Article

Impact of a Serious Board Game on the Academic Performance of Future Physical Education Teachers

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Abstract

University-level training is constantly evolving to meet the needs of future professionals. However, a passive student role and a disconnect between academic content and professional practice often lead to disengagement and low involvement. To address these shortcomings, active learning methodologies have emerged, and their appropriate implementation fosters contextualised, meaningful learning. Among these methods, Game-Based Learning stands out, particularly the use of serious games, which aim to develop competencies and consolidate knowledge through play. This article evaluates the impact of *Docentis*, a board game created for undergraduates pursuing Primary Education teaching degrees. The game simulates the role of a Physical Education teacher, incorporating organisational and curricular elements of the subject, with the aim of enhancing both cognitive and non-cognitive skills while increasing participants' engagement. Using a mixed-method approach, both quantitative and qualitative data were gathered, demonstrating that *Docentis* motivated students, enhanced their learning, and improved academic performance based on the experimental group's results. Additionally, the game was highly valued for its transferability to professional practice. The findings confirm the suitability of this board game for training future Physical Education teachers, promoting meaningful learning experiences that bridge theory and practice through the simulation of professional contexts.

1. Introduction

The education system is compelled to respond to a society in constant flux yet often fails to adapt teaching practices to the evolving needs of students in relation to their future professional demands [1], [2]. As highlighted by the European Higher Education Area, one of the key challenges lies in the methodological renewal within universities to enhance teaching quality [3], [4]. Consequently, there is a trend towards transforming or combining traditional methodologies with more active ones, which have a greater impact on student motivation,

engagement, and commitment.[5], [6], aiming for more meaningful learning experiences [7]-[9].

This is where active methodologies come into play, defined as instructional frameworks that actively involve students in their own teaching and learning process [10]-[13]. From this perspective, the teacher acts as a guide, facilitating the construction of knowledge across various subjects while fostering the development of soft skills or 21st-century competencies [14]-[17]. These competencies are invaluable for personal growth, employability, and professional development [18]-[21].

One emerging active methodology is Game-Based Learning (GBL), which emphasizes the use of both analogue games and video games to enhance classroom learning processes [22], [23]. Scientific evidence suggests that learning tasks integrated into games are more motivating, engaging, and meaningful than those that are not [24]-[26]. Consequently, the impact of game-based methodologies and their growing presence in academia have positioned them as effective allies in breaking away from traditional teaching models [27], [28]. Games provide opportunities for reflection and critical thinking [29] and serve as a powerful tool for keeping students engaged and motivated over extended periods [30], offering a continuous sense of progress and achievement as players acquire skills and overcome challenges [31].

In the current scientific literature, research on digital games predominates within an interdisciplinary field known as *Game Studies* [32], [33]. Its impact in the academic sphere is increasingly significant [34] and appears to be consolidating as a prevailing trend in game-related research [35]. Some researchers refer to the study of digital games as *ludology* [33], [36], and consider it linked to a fundamental ludic precursor: board games [33], [37], [38]. These, in turn, can offer insights into certain developments in the evolution of video games [33], [38], [39].

The emergence and rise of modern board games in recent decades have been accompanied by a growing trend in the development of a scientific corpus focused on this type of game [40]. Research in this area seeks to highlight the opportunities that board games can offer in educational contexts[41]-[43]. A board game is employed because analogue games, in contrast to many digital-format games, offer greater openness and flexibility. The material nature of such games enables various forms of enjoyment that foster physical social interaction, facilitated by tangible components such as boards, cards, cubes, and 3D pieces, all of which contribute significantly to learning [44], [45]. Furthermore, board games are portable, low-cost products that are widely accessible to the general population [46], [47], without the need for video game consoles, screens, electrical connections, or internet access. This makes them an ideal choice for educational contexts due to the simplicity with which many of their game mechanics can be understood, alongside the enjoyment they generate without reliance on digital devices [48].

Increasingly, research highlights the cognitive and social benefits that commercial board games can offer [41], [43], [49], [50]. This growing interest has led to a practice in education known as Modding Games, where teachers adapt board games by altering certain mechanics, rules, components, and/or themes [51]. These adaptations fall under the category of serious games, as they shift the original entertainment purpose towards learning [51].

In the field of Physical Education, research and learning experiences across various educational levels have utilized adaptations of successful board games like *Magic: The Gathering, Virus!, Sushi Go, Timeline, Dixit, Catan, Monopoly,* and *Splendor*. These

adaptations address topics such as nutrition and healthy lifestyles [52], [53], design experiences for future PE teachers [54], [55], raise awareness about Sustainable Development Goals through body expression [56], and explore content related to physical fitness [57]-[59].

Additionally, custom-designed board games aimed at achieving specific educational objectives in various knowledge areas are noteworthy [41], [43]. These serious games are original creations, not based on existing games, making them complex to develop. Their creation requires mastery of specific game design mechanics and dynamics, the integration of intended content, and multiple testing phases to ensure they fulfil their educational purpose.

