Video games in the classroom: their inclusion as a teaching strategy

El videojuego en el aula: su inclusión como estrategia didáctica

O videogame na sala de aula: sua inclusão como estratégia didática

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Abstract

This research explores the use of a video game for educational purposes, Monsters versus Viruses, in the context of the COVID-19 pandemic in Uruguay. The objective was to investigate the potentiality of using a video game in two educational centers, in order to understand the logics of its incorporation as a pedagogical strategy in primary school classrooms. A case study was implemented through pilot tests of the video game in five groups, and the conduction of four semi-structured interviews with educational technology counselors and teachers participating in the tests. The most relevant result is the multiplicity of ideas that arise among the interviewees about possible strategies to develop with the video game in class. Likewise, the general positive assessment of the interviewees on the use of video games at the educational level is evident, highlighting both obstacles and facilitators at the time of their implementation. As a main conclusion, we point out that there is a need to continue investigating the subject in the country, generating knowledge about teachers' experiences, as there are no records that allow exchanging experiences or assessing the effects of video games in primary education.

Keywords: teaching strategies, video games, situated learning, student motivation, COVID-19, classroom research.

Resumen

La investigación explora la utilización de un videojuego con fines educativos, Monstruos versus Virus, relacionado al contexto de pandemia por COVID-19 en Uruguay. El objetivo fue indagar en las potencialidades del uso de un videojuego en dos centros educativos, de manera de comprender las lógicas de su incorporación como estrategia pedagógica en aulas de enseñanza primaria. Se implementó un estudio de casos, articulado mediante pruebas piloto del videojuego en cinco grupos, y la realización de cuatro entrevistas semiestructuradas a referentes de tecnologías educativas de los centros y docentes involucrados en las pruebas. Como resultado más relevante se encuentra la multiplicidad de ideas que surgen entre los entrevistados, respecto de posibles estrategias a desarrollar con el videojuego en clase. Asimismo, se evidencia la valoración general positiva de los entrevistados sobre el uso de videojuegos a nivel educativo, destacándose algunos obstáculos y facilitadores a la hora de su implementación. Como conclusión principal, se señala la necesidad de seguir indagando en la temática en el país, generando conocimiento sobre las experiencias de los docentes, en tanto no existen registros que permitan intercambiar experiencias o evaluar los efectos de los videojuegos en la enseñanza primaria.

Keywords: estrategias de enseñanza, videojuegos, aprendizaje situado, motivación estudiantil, COVID-19, investigación en el aula.

Resumo

A pesquisa explora o uso de um videogame para fins educacionais, Monsters versus Viruses, relacionado ao contexto da pandemia COVID-19 no Uruguai. O objetivo foi investigar as potencialidades do uso de um videogame, em dois centros educacionais, a fim de compreender as lógicas de sua incorporação como estratégia pedagógica nas salas de aula do ensino fundamental. Foi implementado um estudo de caso, articulado por meio de testes piloto do videogame em cinco grupos e a realização de quatro entrevistas semiestruturadas com referências de tecnologias educacionais dos centros e professores envolvidos nas provas. O resultado mais relevante é a multiplicidade de ideias que surgem entre os entrevistados, em relação a possíveis estratégias a serem desenvolvidas com o videogame em sala de aula. Da mesma forma, é evidente a avaliação positiva geral dos entrevistados sobre o uso de videogames no nível educacional, destacando alguns obstáculos e facilitadores no momento de sua implementação. Como conclusão principal, ressalta-se a necessidade de continuar investigando o tema no país, gerando conhecimento sobre as experiências dos professores, uma vez que não há registros que permitam a troca de experiências ou avaliação dos efeitos dos videogames na educação básica.

Palavras-chave: estratégias do ensino, videogames, aprendizagem situada, motivação do aluno, COVID-19, pesquisa em sala de aula.

Introduction

Video games are part of the daily life of schoolchildren. They are regarded as tools as they are cultural objects that, due to their power and projection, generate novel ways of building knowledge, bonding with peers, strengthening ties between players and self-esteem (Lion, 2018). Incorporating video games into learning spaces gives students particular prominence, especially due to their immersive environment, giving them a central role in the teaching situation. And teachers can generate intervention strategies that accompany students on their journey through the game, with the logic of gamification.

