From Consoles to Classrooms: Preliminary Insights About Pre-Service Teachers and Video Games

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Abstract: Integrating video games into the classroom is a promising way to enhance learning experiences, as the market of serious games is expanding. European schools are investing in digital equipment, and the use of educational video games is technologically viable. Nonetheless, actual experiences of video games in class are still rare. A key gap to be explored is understanding how pre-service secondary teachers perceive and are prepared to use digital games in their future classrooms. Do they think it would enhance their teaching and their students' learning? Do they feel prepared for it? To answer these questions, and possibly address future challenges, we conducted a comprehensive study with students at Zurich University of Teacher Education (PHZH). The research process began with the development and testing of a detailed questionnaire that focused on participants' personal gaming behaviour, preferences, and perceptions of the educational potential of video games. Key areas such as serious games, game design, gamification, game-based learning, and game culture were explored to assess the relevance and understanding of these concepts in an educational context. This paper explains the development and structure of the questionnaire as a measurement instrument as well as the underlying literature and methodological considerations. The first implementation and the preliminary survey with 48 PHZH students are presented, and the practicability and reliability of the questionnaire are evaluated. The result of the survey suggests pre-service teachers are generally positive about integrating video games and game design into the classroom, yet enthusiasm is not enough without additional support.

Keywords: Game Studies, Video Games, Primary and Secondary Education, Pre-Service Teachers, Game-based Learning

1. Introduction

In recent years, integrating digital technologies into education has become increasingly important as students must be equipped with the necessary skills to succeed in a digitally oriented world (Digital Competence Framework, 2021). This trend is particularly evident in expanding the market for serious games - video games developed explicitly for educational purposes (Statista, 2021). Video games have shown significant potential to increase student engagement, promote critical thinking and improve learning outcomes in various subjects. Research indicates that serious games can boost students' motivation and engagement, making the learning process more interactive and enjoyable. For example, the study by Arias-Calderón, Castro, and Gayol (2022) showed that 90.8% of students found serious games to be effective in improving their learning experience, while 87.9% stated that these games increased their motivation to study theoretical content. In addition, the literature review by Videnovik et al. (2023) has shown that game-based learning promotes critical thinking and collaboration by allowing students to apply their knowledge in practical, real-world contexts.

Despite the technological advancement and availability of educational games, their actual use in the classroom is still relatively limited. A systematic review of empirical studies by Oyelere et al. (2020) showed that this is partly due to the challenges associated with aligning game content with educational objectives and the need for more comprehensive integration strategies. Another critical evaluation of smart classrooms and the use of new technologies by Dimitriadou and Lanitis (2023) reveals that while many tools exist to improve student engagement, the actual implementation of these technologies faces several hurdles. These include inadequate teacher training, lack of resources and the complexity of integrating new technologies into existing curricula.

This discrepancy highlights the need to explore the factors that influence the use of digital games in the classroom. One crucial aspect is understanding the perceptions and readiness of pre-service teachers who will soon be at the forefront of educational innovation. Their attitudes towards digital games and their willingness to incorporate these tools into their teaching practices are critical to the successful integration of game-based learning (Meccawy, 2023). To find out more about this target group, this paper will tackle the following research question: "How do Swiss pre-service teachers perceive the opportunity to use video games in the classroom?"

This paper details the questionnaire's development and structure as a measurement tool, including the underlying literature and methodological considerations in Section 2. The selection and formulation of the questions as well as the theoretical framework on which the development of the questionnaire was based are discussed in Section 3. Following this detailed explanation, the first implementation and preliminary survey with a group of 48 PHZH students is presented in Section 4 and discussed in Section 5. This first test phase serves to evaluate the practicability and reliability of the questionnaire.