This article introduces *Docentis*, an analogue serious game specifically designed to simulate the role of a Physical Education teacher in a school setting, incorporating essential organizational and curricular elements for professional practice. This game differs from previous proposals explored within the domain of Physical Education, as it constitutes the sole example adopting a Eurogame-style board game format, characterised by its duration, its thematic simulation, mechanical complexity and strategic component, given the range of possible actions each player can take. The study was conducted with 27 students from the Physical Education specialization within the Primary Education Teaching degree program at University of Alcalá, including both bilingual (English-Spanish) and non-bilingual groups, who were enrolled in the "Didactics of Physical Education" course (4th year). The primary objective of the course, as outlined in the syllabus, is to guide and equip students with the necessary knowledge to teach Physical Education at the Primary Education level. The course aims to foster the development of critical thinking through reflection and well-founded reasoning. In this context, two of the specific competencies highlighted in the official document stress the importance of understanding the theoretical foundations of Physical Education didactics, with the goal of designing, planning, and creating coherent and tailored curricular proposals for the Primary Education sector. By the end of the course, students are expected to be able to:
- Understand the fundamental aspects required to deliver high-quality Physical Education in schools.
- Justify teaching projects by considering the personal and social characteristics of the classroom.
- Identify and understand the components of the Spanish Primary Education curriculum.
- Design and implement learning scenarios suitable for the various educational levels within this stage.

The objective of this research is to analyze the impact of implementing *Docentis* in the teaching and learning process with university students. The study evaluates its influence on academic performance, its utility in developing cognitive and non-cognitive skills (soft skills), as well as its effect on student motivation and its potential transferability to real educational contexts.

2. Docentis: Physical Education Through a Board Game

The serious game *Docentis* is presented in the form of a tabletop *eurogame*, a genre recognized for its diverse gameplay mechanics and high strategic component [60]. Such games prioritize the use of analytical skills and decision-making over luck or chance, fostering complex interaction between players[60]. *Docentis* was designed to be played by groups of 4 to 6 participants, with sessions typically lasting around 70 minutes.

Game Design and Validation Proccess

The design phase of *Docentis* was conceived as a research process, preceding its classroom implementation. For its design and development, which was the subject of study, the widely recognized Design Thinking methodology was adopted due to its iterative approach in creating innovative experiences and products [34]. In addition, specific theoretical frameworks from the game design field were incorporated, such as the MDA model (Mechanics, Dynamics, Aesthetics) [61], the elemental tetrad of design (Mechanics, Narrative, Aesthetics, Technology) [62], and the MMDE model (Mechanics, Mechanism, Dynamics, Experience) [63].

The design process included multiple instances of external evaluation to ensure its quality. First, six individuals took on the role of Critical Friends, providing constructive observations and feedback at various stages of the development [64], [65]. Additionally, an Expert Committee was formed, consisting of 29 professionals from diverse fields:The committee consisted of eight Spanish board game designers, who have collectively published over 20 games with various national and international publishers and have extensive experience in game design; a representative from a board game publisher with a portfolio of more than 10 released titles and considerable expertise in playtesting games intended for publication; eight seasoned gamers affiliated with associations, gaming communities, or content creators who showcase board game updates through social media and platforms such as YouTube, offering diverse insights into the industry; and 12 active physical education teachers, part of the faculty in numerous educator training programs, including four from primary education, four from secondary education, and four from University education. Their collective expertise contributed to enhancing both the pedagogical validity and the overall appeal of the design [66].

Before its final implementation, *Docentis* underwent a rigorous testing process, involving 30 test sessions with former students of the subject and some active teachers, who represented the game's target audience. The initial tests were guided, with the researcher assisting the players. Later, blind tests were conducted, where the game was simply left on the table, and the researcher merely observed what happened during the sessions. These tests helped identify areas for improvement and make necessary adjustments, ensuring that the final product not only met educational objectives but also offered an engaging and effective gaming experience. Although the theme never changed, modifications were made throughout the testing phases, resulting in adjustments to certain mechanics that prolonged the game and did not fully align with the chosen narrative. Other mechanics were introduced to enhance the immersion of the simulation within the school environment. Additionally, some components were redesigned based on these tests to improve the overall user experience. These sessions also served to analyse gameplay duration, the maximum number of cards, the initial energy levels, and the ideal number of players, among other factors.

Considerations and Decision-Making in Design and Production

Some of the considerations, limitations, and aspects to take into account in the design were as follows:

The selected game needed to reflect the complexity of a university-level subject. A filler-style card game, typically limited to two or three mechanics, was considered inadequate for effectively conveying the content and fostering immersion as a didactic resource for learning. Therefore, a Eurogame-style board game was developed, distinguishing itself from all previous proposals in the scientific literature related to studies in Physical Education. Moreover, the proposal deviated from other games that used the educational setting as a central thematic focus, incorporating elements of science fiction or fantasy (*Zombie Kidz Evolution, Colegio Encantado, Humanoides*).

In this case, realism was one of the main approaches of this simulation, with a theme concept similar to *Alma Mater,* a strategy eurogame about the academic management of a Renaissance university.

- The duration of the game was one of the limitations [62]. The game needed to be playable within a 90-minute period (the duration of a lesson), allowing it to be used as a resource during academic lessons. It was tested with a number of 4 to 6 players, with the time between turns and inter-turns being considered and timed across all tests. It was found that, in games with 6 players, the maximum duration was 70 minutes, with 5 players being the ideal number due to player interaction. The number of turns was determined by the theme of the game itself (school hours), incorporating a recess period during which movement was encouraged, generating an active break in the middle of the game to avoid sedentary behaviour.

- As *Docentis* is an educational game, it had to consider the prior experience and knowledge of the target audience. For this reason, the participants in the previous testing process had either been involved with the subject in previous years or were familiar with the theory present on the cards. Enjoyment and pleasure are perceived when individuals are in a state where there is a balance between the difficulty of the challenges they face and their skill or competence [67].Therefore, it is important to highlight that the expectations for completing the tasks in the game were adjusted to an achievable level of difficulty, providing opportunities for early success[68]. The game aims to challenge players without being boring or overly complex, seeking a state of flow where learning occurs [69]. In this way, it is intended that the process linking the game with learning contributes to generating positive experiences [70], while also helping to achieve better learning outcomes [71], [72].

