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# From Facebook to Classroom: A Systematic Analysis of Educational Games Designed by Educators

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**Abstract.** An increasing number of platforms facilitate the production, implementation, and sharing of game-based learning and gamification in educational practice. Teachers are increasingly taking advantage of these tools to enhance student engagement and learning outcomes. By analyzing the characteristics, usability, and education value of the games developed and shared by teachers on Facebook, this study aimed to identify the core components and patterns that teachers use when they design game-based learning and gamification experiences. To achieve this goal, this study employed content analysis of games developed by educators according to 27 criteria in four main categories: general information, learning aspects, game elements, and information design. Games developed by educators and shared on two Facebook groups dedicated to sharing educational materials between 2020 and 2024 were analyzed, and 100 posts of educational materials that were described by teachers as games were examined. Key findings suggest that, while teachers generally understood and effectively developed various educational games for instructional purposes, the materials often lacked sufficient feedback mechanisms and clear learning objectives, and demonstrate a need for better visual design and instructional clarity. This paper contributes both theoretical and practical knowledge to the field of game-based learning by offering a structured evaluation of educator-designed games and identifying areas for improvement, to achieve better learning experiences.

**Keywords:** educational games; game-based learning; gamification; teacher-designed materials; Facebook

## 1. Introduction

According to a Scopus search, research on educational games, game-based learning, and gamification is increasing, as are teachers' knowledge of games literacy and the necessity to provide their students with these active learning opportunities. The term games literacy (Chen et al., 2020), sometimes known as gaming literacy (Hsu & Wang, 2010; Zimmerman, 2009), refers to understanding and interacting with games. While gaming literacy can be understood as a broader

concept that includes systems, play, and design (Zimmerman, 2009), the term itself is more suitable for emphasizing engagement – playing the game and understanding its design (Hsu & Wang, 2010) – than games literacy, which also includes instructional design – designing a game for education (Chen et al., 2020). This article employs the term games literacy to summarize capabilities that enable teachers to effectively understand, design, implement, and facilitate game-based learning in education settings. A variety of terms, such as serious games, smart games, game-based learning, educational games, gamification, and play-based learning, are used in the education context to describe the use of games and their elements. Although there are many conceptualizations of these terms in different fields (Ciuchita et al., 2023; Landers, 2019), the following three terms and their corresponding definitions are used in this research.

- **Gamification.** The use of game design and elements in a non-game context—not a full-fledged game (Ciuchita et al., 2023; Deterding et al., 2011; Kapp, 2012).

- **Game-based learning.** A student-centered educational strategy that uses games as part of the learning process to enhance knowledge and skill acquisition (Coleman & Money, 2020; Grāvelsiņa & Daniela, 2020; Wang & Zheng, 2021).

- **Educational game.** Any game that is used or made intentionally for education purposes (Ge & Ifenthaler, 2017; Talan et al., 2020).

These distinctions provide a framework for analyzing how educators engage with and use game-related strategies in their teaching practices. Despite the growing body of research on educational materials that use games and game elements, there is a notable lack of research on the quality of content that is not topic-specific. A scoping review of 200 articles found that only three were about design thinking and a digital game model (Jan & Yang, 2018; Jan et al., 2017; Tokarieva et al., 2019), two were on game literacy (Chen et al., 2020; Hsu & Wang, 2010), and one was on model-driven engineering that could help educators who lacked programming knowledge to create or develop their games from scratch (Tang & Hanneghan, 2011); none assessed educational materials designed by educators. To contribute to this research field and bridge the gap in the literature, the current research objective was to analyze the characteristics, usability, and education value of games that were being shared by teachers online. This study used Facebook Groups for data collection and analysis to identify the core components and patterns that teachers used when they designed game-based learning and gamification experiences. Unlike previous studies, which primarily analyzed commercially available digital games or their impact (Kurniawan et al., 2022; Portela, 2023; Sarva et al., 2024; Shakhmalova & Zotova, 2023), this research concentrated on materials designed by teachers themselves. The research questions are as follows:

1. What are the key characteristics of the materials shared by educators on Facebook?
2. What educational aspects do educators prioritize when they create and share educational games?
3. What are the similarities in the game mechanics and design patterns between the shared materials?