2. Literature Review

The origins of video games date back to the 1950s, with the first commercially successful video game, “Pong”, being released in 1972 (Kent, 2001). Since then, video games have evolved from simple arcade machines to complex interactive media encompassing a wide range of genres and game mechanics. In parallel with content innovation, technological advances have led to smaller and more powerful devices, making video games more accessible. In particular, the development of mobile tablets and affordable laptops has significantly lowered the physical and economic barrier to accessing video games. This accessibility increasingly allows schools to integrate video games as a teaching tool without having to rely on a computer lab, for example, which often has limited use and can be a major administrative burden.

Scientific studies show that the use of video games in an educational context can have a positive impact on students' learning and motivation. A meta-analysis examining the effects of digital games in STEM (Science, Technology, Engineering, Mathematics) showed significant learning effects in students who used digital games as a learning aid compared to those who used traditional teaching methods (Wang et al. 2022). Another study suggests that integrating games into the classroom can lead to increased student engagement and improved understanding of complex topics. In particular, games that emphasise active participation and problem orientation were found to be particularly effective in enhancing the learning process (Vlachopoulos and Makri 2017). However, results vary depending on the design of the game, the way it is integrated into the curriculum and the role of the teacher in using the games as a pedagogical tool. Games that are well integrated into the course and actively accompanied by teachers show the best learning effects. It is also important that the games are tailored to the specific learning objectives and educational level of the students (Vlachopoulos and Makri 2017; Smiderle et al. 2020). Overall, research confirms the potential of video games as effective teaching tools that, when used correctly, can increase motivation to learn and support the achievement of learning objectives.

Video games in the classroom can help to develop the subject-specific and interdisciplinary skills required by the curriculum. They promote critical thinking, problem-solving skills and collaboration. According to Curriculum 21 (D-EDK 2016), which is used in most parts of Switzerland, students should, for example, use games for research and learning support. The application competence, which is valid for all three school cycles (ages 7 - 16), reads as follows: “Pupils can use given media to learn and obtain information on a given topic (e.g. book, magazine, educational game, story, website).”.

The cross-references to the subjects German, media education, and informatics and STEM indicate that games can and should also be used in a wide variety of subject areas. A second application goal appeals to students' independence in selecting media for learning. “Pupils can independently select and use media for their own learning process (e.g. non-fiction book, magazine, RSS feed, social networks, e-book, subject-related software)”[1].

In today's world, where video games often play a central role in young people's everyday lives, it is obvious that schools should consider them as a learning medium and demonstrate the possibilities and limitations.

The Dagstuhl Triangle (Brinda et al. 1985), a framework for evaluating and designing educational technologies, emphasises the interplay of three critical perspectives: a technical, a socio-cultural, and an application-oriented perspective. When applying the Dagstuhl Triangle to the use of games in the classroom, it is important to ensure that each of these components is carefully balanced and integrated, see Figure 1.