In Uruguay, Plan Ceibal has generated a technological ecosystem that includes the incorporation of video games as educational resources. In this sense, each student and teacher from primary to secondary school has his/her own device and guaranteed connectivity to work with the resources provided by the Plan (Plan Ceibal, no date a). The ecosystem is made up of various resources that students and teachers access from *Mi Espacio* [My Space] portal. One of the digital resources available for learning is the *CREA* platform, which works as a learning management system, among other elements (see Table 1).

Table 1
Digital resources of the Plan Ceibal ecosystem

Resource	Description
CREA	Virtual learning platform
Biblioteca País	Book consultation and loan platform
PAM	Adaptive platform for mathematics (primary and secondary school)
Matific	Gamified platform for mathematics (early and primary school)
Little bridge	Ceibal platform in English for 4th, 5th and 6th grades
Language Platform	Language platform from a communicative approach (4th, 5th and 6th grades of primary school and middle school [grades 7 to 9])
SEA	Learning assessment system
Micro:bit	Platform to create with Micro:bit (programmable micro-computer)
REA	Open educational resources
Deep Challenge: *Misterio del Cabo Frío*	Transmedia educational novel
Valijas	Collection of free digital tools to support the teaching and learning processes
Educational applications and video games	Designed for the specific purpose of learning particular topics and skills

Note. Adapted from Plan Ceibal (no date b).

The offer of educational applications and video games is made up of almost twenty options with different topics and levels of challenges. Among them is the Monsters versus Viruses video game. It is an educational video game, released in mid-2021, whose purpose is to teach students (aged 9 to 12) about the risks and ways to take care of a virus that exists in a camp for monsters (*El Observador* newspaper, 2021; *Universidad ORT Uruguay*, 2021). By interacting on a virtual scene, players clearly see how a virus can spread through a small population and at the same time learn about the consequences of not maintaining proper care, both at an individual and community level.

Uruguay plans, in this way, accessibility to educational digital technologies. In this context, the purpose of this study has been to inquiry into the perspective of educators on the potential of using video games for teaching and learning. The intention has been to understand what are the logics of incorporating this tool as a pedagogical strategy, in primary school classrooms.

Theoretical framework and background

As a frame of reference for this study, the elements that facilitate the understanding of the phenomenon in context are addressed. Firstly, educational video games are defined and classified. Secondly, the conceptual foundations that enable the inclusion of video games in the teaching and learning processes are shown, the learning scenarios provided by educational video games are listed, and the learning triggers or motivators are identified. Taking these elements into account, the background on the use of video games for educational purposes at an international level is presented. Finally, teaching practices with video games in Uruguay are described in order to contextualize the study.

Educational video games

An educational video game can be defined as an interactive digital resource that allows simulating experiences through the active interaction of users with the content, by means of controls and electronic devices. Although the main purpose is entertainment, video games can differ in terms of topics and complexity (Plan Ceibal, no date c).

According to the typologies, the video games that are designed for educational purposes can be classified as serious games and can be used to inform and train, using the attraction and playful characteristics of this type of tools (Lion & Perosi, 2018; López, 2016). While they pose risk-free simulation scenarios, they constitute a safe environment for risky action practices, such as rescue simulation, for example, generating situations in which different skills and knowledge are acquired in a context to interact and think about reality (Lion & Perosi, 2018; Torrella, 2020). In these scenarios, students get involved in a story, where they assume a certain role to fulfill specific tasks, solve situations, complete missions, among other objectives (Lion & Perosi, 2018).

The identification of players with the game environment and, therefore, the link with reality in a playful environment of experimentation, favor problem solving and

engage students in the proposed missions and challenges. Besides, as Lion and Perosi (2018) mention, "they offer an opportunity to modify the scenario, reinvent contexts, incorporate new situations and propose assemblies or meetings once the experience has been completed for the purpose of submitting the displayed behaviors and activities for analysis." (p. 12).

To classify the genres of educational video games "three aspects can be considered: iconography, structure and theme" (Lacasa, 2011, p. 25), which enable students to "have flexibility when facing changes, promoting innovation strategies and creativity to function in society" (Méndez & Boude, 2021, p. 70). On the other hand, the classification of Laird and Lent (2005) differentiates video games by genre. For example, Monsters versus Viruses is classified according to this typology as a simulation, strategy, adventure and role-playing game (see Table 2). Likewise, Monsters versus Viruses is conceived both to inform and to train, teach and educate, coinciding with the characteristics that Lion and Perosi (2018) give to serious video games.