- The type of components was adjusted to a limited budget, considering the possibility of greater future production. For this reason, a central board and an individual board for each player were used. Additionally, two sizes of cards were selected, with iconography to accommodate people with visual impairments such as colour blindness. The larger cards represented people, while the smaller ones represented the various curricular elements. Tokens of different colours and pieces that represented counters and resources on the board were also included. These components are accessible to any designer or individual and can be easily replaced, as they do not have a specific design [60].

- As "images narrate and also act" [73], it was decided that the illustrations would be created by an illustrator and not be royalty-free. This way, the personalities of the characters that would define the artistic style of the game could be showcased, reflecting the diversity of students and teachers who attend educational institutions daily (Figure 1). Convincing faces, with character, were designed to allow players to empathise with figures they could relate to, evoking memories of teachers and students they encountered during their own childhood. The illustrations were aimed at reflecting educational needs that would transport players back to the educational institutions where they had spent much of their lives. These characters were carefully chosen, not randomly. The opportunity was taken to address subject content through real diversity in body types, skin colours, ethnicities, and ages. Showcasing this globalised, multicultural society was essential.

Figure 1. Character card illustrations of *Docentis*

- The specific educational context of this game determined its mechanics and mechanisms [63]. Referring to the main objective and competences of the subject, which involves properly developing a good didactic plan and managing a Physical Education classroom in an educational setting, mechanics were incorporated that promoted interaction among players, decision-making and problem-solving through individual and group strategies (Figure 2). Furthermore, the inclusion of a mechanic that involved memory would support the integration of specific content from the subject. In order to design an effective curriculum, it is essential to consider the pedagogical models, content, didactic objectives, teaching styles, assessment tools, and types of assessment to ensure that the educational process meets the needs of all learners. The repetition and evocation of descriptions of the different curricular elements, represented by the game's cards, became two essential actions for consolidating knowledge, provided this is done consciously [68].
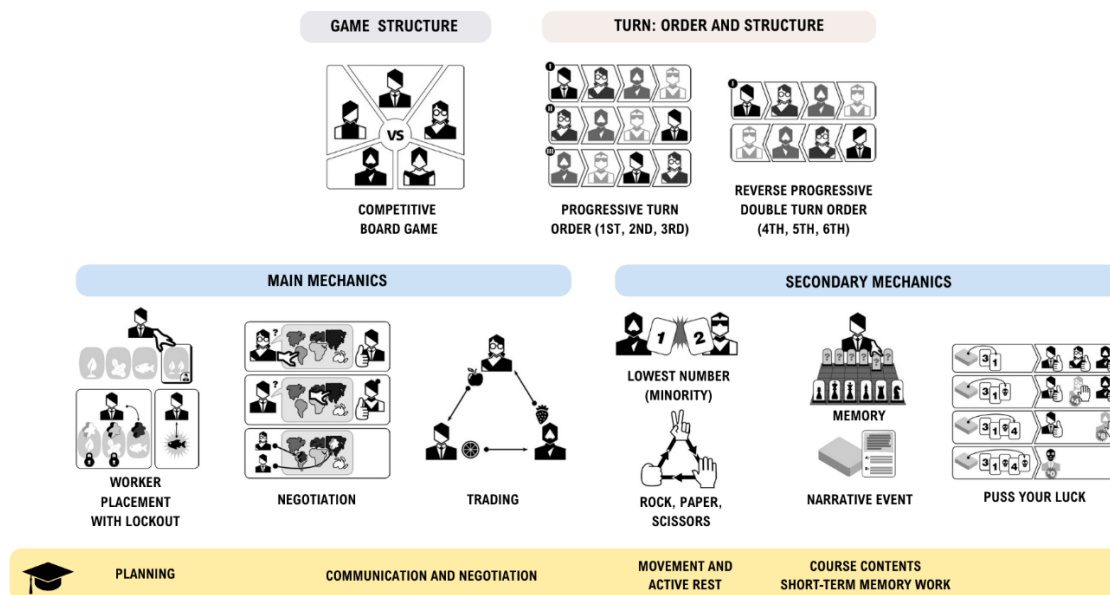

Figure 2. Simplified Diagram of Mechanics and Mechanisms Analysis in *Docentis*

Theme and Purpose of the Game

Players take on the role of teachers in the Physical Education department of an educational institution. During the game, they must plan a teaching proposal for a class aimed at primary school students from Year 1 to Year 6, incorporating all the necessary didactic and curricular elements for proper execution. To accomplish this, they need to take into account the distinct requirements of each class's students, the constraints presented by the environment and the available space, the theoretical insights necessary for effective intervention, and various unexpected occurrences that could happen during a school day, including damaged supplies, the weather conditions, occupied areas, substitutes, or responsibilities during recess.

The main objective for the players is to obtain the didactic elements they plan at the start of the game to develop the project. These elements grant Victory Points (VP), but players must acquire them without running out of Energy Points (EP) by the end of the day. Despite being a competitive game, creating synergies with other members of the Physical Education department will be necessary. Furthermore, the selfless help of student interns who join after recess will facilitate the achievement of objectives. The game unfolds in six turns, representing the school hours, with recess included. When the school day ends, the person who has collected the most elements from their originally planned project will be the winner of the game.

At the end of the day, the player who has gathered the highest number of the initially planned elements will be declared the winner. The elements collected in the final round will serve as the basis for the creation of a practical case that will be evaluated. Any elements that were not obtained during the game will be assigned randomly during the assessment. Winning players will be able to select an additional element that will assist them in completing the evaluable practical case.

