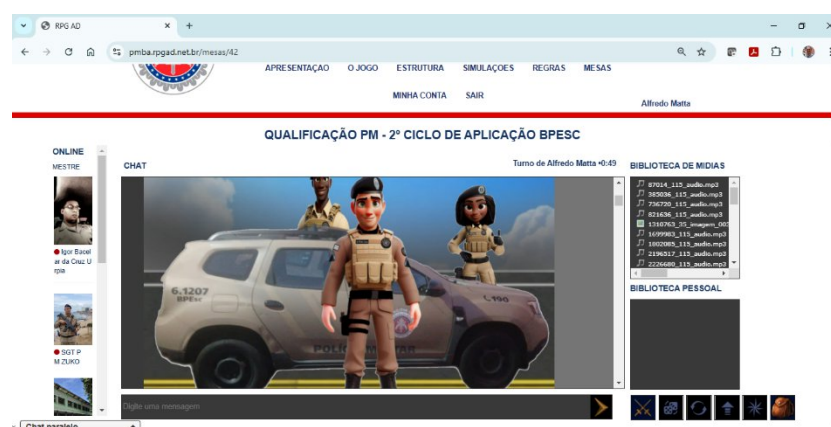
The work created two new simulations related to the misuse of psychoactive substances by children and adolescents:

- 1) SAFE PLACE
- 2) ROUTINE VISIT

The first one simulates the police patrol in a neighborhood, and the consequent confrontation of the practice of using psychoactive substances by a teenager and an adult. The second one simulates a patrol situation inside a public school, with a suspicious situation being faced. The part relating to mediation by the master instructor and the training practice were carried out with satisfactory results and in response to the feedback and needs for redesign signaled in previous developments and cycles.

The applications with these round simulations took place in two cycles, each cycle experiencing both simulations. The first cycle trained three police officers, using the same training as a military police garrison. In the second cycle, the same simulations were played, training three more police officers, but this time adding a new police instructor as a master, taking into account the returns on the maturation of the model to achieve a greater scale of use. This police instructor and master of the second cycle had participated in the first cycle as a student, which characterized an important case of training for multiplication of the game.

This success in scalability – the biggest criticism we found in the first cycles of the proposal, still during Josete Oliveira's doctorate – was considered by the programmers in dialogue with the system's users and resulted in an interactive version of the educational Digital RPG game PMBA, with the creation of characters, online combat management, uploading images and maps, as requested. The game proved to be more prepared to face network instabilities, and worked well at a distance and in asynchronous plays. Figure 3 illustrates a game screen from the computer version by Sociedade em Rede (2024).



Source: Sociedade em Rede (2024)

*Figure 3. RPGAD PMBA screen. Collective narrative and functions*

Furthermore, as it was highlighted as a necessity in the cycles carried out at Nivia's doctorate, a version for cell phones was developed that made it much easier to work with police officers, without leaving their policing situations and professional practice.

Some feedback from users regarding software inconsistencies were also noted for future redesign, for example: 1) The character creation routine is only working on computers, 2) the need to create a character also in the cellular system, and 3) audio posting can also be done on computers, as this currently only works on cell phones. These are important problems that need to be improved in later versions. But the current situation already puts us in a position to propose the use of the system in a

scaled manner for police education, which meant achieving the practical objectives of developing DBR research that we proposed in 2011. Figure 4 illustrates a game screen from the mobile version by Sociedade em Rede (2024).



Source: Sociedade em Rede (2024)

*Figure 4. RPGAD PMBA APP Screen. Collective narrative and functions in the App running on Android*

When reviewing the first application cycle, Urpia understood the need to provide the PMBA with a tool that would allow him to easily evaluate the effectiveness of those actions carried out in the digital RPG, so he developed a framework for evaluating the simulations of occurrences, based on the simulation script and the decisions made in the situations presented throughout the RPG application. This was made in a scoring system from 0 to 100 points which measured the effectiveness of the application, based on a quantitative model from the PMBA teaching guidelines (Diretriz de Ensino do PMBA) which established the concepts "Very Good", "Good", "Fair" and "Insufficient".

Urpia's work, and the other two simulations that were built, now gave us a total of five simulations, three police training areas with simulations to be used, a scaling proposal for broader application and with



a greater number of apprentice police officers, and the defensible perspective of using this scaling to organize police action patterns into organized records and applied to the proposed educational digital games.

## 7.0 Conclusion

The development of the RPGAD PMBA Educational RPG Digital Game as well as the RPGAD PMBA APP for cell phones are an important example of how we have worked with DBR to achieve applied and practical results, based on the research conditions we have in our university and country.

We were able to show a recognized production result in addition to showing how we organized ourselves for this work. It is true that development based on doctoral theses is sometimes slow. However, the care in implementing practical solutions that are recognized by the participating communities and subjects, as their own, has compensated for our expectations.

We obtained the three dimensions of results that we recognize as required by the DBR methodology:

- 1) The applied technical solution of the Educational RPG Digital Game was developed and improved in cycles, having reached a worthy level and expansion and scaling of use, now in the request and implementation phase;
- 2) There were also contributions at a theoretical level to scientific knowledge. The specification of ways to model social constructivism, in a social-constructivist modeling workflow of points of interaction, collaboration and control in educational computer systems are additions both to knowledge about social constructivism and about the computational modeling of educational systems. And we also have greater knowledge about the organization of standards for the PMBA.
- 3) Regarding personnel training, in addition to the three doctoral students who develop the ability to multiply the approach, we have satisfactory training for 18 military police officers and more than three instructor officers, today trained thanks to the digital education and gamification (game-making) solution we created.

This does not mean that we do not inherit difficulties or more elements for future redesign, providing for new versions of the system. Each advancement and experience signals new frontiers and fields of development in DBR.

The latest evaluations signaled new needs for improving the digital game. Furthermore, the expectation now is that more simulations of other collapses will begin to assess more accurately the police training needs.

On the other hand, being able to scale and respond to the massive training of police officers should open one or more new fronts of evaluation and development cycles.

Currently, other digital RPG application cycles are in the development phase at PMBA. Major PM Xavier develops the research “Digital RPG: proposal for training the school community at the Colégio Estadual Luiz José de Oliveira to act in incidents involving an active aggressor” to be conducted by police officers from the School Police Battalion (Batalhão de Policiamento Escolar).

In this way, DBR has fulfilled its role by leading us to develop gamification solutions, which we generally choose to be RPGs, virtual museums, educational web TV and others, which our research group has been advancing for 13 years, carrying out research and obtaining results with DBR.

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