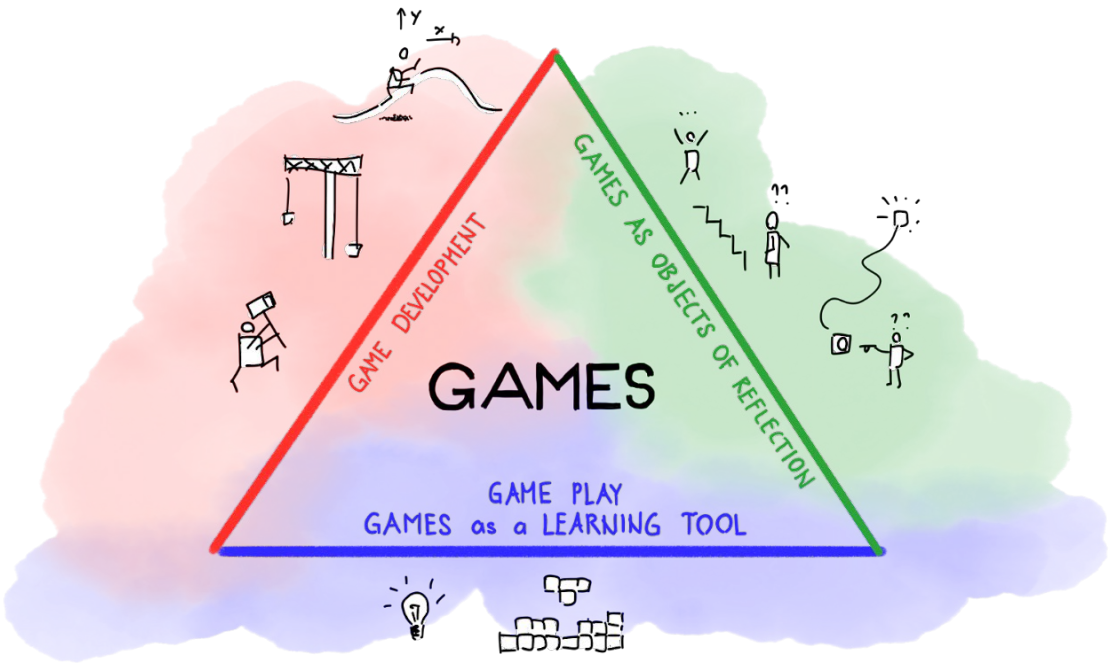

Figure 1: The Dagstuhl triangle can be used to combine games in education with different perspectives. Own illustration.

Game Development: This perspective involves students creating games, enhancing their skills in programming, design, and critical thinking (Clark et al., 2016)

Games as Objects of Reflection: Here, games are used to stimulate discussion and analysis, fostering critical thinking and deeper understanding (Boyle et al., 2016). This could include the media-psychological effects of games on young people, trends, and new developments that influence us as a society.

Games as Learning Tools: This involves using games to directly teach specific content, promoting engagement and retention (Plass et al. 2015).
Numerous research findings support the assumption that early exposure to digital games is associated with more positive attitudes towards these games in an educational setting. For example, research shows that teachers who played digital games in their childhood not only have a more positive attitude towards games today, but also have greater knowledge in this area. This positive correlation was highlighted in the work of Pozo et al. (2021).

Furthermore, this extensive knowledge of games often leads to a more nuanced understanding of their potential learning benefits, which is not readily apparent to those with less gaming experience. Studies by Sánchez-Mena et al. (2017, 2019) support this idea by showing a positive correlation between the frequency of game use by teachers and their positive assessment of the educational value of games.

Studies by Bourgonjon et al. (2013) and de Grove et al. (2012) also agree with these findings and show similar trends in teachers' intentions to use digital games educationally. The accessibility and thematic relevance of games are cited as the main reasons for their use in educational contexts, as a study by Belda-Medina and Calvo-Ferrer (2022) shows. They found that a wide range of games are used by teachers, suggesting that the choice of games does not necessarily depend on specific pedagogical skills, but rather on perceived ease of use and thematic fit with curricular objectives. This is also supported by Alberola-Mulet et al. (2021), who points out that while teachers see the potential of using digital games for learning, they also recognize significant challenges in effectively integrating these tools into the curriculum.

Our past research revealed several important findings about in-service primary teachers' perceptions and use of digital games in the classroom (Spieler and Degonda, 2022). Teachers associated both positive and negative aspects with games. On the positive side, they noted the usefulness of games for practising learning content, individualising lessons and introducing fun and innovative elements. Gamification and competitive aspects were seen as motivating factors. However, negative perceptions included the effort required to use games, the risk of

them being seen as time wasters and the potential to isolate students. Teachers also reported that games are a pervasive topic at break times and during free time. These findings suggest that targeted teacher training is needed to better integrate digital games into the educational environment and eliminate existing stereotypes and misconceptions.

3. Study Design

To understand the perception of pre-service teachers regarding the use of video games in the classroom, whether they believe it would improve their teaching and their students' learning, as well as if they feel prepared for it during their future classes, we designed and administered a questionnaire during the Spring Semester 2024.