Components

The game is centered around a main board, where all players interact (Figure 3). This board includes various locations that simulate the spaces of an educational institution, such as the staff room, sports courts, gymnasium, department office, storage room, and porch, among others. In each of these spaces, cards are placed that represent the different curricular elements required to design a project or learning situation in the field of Physical Education. These elements include key competencies, specific competencies, pedagogical models, basic knowledge, teaching styles, types of assessment, assessment tools, interdisciplinarity, active methodologies, etc. The front of each card displays the name of the element, while the back provides its description.

Figure 3. Deployment of the components of the *Docentis* board game.

In the game, each player manages a class using student cards and a project sheet, starting with 14 energy points. Players must select curricular elements to create an innovative project in Physical Education, acquiring them through the strategic use of their pawn on the board.

Elements are obtained by linking correct definitions, negotiating exchanges with other players, and managing events that impact energy and available actions (Figure 4).
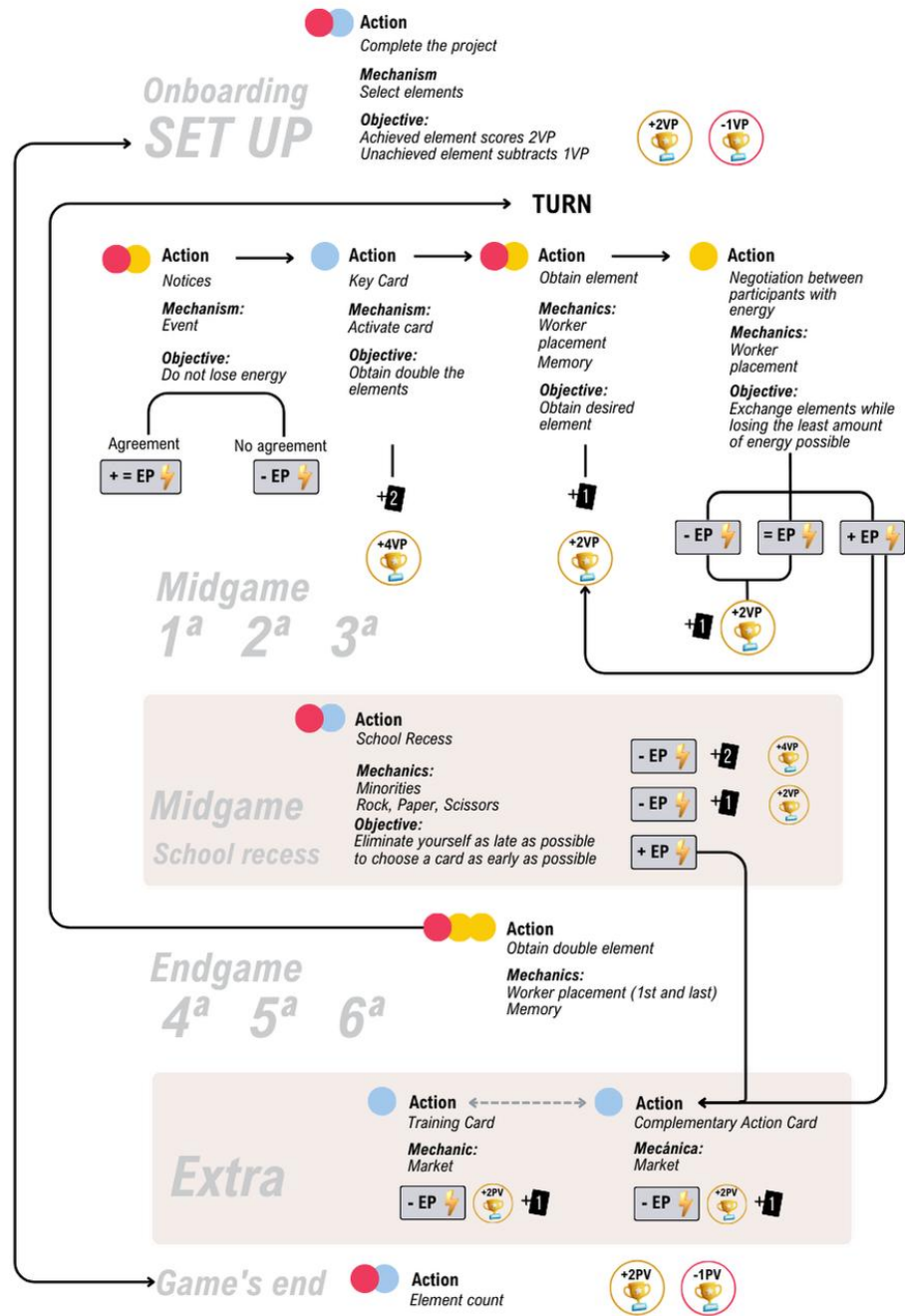

Figure 4. Simplified diagram of a turn's development in *Docentis*

Energy Points (EP), which fluctuates due to agreements between teachers, weather conditions, or events affecting the entire school staff, is crucial for continuing to play and can be converted into extra points. Each element acquired adds two points, while each mistake deducts one point. The winner will be the player who accumulates the most Victory Points (VP) at the end (Figure 5).