Table 2

Monsters versus Viruses genres

Simulation	It provides players with control of a simulated world. People can modify the environment and its inhabitants.
Strategy	Players face problems they have to solve by, for example, distributing resources, organizing production, defenses and attacks.
Adventure	It is related to interactive fiction. It puts emphasis on the story and the plot. Players have to solve problems when interacting with other characters, thus progressing through different moments of adventure.
Role-playing	Players can play with different types of characters (for example, a magician). It is often necessary to collect items in a virtual world to increase the powers of the characters.

Note. Prepared based on Laird & Lent (2005).

Inclusion of educational video games in the classroom

The literature on video games for educational purposes identifies two essential elements to analyze their incorporation as a pedagogical strategy. On the one hand, there is the concept of digital game-based learning that proposes three areas to consider for effective learning: student empowerment, problem solving and understanding (Gee, 2003). These areas are, in turn, divided into principles which act as key components to promote learning; Coleman & Money (2020) describe these principles. On the other hand, there is the student-centered learning, whose key elements are active learning, deep learning and understanding, greater responsibility, sense of autonomy, interdependence between teachers and students, mutual respect, reflective approach to teaching and learning (Lea *et al*., 2003).

In general, video games classified as serious games offer various opportunities for player development (Torrella, 2020):

a. Learning or reinforcement of values, such as cooperation, collaboration, respect, tolerance, empathy.

b. Development of communication skills.

c. Community building and socialization.

d. Development and promotion of digital skills, especially digital literacy.

e. Opportunity to acquire various learning.

f. Development of psychomotor coordination, greater reaction capacity.

g. Exercises for the analysis of risks and decision-making.

h. Preparation for real life, as a simulation of real situations mediated by the game.

i. Improvement of memory, creativity, organization and metacognition.

j. Building resilience and patience.

Using these learning opportunities and the principles for effective learning, by focusing on students and relying on this type of digital tools, teachers can promote the use of video games to determine or stimulate learning, as well as establish guidelines and behaviors. In any case, it is necessary for teachers to be able to identify the benefits of using video games in their teaching practices and for active learning. For this, video games must imply a problem or challenge, while favoring learning: assisted by peers, collaborative and cooperative, through peer tutoring (Bishop & Verleger, 2013).

Background on the use of educational video games in the classroom

In the field of teaching, video games have been seen, until not so long ago, as only recreational. It may be for this reason that teachers have not incorporated this educational resource more frequently in their pedagogical practices. Besides, it is important to highlight that although video games, in general, provide advantages for learning, not all of them can be used for educational purposes. In this sense, Macías (2013) proposes a series of requirements that these tools must meet for their use in classrooms for pedagogical purposes.

- Player fun as a trigger for learning.
- Progressive difficulties.
- Adaptive proposal for each player, so that they can learn at their own pace.
- The results of the game must be known immediately.
- Clear game objectives and actions for players.

- Error shown as an option to learn, offering opportunities to overcome a task or challenge again.

- Achievements in the game are rewarded and are associated with the player´s prestige in relation to others, by means of recorded records.

- The sounds that indicate achievement must be clear and motivating.

Once teachers are clear about these video game elements that promote learning, they must select those games that, regardless of the purpose for which they were designed, allow them to be used for educational purposes.

Pedagogical practices with video games constitute a complex process, especially because, despite international studies that show that teaching planning is changing its focus to students with the inclusion of digital technologies (Freeman *et al*., 2017), the perception of video games in education has changed: "there are still very few studies reported in this regard and there are many questions about the advantages and disadvantages of incorporating this type of technology into the educational process" (Mendez & Boude, 2021, p. 74).

The current challenge implies that teachers must get out of their comfort zone and consider the expectations of the students about video games, as well as "the dynamics they need to favor in order to foster the abilities and skills appearing in the curriculum" (Méndez & Boude, 2021, p.67). For this, teachers need to be solidly trained in pedagogical, digital and communication skills, including psychosocial skills for the use of interactive tools (Esnaola & de Ansó, 2019).

In this sense, teachers are required to know the potentialities of video games as learning resources and, at the same time, consider the virtual learning environment in relation to certain criteria, such as accessibility by students, usability from the point of view of complexity and ubiquity of devices and platforms for use. According to Esnaola and de Ansó (2019), teaching practices with video games are characterized by including diagnostic actions, planning, execution, control and evaluation of the educational process with a clear pedagogical focus, which manage to achieve the expected learning results.