We designed the questionnaire in a digital format with Survalyzer[1] to be completed online, ensuring accessibility and ease of data collection. The questionnaire presented a set of close-ended questions, with the exception of a final open-ended space for comments on the survey and was divided into three categories. The first category presented an introductory set of questions regarding data about the participants, such as gender and age. The following two categories presented Likert-scale questions to assess students' perceptions on a five-point scale from "strongly disagree" to "strongly agree". In particular, the second category of questions regarded the perception of participants on the possibility to learn while playing, while the third category focused on game design in the classroom. The questionnaire was designed to be anonymous, with no personal identifiers collected to maintain participants' confidentiality. Participation was voluntary.

The design of the questionnaire was based on the survey presented in Rüth et al. (2022), where multiple regression analyses were applied to investigate how the individual traits of pre-service teachers influence their plans to incorporate digital games in educational settings. The questionnaire identifies perceived usefulness and curriculum relatedness of video games as important factors for pre-service teachers' intention to teach with them. We applied the same multiple regression analyses approach used in Rüth et al., while adapting their questionnaire for the Swiss educational context and shortening it from the original 23 questions with 87 items to 12 questions with 46 items.

In the Swiss Curriculum 21 (D-EDK 2016), active media work, i.e., creating digital products and exploring programming skills, is becoming increasingly important. For this reason, it makes sense not only to use games as a learning tool and occasion for reflection, but also to create games on your own. Our questionnaire was thus supplemented with three questions of three items each on attitudes to game design at school. These were based on the content of the previous questions and collected data on the following topics:

- Perceived usefulness of game design in the classroom
- Perceived user-friendliness of game design for teachers
- Perceived user-friendliness for pupils

The questionnaire was pre-tested in advance with three students from the PHZH. In addition to minor shortcomings, it was also pointed out during this test that negatively worded items could be confusing. The two items to which this applied were reformulated. It was also noted that video games in the school context may only be understood as software that has been developed for teaching. For this reason, a brief definition of what is meant by and considered as video games was included in the introduction.

The students at PHZH who completed the survey are in their 8th semester and usually complete their studies in the following semester. The students surveyed have selected media education and informatics (MI) as an elective area and must obtain 18 ECTS credits in this area. Particularly noteworthy is the 7th semester, in which the Scratch programming language, and game design approaches were addressed in several module courses. These included a course dedicated to (paper) prototyping and several inputs on typical mechanics that are used in games and can be recreated with Scratch. As proof of performance, the students had to develop and implement a game idea with individual students within two double lessons. The topic of games was thus examined intensively from the perspective of game design. The perspective of using games as a learning tool in

[1] https://survalyzer.com/

the classroom was not actively addressed. We gathered 48 answers out of a total administration of 55 students during a self-organised phase of a module as a task.

4. Findings

Part 1 of the survey gathered general data about the population sampled and their experience with video games. The sampled population had an average of 28 years old, with 17 participants describing themselves as female, and 31 as male. On average, the surveyed population plays video games for 3-4 hours a week, while they used to play 11-12 hours a week when they were 15 years old. About 71% of the sampled population does not describe themselves as gamers, 61% does not think they play more video games than other people, about 45% mention they play different kinds of video games, 52% admits they don't play video games often, while 68% admits they like to play video games.

Part 2 of the survey was focused on their perception of the possibilities to learn by playing video games. The following tables presented in this Section show internal consistency, mean (standard deviation) and results of the one sample t-tests for the scales of the regression models' dependent variables. The one-sample t-tests were always computed to examine whether means differ from the scale's midpoint of 3.