Figure 5. Video Tutorial: "How to Play *Docentis*"

Figure 6 provides a comprehensive summary that concludes the Design process of the board game *Docentis*, presenting a step-by-step account of how the final product was developed and highlighting the key characteristics that informed specific design decisions.
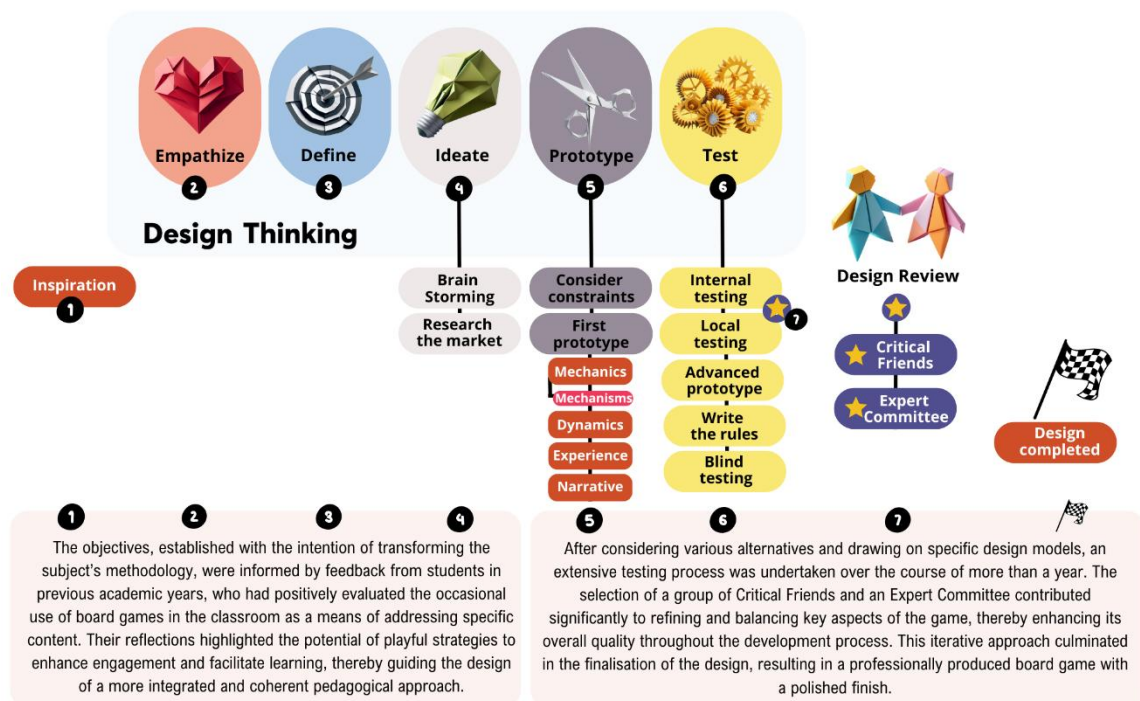

Figure 6. *Docentis*, step-by-step

3. Methods and Material

This research follows an experimental, longitudinal, descriptive-explanatory design, with the sample selected through convenience sampling [74]. The methodology employed adopts a mixed-methods approach, commonly used in the social sciences and particularly in education, due to the complexity of educational contexts [75]-[77].

Participants

The study included 18 students in the experimental group, who attended game sessions lasting approximately 70 minutes each. A control group of 9 participants, who did not attend the game sessions, also took part in the study. Inclusion criteria for the sample required students to be enrolled in the Physical Education specialisation of the Primary Education Teaching Degree, participate in the continuous assessment modality of the course "Didactics of Physical Education" and provide signed informed consent. Exclusion criteria included enrolment in the final assessment modality, non-attendance at the evaluation test, and failure to provide signed consent.

This research received approval from the Research Ethics Committee of the University of Alcalá, with a favourable report (CEID/2021/5/116).

Procedure

Participation was voluntary and took place outside regular academic hours, running concurrently with the course over a period of four months. To assess the impact of *Docentis* on academic performance, it was incorporated into the course evaluation, influencing a small percentage of a graded written practical task. The experimental group played *Docentis* once a month, while the control group did not participate in any game sessions throughout the course (Figure 7). Four permanent game groups were formed, each comprising 4 or 5 participants.

To ensure fair evaluation conditions for the practical task, a carefully structured design was implemented. For the experimental group, the practical task was based on curricular elements obtained during their last game session, with unknown elements excluded. Conversely, the control group worked with a previously known incomplete task. In both cases, missing elements were revealed on the day of the written test, ensuring balanced access to the necessary information for evaluation.

Figure 7. Different groups of students playing *Docentis* (2022)

Instruments

To assess the impact of the game on academic performance, the grades from the evaluable practical task were analysed, comparing the results of the experimental and control groups. The case study consisted of a single-task question requiring the design of a physical education session for a specified group. The prompt outlined the academic year group, learner characteristics, available material resources, prescribed teaching methodology, and key curricular elements to be addressed.

This quantitative data was complemented by qualitative information collected throughout the research. All game sessions were recorded and transcribed to examine the dynamics and

interactions among participants. Upon completion of the game, students completed a game diary providing immediate feedback on their experience. This reflective journal included a single prompt: Reflect carefully on the events that transpired during the game. Detail the moments and elements you consider most significant to your learning, with particular focus on the aspects that distinguished this session from those previously undertaken.