These authors state that such pedagogical practices are also characterized by developing specific dimensions:

> I. The cognitive dimension, which includes "critical reflection, decision-making, and strategic and anticipatory thinking" (p. 408);
>
> II. The educational dimension, identified as pedagogical innovation, which is sustainable if there are public policies and institutional decisions and is not only reduced to curricular decisions of the teacher;
>
> III. The emotional dimension, represented by motivation as a factor for the evaluation of learning, whether it is given by the entertainment itself or by the interest that video games arouse to promote learning. In this dimension peer collaboration also plays an important role for learning.

Additionally, and from the point of view of the design of educational video games, Laine and Lindberg (2020) systematize elements that facilitate the gamification of teaching proposals and identify principles and motivators, creating a toolbox to evaluate the way in which a certain video game can be analyzed to establish to what extent it involves students with learning.

In short, pedagogical practices and, therefore, the use of educational video games for student learning depends not only on the characteristics of the video game (Coleman & Money, 2020; Gee, 2003), but also on the extent to which teachers are able to ensure that its use generates connections with daily life, promote mental operations, collaboration and autonomy, interdisciplinary work and divergent thinking (Lea *et al*., 2003), together with appropriate monitoring and evaluation instances (Esnaola & de Ansó , 2019).

At the international level, there are some valuable experiences that contribute to the understanding of the subject. For example, a systematization by Crompton *et al*. (2018) analyzes different studies that report benefits of the use of video games at the K-12 level (primary and secondary school) for the learning of languages, mathematics, science, art and history. In parallel, an article by Grande de Prado (2018) collects experiences and benefits reported in Spain, while Torres-Toukoumidis & Romero-Rodríguez (2018) describe educational practices in the Ibero-American context. Likewise, there are studies that report benefits of the use of video games among students to detect and avoid bullying and cyberbullying (Calvo *et al*., 2020), control of childhood obesity (Días *et al*., 2018), prevention or treatment of mental health (García-Ríos & García-Ríos, 2020; Zayeni *et al*., 2020), among other topics that can influence learning.

Teaching with video games in Uruguay

The systematization of evidence on the use of video games in Uruguay is scarce. However, a general study on digital literacy (Cabrera *et al*., 2020) reports the benefits of video games among adolescents for the development of transmedia skills, although the use of these resources is not associated with a pedagogical proposal and, therefore, is not evaluated for this purpose. Regarding studies in primary school, one article mentions the use of video games related to leisure, but it is not linked to the analysis of learning activities either (Gewerc *et al*., 2017).

Currently in the country the use of educational video games for teaching and learning is at the discretion of the institutions and teachers. As mentioned above, the digital ecosystem proposed by Plan Ceibal facilitates access to some video games for the development of specific skills and knowledge. Among these resources there is the Matific platform, focused on recreational activities, with video game logic (Plan Ceibal, no date d). Also, in the Deep Challenges of 2021, a transmedia educational novel is developed. It shows a learning experience which has a gamified novel as a common thread, with challenges that require computational thinking and chess strategies to solve them. The novel allows several educational expansions through its different formats: digital on the website, paper in the book or audio in the podcasts of each chapter (Global Learning Network, 2021).

Plan Ceibal has also supported teachers´ training in the use and integration of technology in classrooms. There are currently two training proposals that contribute to this: "Video game laboratory" (30 hours) and "Digital technology with pedagogical sense" (120 hours) (Plan Ceibal, no date e). However, these are specific initiatives for teacher professional development, while the initial training curriculum does not include digital technologies (Cabrera *et al.*, 2018).

Methodology

To carry out this exploratory study we used the methodological strategy of multiple case study, type 3 design (Yin, 2018). We sought to know and analyze the phenomenon in context and to establish some lines that allow reaching conclusions about the application of educational video games. To develop this study, the educational centers were selected according to the accessibility and convenience criteria (Stake, 2006). The selection was made so as to enable the description of the phenomenon to be studied in two different contexts (public and private education) to achieve a broader observation of the situation studied. In each case, a pilot test of the Monsters versus Viruses video game was coordinated for the sole purpose of obtaining teachers´ feedback and reflections on the tool during the field work.

Selection of cases

Two cases were selected, involving students and teachers from the last three grades of primary school.