The answers to these questions could promote game literacy and better teaching practices, because teachers can adopt successful game-based learning strategies that have been tested by others. For designers of instructional and educational games, such insights can guide the development of better resources that align with teachers' preferences and classroom needs (Gaydos, 2021). Additionally, comprehending these trends can help in understanding the key elements that contribute to enhancing students' learning outcomes, which could lead to the creation of more effective and engaging educational materials, and stimulate the professional development of teachers.

Content analysis methodology was chosen to do the research because of its ability to systematically categorize and analyze qualitative data from diverse sources into thematic groups (Mayring, 2014). To compare pedagogical approaches to game development, materials for analysis were collected from two Facebook groups where teachers shared educational materials in Latvian and English. The study analyzed educator-designed games according to four developed categories: general information, learning aspects, game elements, and design aspects. This evaluation strategy was assessed by instructional design experts.

This study provides valuable insights that can enhance our understanding of design principles and support educators to adopt more effective, engaging, and student-centered teaching practices, thereby filling a critical gap in the literature and providing an assessment of educator-developed games and identifying recurring design patterns and pedagogical strategies.

## 2. Literature Review

To differentiate between the terms game-based learning, gamification, and educational games, it is important to understand what a game is, because it is at the core of all these terms. In the book *Fundamentals of Game Design*, Ernest Adams writes:

> *A game is a type of play activity, conducted in the context of a pretended reality, in which the participant(s) try to achieve at least one arbitrary, nontrivial goal by acting in accordance with rules* (Adams, 2009, p. 3).

The author perfectly outlines the building blocks of a game by mentioning that it is an activity that happens outside of a "serious" environment, that it cannot happen on its own, and that there should be at least one player interacting with

content that has previously set goal(s) and rules (Adams, 2009). Unlike play, a game is structured. In some educational practices, teachers use certain game elements that are not complete games (they lack a goal, a win factor, and winning conditions), for example, using dice to determine which question to answer or a story narrative that leads from one math problem to the next. In this research, similar approaches that are used to increase productivity and motivation and change attitudes and behavior are classified as gamification (Deterding et al., 2011).

Every year, more research is undertaken on educational games, gamification, and game-based learning (see Table 1). In 2021, there were 21,550 articles on educational games on Scopus, the world's largest abstract and citation database. By 2024, this number had increased to 32,179 new studies, which demonstrates a significant growth in interest and investigation. A similar increase in data volume was noted for game-based learning (11,605 articles in 2024) and gamification (12,487 articles in 2024).

**Table 1: Number of articles on educational games, gamification, and game-based learning on Scopus**

| Term | Year | Results |
|---|---|---|
| Gamification | 2021 | 7,011 |
| | 2022 | 7,926 |
| | 2023 | 9,776 |
| | **2024** | **12,487** |
| Game-based learning | 2021 | 6,599 |
| | 2022 | 7,808 |
| | 2023 | 9,292 |
| | **2024** | **11,605** |
| Educational games | 2021 | 21,550 |
| | 2022 | 23,903 |
| | 2023 | 27,440 |
| | **2024** | **32,179** |

Because the number of studies in the field of educational games continues to increase, there is a need to test and integrate high-quality educational games into classroom settings; however, such tools can be expensive (Soni, 2023). For schools and teachers who work with limited budgets and resources, the cost of high-quality educational games can be restrictive (Marklund & Alklind Taylor, 2016).

However, there is significant potential for teachers to create the necessary materials themselves. By leveraging free or low-cost tools and platforms, teachers can design and share high-quality educational games that meet their specific classroom needs, thereby making innovative learning experiences accessible, even in the face of financial constraints. In research on digital solutions that teachers can use during their lessons, 97 different tools are mentioned (Sarva et al., 2024). Online platforms such as Wordwall.net, LearningApps.org, Genially, Kahoot!, Quizlet, Quizizz, and Nearpod are known for their interactive features that facilitate active learning. These platforms offer customizable activities and assessment tools that make it easier to tailor educational materials to diverse needs and make them suitable for a wide range of subjects. These platforms are highly favored by both teachers and students for their ability to engage and motivate (Kurniawan et al., 2022; Portela, 2023; Sarva et al., 2024; Shakhmalova & Zotova, 2023). Graphic design programs and free picture databases, such as Canva, a graphic design platform, provide tools for creating printable materials, including games that teachers can use, share, and sell to other teachers (Titiyanti et al., 2022). And while digital games are efficient, non-digital games also play a significant role in classrooms and are often preferred by teachers for their simplicity and effectiveness (Talan et al., 2020).