Scale	α	M (SD)	t	p	d
Perceived benefits of games in the classroom ("By using games in the classroom, I can teach better.", "By using games in the classroom, I can teach students more.", "Using games in the classroom improves my effectiveness as a teacher.", "I find the use of games in lessons useful.")	0.84	3.24 (0.65)	t(44) 2.52	0.015	0.37
Perceived ease of use of video games for teachers ("The use of games in the classroom is clear and understandable to me.", "For me, interacting with games in class doesn't require much mental effort.", "I find it easy to use games in the classroom.", "I find it easy to use games in the classroom the way I intend to.")	0.83	2.84 (0.74)	t(37) -1.13	0.202	-0.21
Perceived user-friendliness of the use of video games for students ("The use of games in the classroom is clear and understandable for students.", "Interacting with games in class doesn't require much mental effort for students.", "Students find it easy to use games in class.", "Students find it easy to use games in class the way they intend.")	0.60	3.03 (0.58)	t(37) 0.41	0.68	0.067

Table 1: Perceived benefits and ease of use for teachers, perceived user-friendliness for students.

Table 1 shows the perceived benefits, perceived ease of use for teachers, and perceived user friendliness for students of video games. The degrees of freedom for the t-statistic varies from scale to scale, as not all the participants answered all the questions. Table 2 shows the results for the scale related to reputation.

Scale	α	M (SD)	t	p	d
Assumptions about the reputation of other people through the use of video games in the classroom ("People who have an influence on my behaviour think that I should use games in class.", "People who are important to me think that I should use games in the classroom.", "I think that the school management would support me in using games in the classroom.", "I think that the school management would generally support the use of games in lessons.")	0.76	3.13 (0.63)	t(28) 1.08	0.28	0.20
Reputation of teachers who use games in the classroom ("Teachers who use games in lessons are more highly regarded at school than teachers who do not use games in lessons.", "Teachers who use games in the classroom are well known.", "Using games in the classroom is a status symbol for teachers.")	0.45	2.92 (0.58)	t(34) -0.77	0.44	-0.13

Table 2: Teachers' assumptions about their reputation, or other teachers' reputation, in using video games in class.

Table 3 shows the results for the scale related to relevance for teachers to use video games in the classroom, their belief regarding the results of using video games in the classroom, and their subjective perception on the use of video games in class.

Scale	α	M (SD)	t	p	d
Relevance of video games for teachers in the classroom ("The use of games in the classroom is important in the teaching profession.", "The use of games in the classroom is relevant in the teaching profession.", "The use of games in the classroom is relevant for the various tasks in the teaching profession.")	0.78	3.17 (0.66)	t(43) 1.73	0.089	0.26
Conviction of results ("I have no difficulty telling other people about the results of using games in the classroom.", "I think I could teach other people about the effects of using games in the classroom.", "The results of using games in the classroom are obvious to me.")	0.76	3.30 (0.73)	t(42) 2.67	0.010	0.40
Subjective perception of using video games in the classroom ("I find it entertaining to use games in the classroom.", "The actual process of using games in the classroom is gratifying.", "I enjoy using games in the classroom.")	0.83	3.89 (0.51)	t(40) 11.15	< 0.001	1.74

Table 3: Relevance of video games in class for teachers, their belief on the results achieved, and subjective perception of the use of video games in class.

Figure 2 and Figure 3 show how in-training teachers replied to items of the questionnaire related to what opportunities video games offer, and how they could use a video game in class.