- Case 1: public school, of common primary education that is located in Montevideo and works in the morning shift. The school has a facilitator teacher and the coordinator of the Department of Educational Technology and Ceibal (*DTEyC*) as technology counselor. The pilot test of the video game was carried out on Friday, June 18, 2021. As primary education was operating remotely during that period, the teacher, the students and the technology counselor were at home. The test began with a brief explanation of the game and its installation. Then the use of the game was proposed for 20 minutes and there was an exchange of opinions with the students. The test was developed in three groups corresponding to fourth, fifth and sixth grades.
- Case 2: this center develops a national and international educational program. The school has a computer room and a technology counselor teacher to support all groups and their teachers. The pilot test of the video game was carried out on Thursday, September 30, 2021. The test was face-to-face, in the computer room, with the presence of the two teachers who were in charge of the groups involved (fourth and fifth grades) and the technology counselor teacher. The video game was previously installed on the devices of the room, so we directly started with a brief explanation of the game. The game lasted 20 minutes and then there was an exchange of opinions with the students.

It is important to mention that both cases have access to the ecosystem of Plan Ceibal resources, so we consider that there is a similar starting point to compare the topic of interest in this study.

Organization of the pilot tests

The educational centers where the tests were carried out accessed the video game differently. In the case of the public school, the students downloaded it to

their devices through Plan Ceibal or Play Store, while at the private school the download link was provided so that the center's technical staff could install the version for Windows on the computers of the computer room.

These differences caused some difficulties in accessing or executing the program, but beyond these operational issues, the pilot test was carried out without problems, so the informants could visualize the experience of the students and then give their opinions during the interviews. Since the video game was in the promotion phase, the pilot test was a way to raise awareness of the resource and to generate a space for student interaction with the video game, as an input for reflection and for conducting interviews with the teachers.

Data collection techniques and instruments

After the pilot test, interviews were conducted with teachers and technology counselors. Regarding the interview guidelines, questions related to the inclusion of educational video games in the classroom were included, as well as the assessment of the Monsters versus Viruses video game. Likewise, we asked about the expectations and reactions of the students and about the potentialities of the game from the educational point of view. Due to the health situation in the country, we decided to hold the interviews by videoconference in all cases. Table 3 shows the details of the interviews conducted.

Table 3

Detail of the application of the interviews with key actors of the centers involved in the pilot plan

Case	Informant	Date of interview	Code
1	Technology counselor	October 12, 2021	E2
2	Technology counselor	October 1, 2021	E3
	Teacher	October 14, 2021	E4
	Teacher	October 19, 2021	E5

Note. In case 1, due to the contagion situation in the center, it was impossible to arrange interviews with the teachers participating in the pilot tests.

Prior to the pilot tests of the video game, as a first approach to it and to the logic of its design, an interview was held with a member of the developer team. The interview was conducted on August 6, 2021, and it was coded as E1. In this interview, topics such as the emergence of the idea, the components of the video game, aspects of testing, downloads, the socialization campaign and a first evaluation by the team were explored, which served as basis for the design of the interviews.

Data analysis strategy

For the analysis of the collected data, the main strategy was the thematic analysis (Harding, 2013) which resulted from a priori analytical categories (see Table 4).

Table 4

Dimensions and categories of analysis according to the informants

Dimension	Category	Purpose	Informant
Generalities	Use of video games for pedagogical purposes in the center/classroom	Describe the assessments of the actors involved in the initiative	Technology counselors
Teachers	Opinions about the video game		Teachers
	General assessment about video games		
Students	Comments of the students about the video game		Technology counselors

These categories allowed the primary work with the transcripts of the interviews, and they were also useful for the presentation of the results obtained, as mentioned below.

Results

In this part we show the main findings of the study, through a compilation of the evidence obtained, in a synthetic way. In the first place, we show evidence of the use of educational technologies in general and, in particular, of the use of video games in each center, according to the voice of the informants. Then, we present the results related to the opinions of teachers about the video game and their general assessment of video games as a teaching strategy. Ideas for using the video game are also collected, motivated by experimentation during the pilot test.

In order to organize the results, the categories of analysis are presented in thematic blocks that help to display the information. It is worth remembering that the purpose of this study is to know the opinions of teachers on the use of video games as a teaching strategy. The presentation about this topic is divided in three sections.

Use of video games in educational centers

Regarding the category "Use of video games for pedagogical purposes in the center or classroom", the voice of the technology counselors of each center provides information and reflections on this teaching strategy. Thus, after participating in the development of the pilot test of the video game, all the counselors mentioned that these are institutions with high levels of digital inclusion (E2; E3). For example, in case 1 the counselor mentions:

> We use Ceibal. The good thing about the pandemic, to say something positive, is that it made teachers use [it] a lot more... They used a lot of Matific, PAM, obviously CREA, because we had everything in CREA. And then, other tools depending on the [educational] level (...) It is a school that incorporates resources and uses

> educational resources of all kinds. And if a child brings something, the teacher uses and supports it and accompanies him/her. (E3)

However, in this case, the counselor recognizes that video games are not the tool most used for pedagogical purposes, and they are used for creative purposes in the area of computational thinking development. In contrast, the person of reference of case 2 mentions that "In 1st and 2nd grades they use some video games... They have used them because they have asked me about some. I remember some, but rather educational" (E3).