While there are thousands of articles on game-based learning, gamification, and educational games, a scoping review of Web of Science and Scopus, using combinations of the keywords "educator," "teacher," "teacher-created," "teacher-generated," "solutions," "materials," "design," "literacy," "game-based learning," "gamification," and "educational games," and sorting the articles by relevance, found that none of the first 100 articles in either database analyzed educational games developed by teachers. The number 100 was chosen because it is sufficiently large and would allow a conclusion on current research trends. More articles focus on facilitating specific subjects through educational games and their design (Baldeón et al., 2017; Vodenicharova, 2022) than on analyzing teacher-designed materials. For example, "Understanding teachers' design thinking in designing game-based activities" by Jan and Yang (2018), 'Exploring teachers' pedagogical design thinking in game-based learning' by Jan et al. (2017), and "Educational digital games: Models and implementation" by Tokarieva et al. (2019) primarily focus on how teachers incorporate games in the classroom, rather than their design. More relevant articles on the games literacy of teachers relate to how to make educational games (Chen et al., 2020; Hsu & Wang, 2010). While these articles explain the basic literacies teachers need to implement game-based learning effectively, they do not provide a detailed, practical guide for designing or analyzing educational games. While the analyzed articles provide evidence of teachers' acceptance of game-based learning and offer insights into how teachers integrate games in the classroom, research on the material design process is still

lacking, and there is a need to bridge the gap in the literature on games made by teachers.

Research reports that educational games can help students enhance a diverse set of skills, including critical thinking and problem-solving capabilities (Coleman & Money, 2020; Wang & Zheng, 2021); their motivation to learn can be improved (Deterding et al., 2011), and games can help them to actively participate in the learning process. For educators, the reasons why they use educational games vary. Teachers refer to the education objectives they achieve through these solutions, as well as the diversity of and ease of using games. Having access to pre-made materials and being able to create their own content is mentioned as highly beneficial (Sarva et al., 2024). Moreover, the need for diverse and adaptable tools aligns with the growing importance of collaborative spaces such as Facebook Groups, where educators can find ideas and alternative content, exchange insights, and even sell their materials. Facebook Groups can be a helpful medium for teachers to interact and network on teaching and other education matters (Bett & Makewa, 2018; Nelimarkka et al., 2021) and can provide a learning platform for both sharing academic sources (Ulla & Perales, 2021) and doing informal teacher development (Van Bommel et al., 2020). Unlike other platforms, such as specialized education repositories or learning management systems, Facebook Groups facilitates informal, organic sharing and discussion (Bett & Makewa, 2018; Nelimarkka et al., 2021; Ulla & Perales, 2021) and thereby reflect real-world teacher practices in a less structured and highly interactive environment. While this study focuses on Facebook, these benefits may also be relevant to other social-media-based educator communities, such as WhatsApp and Pinterest, where teachers exchange materials and ideas in a similar way. However, further research is needed to explore the extent to which game-sharing practices differ across various platforms. To improve teaching methods, guide the development of better educational resources, and enhance students' learning outcomes by identifying effective game design patterns and components, it is important to understand educators' and instructional designers' practices for developing educational games and similar materials. Accordingly, this research conducted a content analysis of games shared on Facebook.

## 3. Methodology

A five-step research design was created to analyze a wide variety of educational games that were designed and shared by educators in two Facebook groups (see Figure 1).