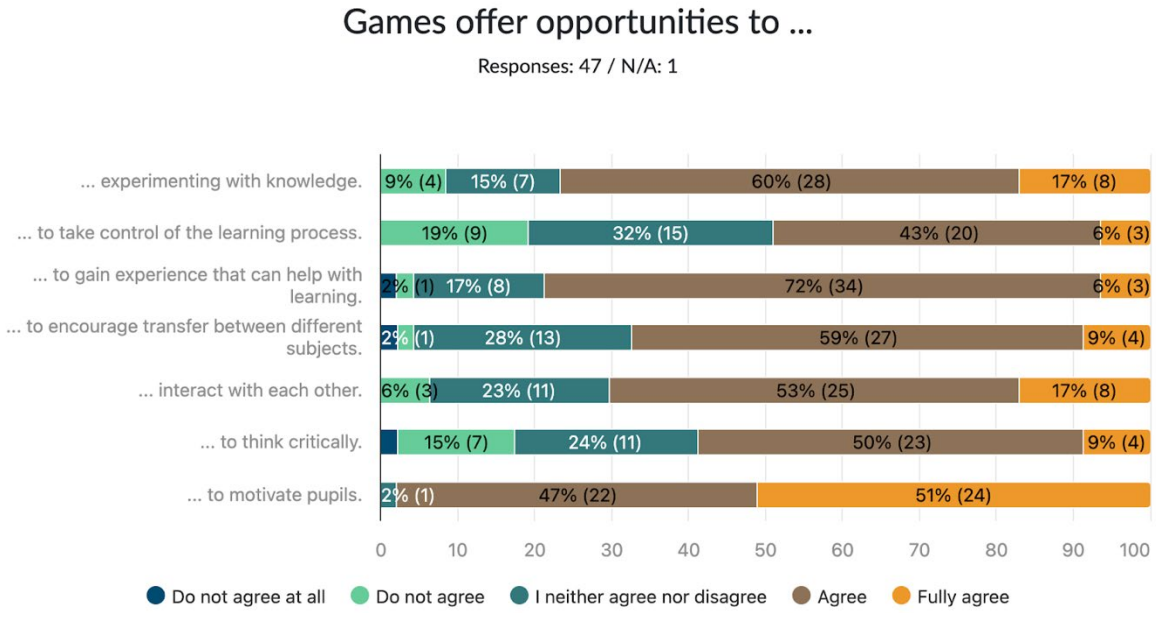

Figure 2: Visual representation of the results of the question on opportunities offered by video games.

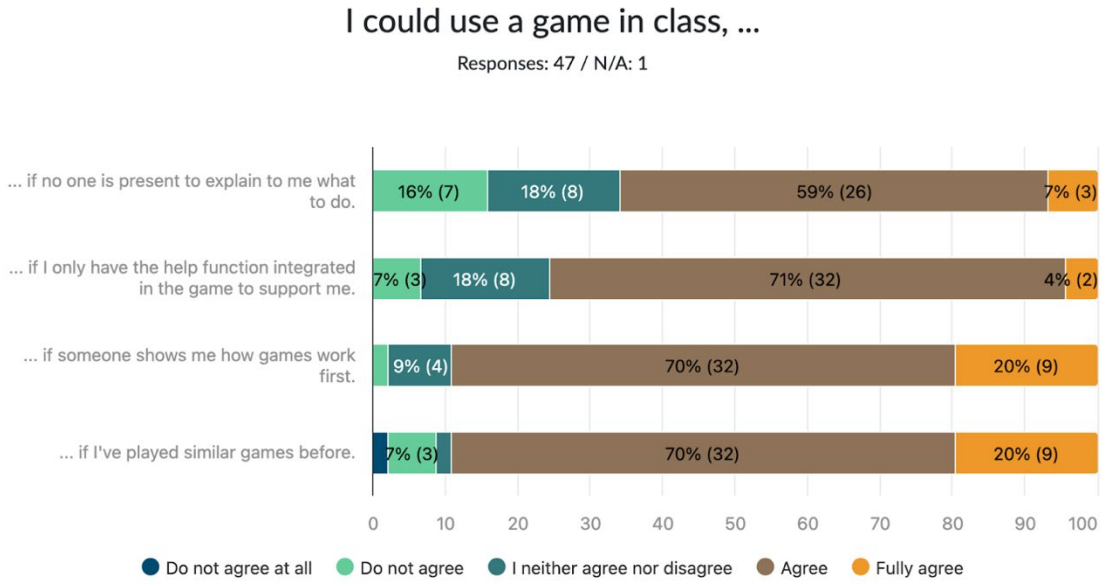

Figure 3: Visual representation of the results of the question on how pre-service teachers think they could use video games in class.

Part 3 was focused on the intention and perception of using game design in the classroom. Table 4 shows the results of the one sample t-test carried over the intention of using game design in the classroom.