Likewise, in both centers the counselors state that the use of digital developments for learning is usually associated with other areas such as mathematics, for example; thus, they find it is interesting to incorporate features linked to natural sciences and to modeling behavior, as is the case of the video game shown (E2; E3). Apart from these comments, the counselor of case 1 reflects on her role as a technology facilitator:

> Perhaps other tools and other resources are highly incorporated [in teaching practices], so we can put them on standby and focus our energy on that [the use of video games]. Begin to bring video games closer... And kids are attracted to them, in addition, because kids do use them. (E3)

These comments show that, despite the availability of educational video games in the Plan Ceibal ecosystem, teachers and counselors do not consistently use them for pedagogical purposes. Likewise, the interviewees recognize that students, to a large extent, use video games for recreational purposes in their free time (E2, E3).

On the inclusion of video games in the classroom

This section analyzes the information collected in relation to the opinions of the participants about the Monsters versus Viruses video game, in particular, and the general assessment of the use of video games for educational purposes in general.

After carrying out the pilot tests in each class, the video game is positively assessed by all the interviewees as it aroused the interest of the students. In equal measure, the teachers were motivated to see the reactions of the students. The evidence in this regard shows the opinions of counselors and teachers in relation to the Monsters versus Viruses video game:

> – "I think the teachers liked it, that they found it interesting, it has many contributions that can be used from an educational-pedagogical perspective for learning and teaching. The teachers were very interested. And all the opinions were very positive" (E3);
>
> – "[the students] assessed the game as a creative, interesting game, with good tools. Addictive" (E3).

However, they pointed out that it would be more appropriate for younger students due to the simplicity of its approach: "It seems to me that it is suitable for primary school, I don't know if it applies for higher levels" (E2). More precisely, a teacher mentions that

> with younger students the game could be used as a trigger, or the other way around, we first get prepared and then go to the game. With the little kids I think it could be done. Even in computing, because all this clicking thing and all that happens... They work on it in the early stages. It seems to me that, for the youngest kids, mastering the game may be a little more complicated, perhaps that is where the challenge lies. And the contents that could be dealt with in a curricular way. For the youngest kids, who deal with the issue of hygiene. By youngest kids I mean students of 1st, 2nd [grades]. (E4)

This vision is recurrent in the voice of another of the interviewed teachers (E5): "It was quite automatic, I think it was not necessary to explain much (...) And for them it was quite intuitive. For many it was too intuitive. I think that for their level, as a 4th grade, (...) it was too easy".

In general, the teachers and counselors interviewed visualize pedagogical uses of the video game, with great projections of application in classroom work, for example. Among the possible uses for learning, one of the interviewees mentions:

> It can be coordinated with science, I think it is a good thing. And we were just saying with the 3rd grade teacher that maybe not only with science, because when you talk about viruses or, for example, we were saying... When, now, with the quarantine, for example, there is a child who has to stay in quarantine... And we can also work on that, through the game. Why does the child have to quarantine, what happened in parallel in the game if he/she did not quarantine or if he/she did not take care of himself/herself? (E2)

> We had seen that, with the tokens, with 2nd grade students who generally work a lot with descriptions, that they are learning to do that, maybe, after playing the game we cannot only talk about the scientific part of the virus or how it is transmitted. We can work on other parallel things, right?, such as the description of a character. Another idea could be, if you were a monster, it could be a monster, make up a similar monster. (E2)

> Maybe each of them can be a monster and they may also tell, through that, if they take care of themselves or which would be their weak point to get sick. Don't I wash my hands a lot? For example. Don't I brush my teeth? Not only with the virus, with other diseases or other things that can happen to me. (E2)

In particular, regarding the video game, a teacher explains:

> if you present the game in a class, it can be a stimulus to start a class. (...) And the game seems good to me for motivation. Or, for example, it could be for the closing of a class. In the end, to talk about the virus, the care of hand washing and all that, all the rules, as a way of concluding the subject. (E5)

These testimonials and pedagogical visions identify video games as a teaching strategy, even suggesting some outlines for the design of pedagogical practices in which this tool is, in some way, the protagonist. In this exercise, reference is made not only to the specific theme of the video game and its health-oriented purpose, but also to the potentiality of the pedagogical application in different educational scenarios, regardless of the topic. In this sense, we could think that if teachers incorporate video games into their practices, they can go beyond the obvious content of the game to promote other learning.