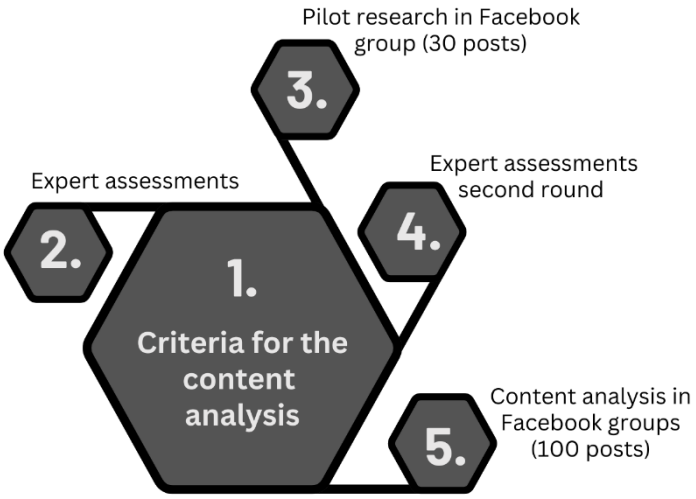


**Figure 1: Overview of five-step research design for analyzing materials developed by educators**

At the center of this research are the four content analysis categories. They were inspired by Zimmerman's (2009) concept of gaming literacy, which identifies three aspects of games: systems, play, and design. To these three aspects were added educational aspects suggested by Chen et al. (2020), and together, they make up the four main content analysis categories that were used to evaluate game-based learning materials comprehensively. The first step involved the development of detailed criteria for these categories. These criteria were derived from a combination of existing frameworks on game-based learning and the design of educational games, expert input from educators and researchers in the field, and a preliminary review of teacher-created game materials.

The content analysis category of **general information** aligns with the systems aspect of game literacy. This category includes details such as the targeted age group, play time and feedback. In general, this category provides the necessary background information to situate the material within its intended education context. The games literacy for teacher education framework (Chen et al., 2020) was designed to help educators develop the necessary competencies to implement effective game-based learning. We used this framework, together with criteria from the content analysis category of **learning aspects**, to evaluate educational materials according to six key components: their type, clarity of learning objectives, alignment with Bloom's taxonomy (Anderson & Krathwohl, 2000; Khoy, 2025), task structure, adaptability, and promotion of transversal skills such

as critical thinking and creativity (skills promoted by Skola2030, n.d.). These categories ensure that the material is pedagogically sound.

The **game elements** content analysis category aligns with the concept of play as explained by Zimmerman (2009) and Chen et al. (2024), by focusing on how players interact with, experience, and engage with the game. It includes game mechanics, objectives, player configurations, rule explanations, feedback (during and after play), and the use of specific game elements such as levels and narratives. The main game elements were taken from the gamification taxonomy of Armando Toda and colleagues (2019), and some were added during the content analyses of games – several additional important aspects were identified during the scoping review of the literature. Together, these aspects ensure that the material not only facilitates learning but also fosters play experience, which is central to effective game-based learning.

The last content analysis category is **design**, which focuses on basic game design to ensure visual and thematic coherence and readability and emphasizing clear and accessible text, and cognitive load management, to assess whether the material supports effective information processing and avoids overwhelming the user. All categories with their aligned criteria are listed in Appendix 1.

After the categories and criteria were established, the second step was to ensure that experts in specific fields proofread the designed methodology for content analysis; doing so helped systematically identify specific characteristics of Facebook posts. Limitations of this method relate to the challenges that were experienced in defining data, establishing categories, and ensuring consistency and reliability among researchers when they interpreted subjective material (Krippendorff, 2025; Litwin, 2003; Netemeyer et al., 2003). Two experts were assigned to assess and proofread the designed methodology. Both experts were doctors in education – one was a specialist in SMART pedagogy, and the other had good digital literacy and was a reviewer of educational material. Their input led to modifications to the categories, such as refining certain terms and adding additional subcategories.

To test the content analysis methodology, pilot research was conducted in the Latvian teacher Facebook group "Digitāli mācību materiāli" (Digital Learning Materials), which had 11,400 members. The group is described as a place where teachers and parents can share and download educational materials in Latvian; the materials are available in multiple formats, including.pdf,.docx, and.pptx. Members are encouraged to contribute resources to benefit the community. The group was appropriate for this research because it provided a large, active platform on which teachers regularly shared diverse educational materials, including teacher-designed games in various formats, which made it an ideal context for testing the content analysis methodology. After the selection, the

search function and the keywords "game" and "games" were used to find materials that teachers had shared and that, from their perspectives, seemed to be useful materials that contained game elements. The first 30 games found in the Facebook group were analyzed using the content analysis methodology. Screenshots were taken of all the Facebook posts and related materials that were used for analysis, so that the researchers could reflect on each post. This was done because information on Facebook changes frequently because of updates, because it involves user-generated content, and owing to platform algorithm adjustments.