Prior to the evaluation test, two discussion groups were organised to exchange opinions and delve deeper into their perceptions of the teaching and learning process experienced. To guide these discussions, several questions were provided, focusing on topics such as the use of Game-Based Learning (GBL) in higher education, the role of the *Docentis* game as a didactic tool, and its potential for transfer from the game environment to real-world educational settings. As an example: Do you believe that board games can be useful tools for fostering learning in higher education?; Does Docentis serve as an educational resource that reflects the reality of an academic institution?; What key learnings have you derived from the gameplay sessions?. The diverse contributions from the participants led to the emergence of new themes and questions in each group. Finally, after the course was graded and during the final placement period before graduation, semi-structured interviews were conducted to explore the connections and learning outcomes derived from the *Docentis* experience in real educational contexts. The interview questions aimed to draw parallels between the experiences within the game and the participants' real-life teaching environments, exploring themes such as teacher-student dynamics and the influence of teacher energy throughout the school day, among others.

Data Analysis

The statistical analysis of grades was conducted using IBM SPSS Statistics software (v.29.0), employing tests such as the Student's t-test, the Shapiro-Wilk test, and Hedges' g to identify differences between the grades of the experimental and control groups.

For the qualitative data gathered from session transcripts, game diaries, and semi-structured interviews, thematic analysis was used to identify patterns of meaning in the data [78]. Atlas.ti (v. 9.0) content analysis software facilitated this process, refining codes to identify the following themes: (1) The current state of the university teaching and learning process, (2) student motivation for learning through play, (3) the role of games as a transformative educational tool, and (4) the impact of *Docentis* on academic performance and the development of essential cognitive and non-cognitive skills for professional practice.

4. Results

Building on the previous explanation, this study conducted two primary analyses. The first examines the impact of *Docentis* on academic performance, based on the grades obtained in an assessable practical task, while the second explores students' perceptions, reflections, and opinions regarding the teaching and learning process they experienced. The subsequent section will provide a detailed account of these analyses and their corresponding findings.

Academic Performance

The Student's t-test revealed significant differences between the groups ($p = 0.036$), and the Hedges' g test indicated a large effect ($g = 1.131$), highlighting the impact of the *Docentis* game on the performance of the experimental group compared to the control group (Table 1).

**Table 1.** Grades of the Experimental Group and Control Group

	N	HIGH-GOOD		MEDIUM			LOW-FAILING			P-value	Effect Size
		> = 9	8,9 - 8,1	7,6 - 8,0	7,5	7,4 - 7,0	6,9 - 5,1	= 5	0 - 5		
Total participants	**27**	9	7	3	3	0	4	1	0	0,036	1,131
Participants who did not play *Docentis*	9	2	1	1	1	0	3	1	0		
Participants who played *Docentis*	18	7	6	2	2	0	1	0	0		

Note: p < 0.05. Effect size > 0.8

The average grade for the practical task among participants who played the game was 8.56 out of 10 points (SD=0.83), compared to 7.31 out of 10 points (SD=1.45) for those who did not participate. This analysis (Figure 8) indicates that the group that engaged with the game improved their score by 1.2 points on the practical task.
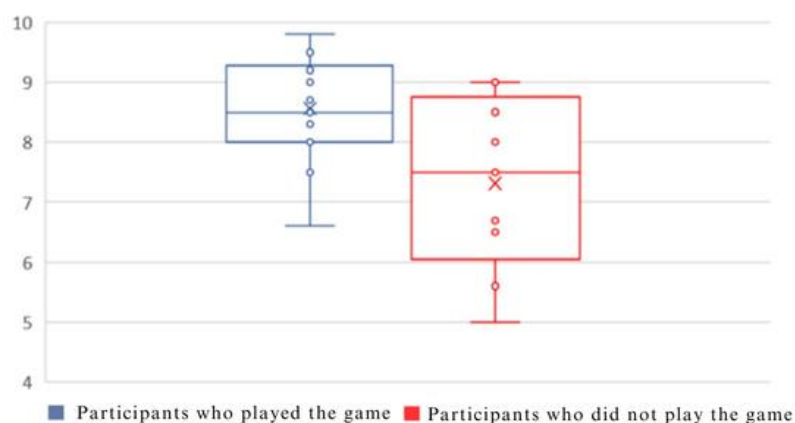
Figure 8. Grade distribution of both groups

Outstanding grades were more frequent in the experimental group (38.89%) compared to the control group (22.22%). Notably, no students failed the practical test, nor did anyone achieve the maximum score. However, 94.44% of the experimental group attained a grade from "High" to "Medium" (>7.5 out of 10 points), compared to 55.55% in the control group (Figure 9).
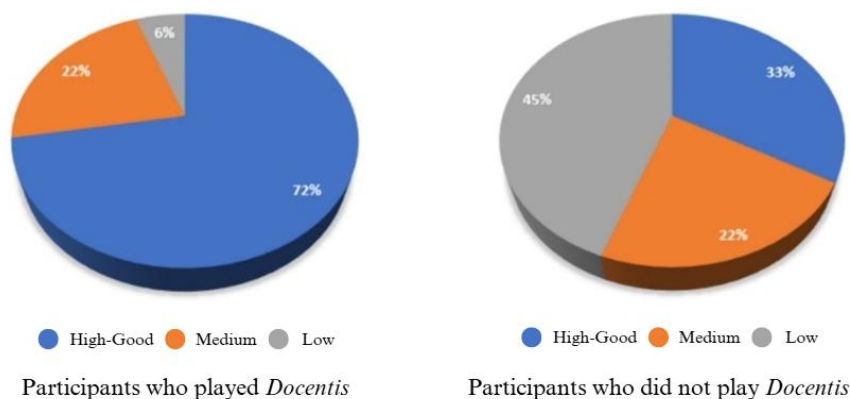
Figure 9. Percentage of grades by groups

Student Experience: The voice of the players

At this stage, the categories and themes identified through the analysis of game diaries, discussion groups, and semi-structured interviews are presented (Table 2). Subsequently, a selection of verbatim excerpts from participants (Player No.) is provided, as these are considered both relevant and representative of the perspectives expressed.