Scale	α	M (SD)	t(44)	p	d
Intention to use game design in the classroom ("I intend to use games as a tool in the classroom as soon as I start working as a teacher.", "I can already think of specific game design content that I will implement with the students.")	0.65	3.33 (0.13)	2.45	0.018	0.36

Table 4: Teachers' intention to use game design in class.

Table 5 shows the results of the one sample t-test carried over the perception of usefulness and user-friendliness for both teachers and students of game design in the classroom.

Scale	α	M (SD)	t(42)	p	d
Perceived usefulness of game design in the classroom ("Game design is suitable for implementing the objectives of the curriculum.", "During the use of game design, the students' skills increase.", "Game design can be used to create productive lessons.")	0.8	3.93 (0.53)	11.47	< 0.001	1.75
Perceived user-friendliness of game design for teachers ("I have the confidence to do game design with my future classes.", "I can support my students profitably with questions about game design.", "I know a tool or a programming environment that can be used to develop games in the classroom.")	0.81	3.65 (0.90)	4.96	< 0.001	0.78
Perceived user-friendliness for students ("The students will be able to develop games without much help.", "There are tools and instruments that are suitable for game design at school.", "We will develop exciting games in the classroom without any major effort.")	0.66	3.19 (0.72)	1.74	0.08	0.26

Table 5. Perceived usefulness and user-friendliness from teachers' perspective on the use of game design in class, and perceived user-friendliness for students.

5. Discussion

The analysis of the survey results among pre-service teachers provides interesting insights into the perception and acceptance of video games as a teaching tool. Despite widespread recognition in the literature as an effective teaching tool, see Section 2, the data reveals a complex mix of agreement and reservations that merit critical examination.

5.1 Teachers' Perceptions of the Benefits, Ease of Use, and User-Friendliness of Video Games in Classroom

The perceived benefits of games in classroom showed a significant result (p=0.015), indicating a positive attitude towards the integration of games in the classroom. This suggests that teachers in education see the value of video games, which is consistent with existing literature highlighting the motivational and pedagogical benefits. However, this optimism must be viewed critically as the moderate effect size suggests that the perceived benefits may not be convincing enough to encourage widespread adoption without additional support.

Teachers' perceived ease of use (p=0.202, not significant) suggests that there is a need for targeted teacher training and resources. The moderate perception of usefulness compared to difficulty of use suggests that it may be difficult for teachers to effectively incorporate games into their teaching practice without adequate training.

The perceived ease of use for students (p=0.68, not significant) suggests that while teachers believe that students could potentially benefit from using video games, their confidence in this belief is not very strong. This highlights the need for better support structures and institutional readiness to facilitate the integration of video games into the classroom.

5.2 Teachers' Perceptions of the Reputation of using Video Games in the Classroom

The assumptions about the reputation of others through the use of video games in the classroom indicate that pre-service teachers believe that the use of games in the classroom is moderately supported by others. The mean of 3.13 (SD=0.63) with a p-value of 0.28 and a small effect size (d=0.20) indicate that although there is a slight tendency towards the perception of support, it is not strong enough to be considered statistically significant. This moderate perception may reflect cautious optimism among teachers about the acceptance and promotion of video games by colleagues and administrators, suggesting that further efforts to communicate the benefits and secure institutional support are needed to strengthen this perception.

The prestige of teachers using games in the classroom shows a mean of 2.92 (SD=0.58) with a p-value of 0.44 (not significant) and a negative effect size (d=-0.13). These results suggest that teachers generally do not perceive a significant improvement in their reputation through the use of video games in their teaching practice. The lack of a perceived reputational benefit suggests that the use of video games in the classroom is not currently viewed by teachers as a prestigious or noteworthy endeavour. This finding highlights the importance of fostering a culture that values and rewards pedagogical innovation, thereby encouraging more teachers to experiment with and adopt video games strategies.