With regard to the specific theme of the video game, the perceptions and comments of the interviewees regarding the possibility of learning by using

it, result in key data to understand the specific educational implications in the area of health. For example:

> – "During the pilot test, they realized that... 'This is COVID,' they said. They immediately related it" (E3)
>
> – "I saw that they said some things, right?, that they commented them to us. They said 'oh, look, they get more infected if they are all together'" (E2)
>
> – "You told him 'that is because of the capacity'. And that, perhaps, although they hear it, they don´t have it so incorporated, what happens if a place is full and what is the capacity" (E2)

In the opinion of the interviewees, the specific learning about COVID-19 was already rooted in the students due to the advanced stage of the pandemic and the socialization with care to prevent the disease. In this sense, one of the interviewees comments: "It was the other way around; they took what they knew to the game, not that they put some behavior into practice after the game" (E4).

This is justified to the extent that, at the time of the pilot test, they have already worked on the prevention, hygiene and distance, to put into practice the health recommendations established by the health regulations. Another teacher confirms this vision: "This year, in particular, we are actually working very hard on this topic [the pandemic]. And since they already have it well acquired, they do not have the curiosity to ask" (E5).

However, the technology counselor of case 2 states that, in courses with younger students, "we can make a glossary of words they didn´t know and, through the game, they know, for example; and what relationship these words have with the things that are happening in the world, in the country" (E2), revealing the educational potential in an age group more prone to acquiring behaviors by imitation.

Comments on the Monsters versus Viruses video game

In addition to their opinions and observations, the interviewees highlight comments or situations experienced during the pilot test in each case. They identified operational aspects of installation, playability and options of interaction with knowledge to generate learning. They mentioned improvement spaces to optimize the use of the video game in particular and reflect on other similar tools.

Table 5 summarizes the observations and suggestions that came up in the interviews.

Table 5

Observations and suggestions of the actors on the video game

Operational aspects	• "Facilitate downloads, create a user´s manual " (E3) • "The main difficulty (...) was downloading the game, which was later solved" (E3) • "The problem was that they can´t download it in the computer. This is a barrier, right? because not all of them can use cell phones or tablets" (E5)
Ideas on the video game development	• "There had to be the possibility that they were one of the characters that was in the game and not that they only moved the monsters" (E3) • "It´s interesting to select different viruses, for example (...) dengue; that stagnant water couldn´t be left in the camps because the dengue virus comes, I don't know... We were also talking with the 4th grade kids (...) and they told me that it was good to make the virus mutate" (E2) • "The older kids got it immediately. And they looked for a way to go further, right? They said, 'but hey, and that's it? I already won? Is that it?' (...) they needed a greater challenge, a new stage, a progressive difficulty that would challenge them" (E4) •"They like to play together. And that was missing in the game, they are used to inviting a friend, two friends, to play... Not playing against the game (...) This is another thing that all [the students] told me: 'yes, but we didn't play with another person'..." (E5) • "I saw little in the language part... It would also be nice to change the language (...) The game seemed good to me but for younger kids because it was simpler. Considering the grade of my students, they are already old. I think that some things were missing" (E5) • "Many told me that they expected, for example, the game to have levels. So, they said 'yes, but it ends like this' (...) Also with the difficulty... They told me 'but the difficulty is the same. It should become more difficult, so we are more attentive. (...) The moment they were waiting for, for something new to arrive, was missing " (E5)

Based on the evidence shown in this section, we can state that the interviewees as well as the students have a critical vision of this video game, which could apply to other video games and their opportunities for use in the educational field. It seems clear that the teachers and counselors understand the elements that video games must have to be learning facilitators based on an educational planning design, which is very auspicious.

Discussion and conclusions

This study has raised the need to understand the perspective of teachers and counselors in educational technologies, on the logic of using video games with a pedagogical sense. At this point, evidence and theory are brought into dialogue, with the purpose of discussing the resulting findings. For this, this section is structured in key questions that refer to the categories of analysis and contextual situations described. Some contributions of this article to the field of knowledge are pointed out, the limitations of this study are mentioned and some projections for future work are outlined.