The 30 posts that were identified in the pilot were evaluated with the evaluation tool that had been developed, the results were discussed with the same experts who had checked the methodology, and the evaluation tool was adapted. New criteria that were not initially foreseen were added; these included aspects such as social media user reactions to the materials and a price overview, because teachers sometimes charged for their materials. These updates enhanced the comprehensiveness of the evaluation instrument. It was suggested to filter materials, starting from the most recently added posts. While Facebook's search filters offer limited options in this regard, the ability to search information by year proved helpful, making it easier to navigate and review the provided materials systematically.

The final part of the research involved conducting a content analysis of materials in two Facebook groups. For the first group, "Digitāli mācību materiāli" (Digital Learning Materials), the analysis focused on 50 of the most recent posts on materials; this approach reflected a manageable sample size and captured the latest trends in content and methods. These materials spanned the time from July 2024 to 2020; the analysis thus covered a substantial time while prioritizing recent developments. Posts were reanalyzed using the revised evaluation tool and older materials were excluded. To compare national and international perspectives, a second Facebook group, "Teachers: Resources, Teaching Tips, Teaching Articles" (96,000 members), was selected and similar keywords were used ("resources," "teachers," "materials"). Materials were shared regularly on both groups (at least once a month) and had active participant engagement through likes and comments. Using search terms such as "game," "games," and "gam" (truncating the word gave good results), the authors reviewed the posts one by one by opening each link or material categorized as a game. A total of 50 posts were analyzed in each group, giving a combined total of 100 posts about materials. Links to the games were added to an Excel table for systematic content analysis.

An unforeseen limitation emerged during research in the second Facebook group. Owing to factors related to how Facebook's data fetching and algorithms work, a group's posts may change when the user refreshes the page, even after searching for specific keywords and setting a date. This means that the research sample that

showed up was dependent on Facebook's algorithm, and we may have failed to record and analyze an unknown number of materials. This was the reason why researchers took the decision to select 50 posts on materials from each Facebook group and analyze those materials; they avoided extending the pool of materials because, if they had extended the data pool, they would have had no control over the materials the Facebook algorithm provided. It was anticipated that this approach would not affect the general results; however, it should be kept in mind when Facebook is used as a research pool.

For future research, a closer inspection of the timeframe could also provide insight into the way teachers developed material variations. The data obtained by this study were not analyzed according to the timeframe, as the varying material amounts in each Facebook group and the limited sample size made pattern identification unreliable. However, events such as COVID-19 may have increased the number of posts of digital and remote-friendly games. Future research, with a larger, more balanced dataset, could explore these trends.

The following section presents findings from the analysis of educational games collected from the two Facebook groups and discusses their implications for game-based learning.

## 4. Results and Discussion

The aim of this research was to understand the characteristics, usability, and education value of games that were shared by teachers on Facebook and to identify the core components and patterns teachers use when they design game-based learning and gamification experiences. This section summarizes the results by answering the research questions, discussing the implications, and interpreting the significance of these findings.

### Key Characteristics of the Materials Shared by Educators on Facebook

First, it is important to understand the types of materials that were shared by teachers under the label of educational games. While it is known from previous research that teachers like to use digital platforms that can be tailored to their specific needs, when they are asked to develop educational games themselves, they tend to use other platforms that do not have game elements, which could indicate that there are misconceptions on what an educational game is (Sarva et al., 2024). The 100 analyzed posts on materials comprised 69 games, 16 gamification posts, two play activities, and two role plays or situation simulations. In 10 cases, the teachers provided a collection of materials that included games, worksheets, and other supporting materials, such as flashcards. This may indicate that there are many interpretations of what it means to use games and their elements in education (Ciuchita et al., 2023; Landers, 2019).

Nevertheless, out of the 100 data materials analyzed, only in four cases involved a misconception about the concept of a game. This finding relates to the fact that only 32 digital educational games were presented; analysis of the rest of the materials identified printable materials that teachers needed to print out themselves or, in rare cases, an option to order the game from the developer. So, as Sarva et al. (2024) found, when using analog/printable materials, which teachers are more familiar with, there are fewer misconceptions than when digital games are involved. This may be because non-digital games are often perceived to be easier to implement, because of a lower risk of technical issues such as software glitches, device compatibility problems, or internet connectivity issues, which can disrupt the flow of lessons and hinder engagement (Talan et al., 2020).