Table 2. Codes and Themes Identified in the Research

CODES / TAGS	ORGANIZATION OF TOPICS	FINAL TOPICS
1. The educational system 2. The role of the teaching staff 3. The role of the students 4. Methodology and resources	• The teaching and learning process in university classrooms	**The current state of the university teaching and learning process**
5. Playful methodologies: Board games 6. The relationship with the teaching staff 7. Participation in research	• Playful learning as an element of educational transformation • Student motivation	**Student motivation for learning through play**
8. The emotional factor (Docentis) 9. The evaluation process (Docentis) 10. Conscious learning (Docentis) 11. Unconscious learning (Docentis) 12. Cognitive processes (Docentis)	• Learning experiences with Docentis • Connection of Docentis with the professional field	**The impact of *Docentis* as a transformative educational tool**
13. Relationships and behaviors (Docentis) 14. Future career prospects (Docentis) 15. Competencies and skills of the teaching staff (Docentis)	• Connection between fiction and reality • Simulation	

a) The current state of the university teaching and learning process

Concerning pedagogical approaches, participant testimonies reveal significant concerns. As P14 notes: *"I've zoned out many times in class because of how the lessons were taught or the tone of voice, and I've missed 15 or 20 minutes because what was being said didn't engage me [...] or how it was being delivered."* This sentiment is echoed by P4, who observes: *"I'd dare say that, eighty percent of the time, the lecturer comes in, reads the slides to us, and leaves—that's the reality. They assign us group work, and that's it [...] sometimes you don't even have to present it."* Such practices demonstrably affect learner motivation, as articulated by P8: *"If I think about it, there are very few modules in the degree where you actually feel like attending lectures. Maybe the practical ones, because you think 'at least you do things you can't do at home,' and you feel the classes serve a purpose [...] but with most of them, if attendance weren't graded, you wouldn't go—I swear [...]."* The tools used in teaching also attract criticism. P11 suggests: *"PowerPoint seems like the only option, but it's not. Classes can be conducted in other ways, not just by reading slides, for example, by understanding things through a board game like this."*

b) Student motivation for learning through play

Relevant testimonies highlight the potential of playful learning in higher education. For instance, P13 states: *"Incorporating play into higher education is novel and engaging. These are different kinds of classes where you learn more than you'd expect."* In this sense, P7 points out: *"One might think that if you play and have fun at university, you're wasting time, but this is an example that proves it's not. Playing is very serious."*. Further reinforcing this perspective, P5 remarks: *"People assume play is only for children, but that isn't true. Adults play too, and we can learn through play."* Extending this critique, P7 adds: *"Occasionally, we're told we can use tools like games with our students or active methodologies such as Game-Based Learning—yet the university fails to lead by example."* Similarly, P5 argues that: *"When I heard that the research involved a board game, I wanted to participate – who doesn't like to play?"*

Following P12's perspective: *"Incorporating games in every session is unnecessary, as this would render them routine and potentially reduce their magic. Nevertheless, they can serve as an effective catalyst when introduced within more traditional teaching frameworks."*

c) The impact of *Docentis* as a transformative educational tool

Concerning Docentis, testimonies can be examined that analyse the various gameplay sessions in relation to the distinct dynamics engendered by the game mechanics. One example is that of P4, who highlights the need for initial planning: *"Every game is different because the course and the students you have are different, so you have to think of an educational proposal that is coherent and the strategy you want to follow in each round."* On this point, P8 notes that the gameplay cannot be predicted and requires decision-making: *"Turns go quickly, so you have to anticipate, and if they take a card from you, you need to think about when the best moment to make an exchange is."* Several students also emphasise the strategic component, as exemplified by P12's statement: *"It's not the same to lose energy and get a card as it is to not lose it and get two. You must think and decide carefully,"* and the testimony of P11: *"I picked the elements where I matched with my teammates at the beginning. This way, in the final turns, I could gain energy from an exchange and score points. It worked well for me."*

A testimony like that of P5 illustrates how some of the mechanics and dynamics of *Docentis* required memorisation processes: *"You had to remember the cards the others had to make exchanges. Some helped and shared what they had, but others didn't. It was difficult."* Additionally, there was a process of information retrieval through the recognition of concepts and definitions, as reflected in P5's words: *"I recognised many cards because we had seen them before in class. If I was unsure, I asked for help so I wouldn't lose energy. There, I was aware of what I knew… it was sort of like a self-assessment."*

In line with this, statements such as those of P7 and P9 indicate that repetition proved beneficial during gameplay: *"There are pedagogical models that you end up learning by seeing them all the time on the cards. It was a way of studying while playing"* (P7); *"I feel that the more you play, the more you learn. [...] I think we should have played many more games"* (P9).

Furthermore, several testimonies from the gamers link the development of some soft skills, such as critical thinking and emotional self-regulation: *"Teaching is not easy. This is a simulation of situations that occur in a school, in addition to having some of the knowledge you need to know. It's nice, but also a bit overwhelming"* (P8); planning: *"The game helped me organize myself better. I think we are often unaware of how many things we need to consider as teachers, and here you can really see it"* (P4); teamwork and strategic thinking: *"In the first game, I didn't trust people and was selfish because I wanted to win and didn't care about sabotaging. And I didn't win! In the second game, I decided to collaborate and not go solo, and I almost won"* (P15); adapting to changes: *"Things happen very quickly, you need to make the most of the key cards and positive events, always [...] If something doesn't go as planned, you need to have a plan B to avoid losing your turn"* (P13).