5.3 Teachers' Perceptions on the Relevance, Effectiveness, and Enjoyment of Using Video Games in the Classroom

The relevance of video games to teachers in the classroom shows a mean of 3.17 (SD=0.66), with a p-value of 0.089, which is not statistically significant. These results suggest that while there is a general perception among teachers that video games are relevant to their profession, many teachers are still unsure of the importance of video games to their teaching practice.

The results regarding the use of video games in the classroom shows a mean of 3.30 (SD=0.73), with a p-value of 0.010, which is statistically significant. This significant result suggests that teachers feel quite confident discussing and teaching the outcomes of using video games in the classroom with others. Furthermore, the figures show that those who have used games see tangible benefits and are willing to advocate for their use.

The subjective perception of the use of video games in the classroom has the highest mean of 3.89 (SD=0.51), with a p-value of less than 0.001, which is highly statistically significant. These results show that teachers have a very positive attitude towards the fun and satisfaction of using video games in the classroom. The high mean score indicates that teachers find the use of video games highly engaging and satisfying, suggesting that personal and professional enjoyment of these tools can significantly motivate their integration into classroom practice.

This strong positive perception is crucial as it can foster intrinsic motivation to adopt and consistently use game-based learning approaches and contribute to a more dynamic and interactive educational environment.

The results of the questions on the opportunities of games (see Figure 2) and an overwhelming agreement in almost all areas (> 50% agreement, except for “take control of the learning process”-option) also show the positive attitude of teachers towards games in the classroom. The same picture can be seen in Figure 3 where a wide range of applications of games in the classroom is seen and here an agreement of almost 60% is recorded for all items.

5.4 Teachers' Intention and Perception of using Game Design in the Classroom

The intention to use game design approaches in the classroom is recorded with a mean value of 3.33 (SD=0.13) and a p-value of 0.018. These results indicate that the intention of prospective teachers to use game design as a teaching tool is statistically significant. This result emphasises the importance of continuously encouraging and supporting teachers to put their intentions into practice.

The perceived usefulness of game design approaches in the classroom has a mean of 3.93 (SD=0.53) and a p-value of less than 0.001. These results indicate a strong and statistically significant perception among teachers that game design can be effective in achieving curriculum goals, improving students' skills, and creating productive lessons which suggests a solid basis for further promotion of game design approaches as an integral part of the curriculum.

The perceived ease of use of game design for teachers is captured with a mean of 3.65 (SD=0.90) and a p-value of less than 0.001, showing that teachers feel confident in their ability to use game design in their future teaching and to support their students effectively. This positive perception of ease of use is crucial as it indicates that teachers are likely to adopt game design methods, provided they have access to the necessary resources and training.

Perceived ease of use for students has a mean of 3.19 (SD=0.72) and a p-value of 0.08 (not statistically significant). Although teachers believe that students can manage game development with minimal help, confidence in this belief is relatively low.

In general the practicability and reliability of the questionnaire showed good values, as evidenced by the successful implementation and high internal consistency for most scales (e.g. $\alpha = 0.84$ for perceived usefulness). However, some scales, such as the reputation of teachers who use games ($\alpha = 0.45$), need to be refined to improve reliability.

6. Conclusion and Outlook

To answer our research question, this study shows that pre-service teachers are generally positive about integrating video games and game design into the classroom. Teachers recognize the significant benefits of using video games in the classroom, particularly in promoting student engagement and achieving curriculum objectives. However, the moderate effect sizes and lack of statistical significance in some areas suggest that while enthusiasm exists, it may not be sufficient to achieve widespread adoption without additional support.

In conjunction with the literature, the discussion section illustrates that the integration of video games in the classroom is not only a question of the availability of the technology or the effectiveness of the games, but also of pedagogical attitude, institutional support, and practical implementation.

This study has several limitations that must be considered. The sample is relatively small and consists exclusively of pre-service teachers from a single institution, which limits the generalizability of the results. Therefore, future studies will include students from the Italian-speaking part of Switzerland (University of Applied Sciences and Arts of Southern Switzerland) and consider students from primary and secondary level and in various stages of their studies.

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