It can be concluded that teachers conveyed a clear understanding of what constituted a game in the materials they shared, because misconceptions were identified in only a small percentage of cases. As mentioned before, 70% of materials were printable, and the results are summarized in Figure 2. The data show the preferences of the platforms and the tools used in the creation and distribution of games that were developed. Word or PDF was the most common format (62 cases) for teachers to share their material and games, with video format (8 cases) being the next most common format, followed by PowerPoint presentations or Google Slides (7 cases).

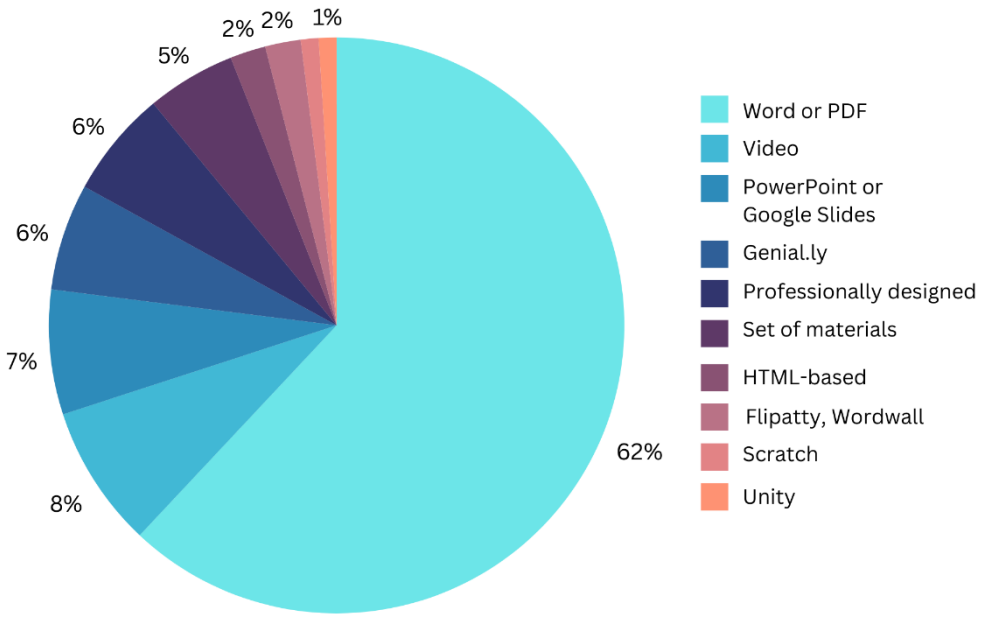


**Figure 2: Formats used for materials shared**

The most logical reason for this kind of distribution could be ease of use, because Word and PDF formats are familiar to teachers; consequently, their use requires minimal technical skills and using them is less time-consuming than other

programs or platforms. A reason for using printable materials could be students' limited access to digital devices.

In the next step, we investigated the age groups for which the materials had been developed. Although the age ranges and grade levels vary significantly between different countries' education systems, for the present research, the materials were categorized according to teachers' descriptions of the target group and the perceived level of difficulty (see Figure 3).