Is also evident in the responses shared during their practicum in schools, where they comparing the simulation played with a real educational environment. P12's words highlight the importance of communication and negotiation: *"The conversations that arise in Docentis are like those in my school staff room. Some teachers help each other because they get along, others only speak if they need something, and some don't speak at all."* Similarly, P9's words stress the importance of creativity in teaching: *"Every day I'm allowed to teach, I can do the same thing or get creative. I really worked on the practical scenario from the game, and every day I try to come up with new ideas."* P11, for their part, refers to resilience and adaptability to change: *"It's not easy because you have to consider the students, the weather, the spaces, everything! In school, you must adapt and do the best you can. There are no points there, it's real."*

5. Discussion

These findings confirm that *Docentis* plays a significant role in enhancing students' learning outcomes. A comparison of exam results between students who engaged with the game and those who did not reveals notable differences, highlighting its effectiveness in supporting the development and assessment of competencies, skills, and knowledge throughout the course. These results align with previous research demonstrating the positive impact of board games on academic performance [59], [79], [80].

Student testimonies reveal that motivation and engagement of university students have been diminished, among other factors, by the traditional methodological approaches often employed by instructors in the classroom [81]. For this reason, for learning to occur, it is important to actively engage students in the classroom [68]. The incorporation of Game-Based Learning through a serious game such as Docentis aligns with scientific evidence suggesting that board games are highly motivating for learners, while also engaging cognitive processes that guide thoughts and actions when dealing with complex or novel situations, referred to as executive functions [82], [83]. These functions encompass planning, cognitive flexibility, continuous decision-making, and problem- solving [84]-[86]. Such evidence demonstrates that integrating serious games like *Docentis* can enhance the acquisition of deep learning [87]-[90].

Similarly, it has been shown that board games also promote the improvement of working memory through the updating or manipulation of information [82], [91], [92]. The implementation of this game-based resource as a pedagogical supplement has facilitated the recurrent reinforcement of subject matter through structured gameplay at strategic mensual intervals. This spaced recall over time helps consolidate knowledge, leading to more durable learning and promoting future transfer [93]-[95]. In line with this, repetition is crucial for knowledge retention, provided it is done consciously [68] Many testimonies highlight how reading the in-game descriptions of curricular elements helped participants internalise content more effectively. These testimonies align with how games make repetition engaging [54].

On the other hand, several testimonies from gamers associate their participation with the development of certain soft skills, such as critical thinking, emotional self-regulation, planning, teamwork, strategic thinking, and adaptability. These competencies are included in various internationally recognised models[14]. The development of these soft skills is also evident in the responses shared during their practicum, where they transferred the resource to new contexts and situations [96], [97], comparing the simulation played with a real educational environment. In this way, the opportunity to create games in a safe environment that mimics real situations without the negative consequences they could have in real life highlights the potential of these games [47], [98].

The inclusion of active methodologies represents a complete break from what university students are used to experiencing in their classrooms [27]. Play-based methodologies should seek a balance that demonstrates the transfer of learning while still using attractive, fun, and entertaining resources [99], [100]. For this reason, incorporating a board game is motivating for students, as has been the case in other similar experiences [43], [56], [101], [102].

Docentis represents the first Eurogame-style board game specifically designed to address a subject within a university course for Physical Education teacher training, incorporating it as both a teaching resource and an assessment tool. The mechanical complexity of the game has fostered the development of competencies that do not emerge in other types of experiences with serious board or card games.

6. Conclusions

The implementation of *Docentis* not only met the didactic objectives of the course on Physical Education Didactics within the Primary Education Teaching Degree but also enhanced students' academic performance. This board game, designed as a simulation of the teaching environment, facilitated reflection on the organizational and curricular elements essential for delivering high-quality Physical Education in schools. Additionally, it stood out as a motivational tool that promoted the development of executive functions such as planning, flexibility, and problem-solving, as well as essential soft skills like communication and adaptability, supporting their transfer to professional contexts.

However, despite the positive outcomes, it is important to acknowledge the imbalance in group sizes and the voluntary participation of students, which may have attracted the most engaged individuals. These findings highlight the potential and suitability of such resources and methodologies in higher education, providing a foundation for future research aimed at generalizing the results.

A possible avenue for future research could focus on the creation of dedicated spaces for playing and a lending system for *Docentis*, allowing students to play in their free time or even take the game home. Additionally, the implementation of a digital version of the game through the *Tabletop Simulator* tool (TTS, available on Steam Platform) could be explored. This would enable a comparison between physical and digital gameplay experiences, analysing new parameters such as social interaction and the emotional impact of each format.

However, that lecturers intending to implement such proposals possess a solid familiarity with modern board games. An understanding of the challenges faced by students who are not regular players is crucial to ensuring an inclusive and effective learning experience. To this end, it is advisable for educators to engage with a variety of games beforehand, gaining first-hand insight into their mechanics and dynamics. Furthermore, adapting existing commercially available games—particularly those with proven mechanical soundness—may serve as a more accessible and pedagogically sound starting point before developing entirely new resources with greater complexity for integration into classroom settings. Lecturers are encouraged to refer to different established models that guide game design, bearing in mind that these are long-term processes whose outcomes may vary depending on the decisions made throughout development. It is also crucial that any Serious Game developed undergoes multiple stages of design, including external analysis by a group of experts and numerous rounds of playtesting prior to classroom implementation. This ensures that the designed board game is not only engaging and fun, but also aligns with the intended learning objectives.

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Conflicts of interest

There are no conflicts of interest.

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