How and how often are video games used?

As previous international studies mention, the incorporation of video games into student leisure spaces is a constant feature (Crompton *et al*., 2018; Torres-Toukoumidis & Romero-Rodríguez, 2018). Although there is little research on video games in Uruguay, the national background confirms that the main use of video games among students is recreational (Cabrera *et al*., 2020; Gewerc *et al*., 2017).

In case there are classroom practices that use this tool for pedagogical purposes, its circulation as an input for other teachers is unknown, and no evidence has been found in this regard. This study makes the digital inclusion of various resources visible in both cases, especially driven by the country's health situation as a result of COVID-19. The recognition of the tools of the Plan Ceibal ecosystem is clear in the speech of the interviewees, which is why it is inferred that they handle technology and could potentially include video games as part of their teaching strategies. This could be stimulated not only with the availability of educational video games but also from the gamification strategies proposed by Plan Ceibal.

Why do teachers not use video games as a teaching strategy in their classrooms?

There are studies that show the pedagogical uses of video games in different areas of knowledge (Crompton *et al*., 2018). However, they do not provide sufficient details about teachers' training in the use of technologies, for example (Mendez & Boude, 2021). In the case of Uruguay, there are voluntary teacher professional development instances that provide tools to include video games as a teaching strategy (Plan Ceibal, no date e), but there is no specific training provided for in initial teacher training (Cabrera Borges *et al*., 2018).

In this scenario, and considering that digital inclusion in the classroom is discretionary on the part of teachers, it could be suggested that the system should offer clearer incentives for the use of video games for educational purposes. Along the same lines, training for the inclusion of these tools could be reinforced and encouraged in each center. The incentives for teachers in this study are based on the development of a pilot test with their students. After the test, it was found that the informants reflected on the tool and tried out ideas about educational uses of video games, which could work as an incentive in other contexts.

Likewise, and to reverse the knowledge gap on the application of video games in the country, uses such as those mentioned by the technology counselor (E3, in the first and second grades) should be registered as practices with digital inclusion and shared in repositories with open access for teachers, which could motivate the use of video games in teaching practices (Mendez & Boude, 2021). Or, studies such as those mentioned as background could be planned (Crompton *et al*., 2018; Grande de Prado, 2018; Torres-Toukoumidis & Romero-Rodríguez, 2018), which give teachers examples of some practices with video games in context, favoring interest in their use.

What elements of educational video games are identified to benefit learning?

Although the literature states that some spaces require more research on the use of video games for educational purposes (Méndez & Boude, 2021), it seems essential that teacher training and the development of skills are considered key elements of inclusion as a teaching strategy (Esnaola & de Ansó, 2019). In any case, apart from the skills of each teacher or their specific training for the use of video games in the classroom, the video game test was a motivation to redesign the practices.

Thinking about learning based on the interests and needs of the students (Lea et al., 2003) and with the incorporation of digital games (Gee, 2003) also requires that teachers pay attention to certain requirements and characteristics of the video games. The opinions of the teachers and counselors interviewed contain aspects proposed by the literature. For example, the progression of the difficulties for students and the adaptability according to the skills and needs of the players (Macías, 2013), the simulation of real situations (such as infections by COVID-19), the analysis for decision-making (Gee, 2003), the reinforcement of behaviors or values (Torrella, 2020) and responsibility (Lea et al., 2003).

Conclusions

The pandemic has accelerated and facilitated the introduction of tools mediated with digital technology for the development of the learning process, although much remains to be promoted and implemented. This exploratory study shows the opinions and reflections of teachers and technology counselors on the use of video games in classrooms, for pedagogical purposes. Although the results are seminal on the subject, they can be a great contribution to the field of knowledge, as in Uruguay there is no research or compilation of practices that account for the use of this tool at a pedagogical level.

The pandemic was also an obstacle to conduct this study as we could access few cases due to the health restrictions at the time of carrying out the work. As limitations, we can mention the number of cases addressed and the consequent conduction of few pilot tests and interviews. However, the experience of the teachers during the pilot test is thought to have been a motivation that can serve as a basis for future studies since the stimulus of the test has triggered valuable reflections and includes both public and private education.

To delve into these findings, the study should be expanded to other educational centers in different regions of the country. Likewise, it is suggested that the educational system could encourage teachers to participate in initiatives where they experiment with video games in classrooms or other interaction options, computational thinking and gamification, taking advantage of the digital ecosystem available in the country.

Notes:

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