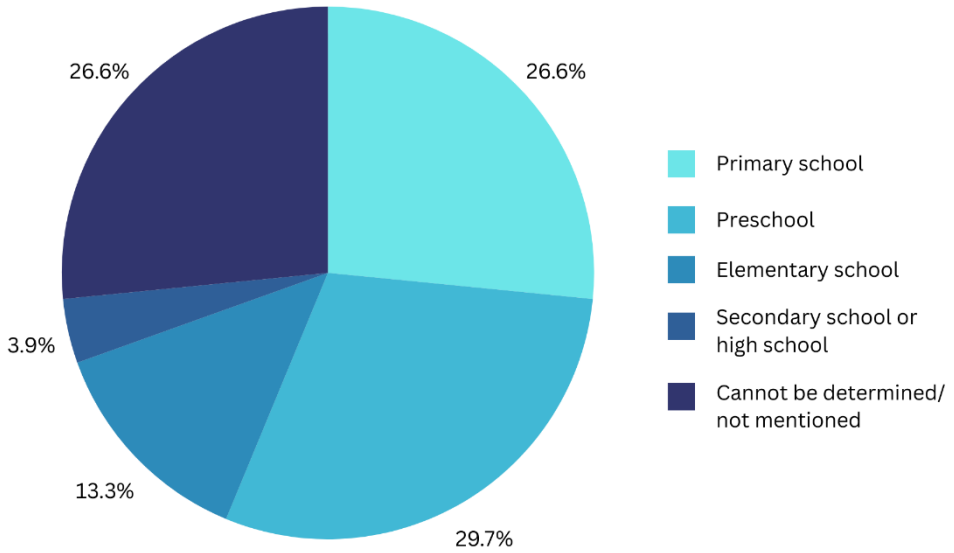


**Figure 3: Materials for different stages of education**

More than a quarter of the cases (27%) gave no indication of the education stage the material was intended for, and it was not possible to properly determine the age group for which the material was developed. Nevertheless, the most surprising finding is that only 4% of the materials was made for high school students. It has been reported that game-based learning and gamification can be very beneficial (Coleman & Money, 2020; Deterding et al., 2011; Wang & Zheng, 2021); and that its effects are equally applicable for all education levels (Karakoç et al., 2022).

Despite the advantages, various limitations still prevent teachers from creating more educational games. There may be many reasons for this finding, such as the complexity and structure of the curriculum or perceptions about more "appropriate" teaching and learning methods for older students. Another interesting conclusion from the data is that guidelines for teachers are seldom described (25 cases); in 29 cases, there were no instructions for educators on using the materials provided. Some simple games are widely known and do not require instruction, for instance, bingo and puzzles; however, more than one third (39 cases) of the materials can be used only according to specific instructions and

are developed in a way that that their components cannot be easily modified or used independently. It would be beneficial if materials included technical instructions, suggestions for assessment and evaluation, options for integration, learning objectives, and other suggestions for use.

Additionally, it is interesting to note that, in most cases (48), the time that material developers assume students should spend on the games is less than 15 minutes. In 34 cases, the time it takes to play the educational game or do the gamified activity is not mentioned or was not possible to determine. Also, most developers assumed that the preparation time for the educational games would be less than 10 minutes (63 cases). As mentioned before, the most common form of material is PDF, which can be printed and handed out to students. If the material is digital, preparing the activity should take even less time than the printing process. Undoubtedly, the preparation time for different activities may vary from person to person; however, it is reasonable to assume that teachers prefer easy-to-use, brief, engaging tasks that fit in typical classroom time constraints and can be supplemented with additional activities or tasks to accommodate students' learning needs. At the same time, we must acknowledge that the assumed preparation time of less than 10 minutes may be insufficient, as teachers need to familiarize themselves with the topic. Therefore, educators should approach material carefully and ensure they do effective lesson planning and material adaptation. If a reasonable time is not allocated for lesson preparation and game integration, games could be misused, and serve merely as entertainment rather than as an aid to achieving pedagogy-related objectives.

**Educational Aspects that Educators Prioritize When Creating and Sharing Educational Games**

The most important aspect of a good educational game is its learning objectives. From the data analyzed, it can be concluded that learning objectives were clearly introduced in 25% of cases, somewhat introduced in the game's description in 31% of cases, and not mentioned or found in the provided material at all in 44% of cases.

The data were also analyzed from the perspective of the cognitive process dimension of Bloom's revised taxonomy of educational objectives (Anderson & Krathwohl, 2000; Khoy, 2025). It can be concluded that the majority of the learning goals focused on the remembering (35 cases), understanding (64 cases), and applying (43 cases) categories, with significantly fewer objectives aimed at higher-order thinking skills such as analyzing (8 cases), evaluating (1 case), and creating (1 case). In 13 of the 100 cases of materials, it was either not possible to determine a learning objective, or the materials were mostly aimed at entertainment rather than a specific learning goal. On the one hand, the intention to maintain learners' interest or provide variety in lesson materials is a prerequisite for a good

classroom environment; on the other hand, this intention has no education value regarding knowledge construction. It is important to plan a learning process so that it contributes directly to learning outcomes, while simultaneously maintaining an engaging learning format that guides learners toward meaningful cognitive engagement or that supports the recollection of prior knowledge.

With the support of educational games, students can strengthen various skills, including critical thinking and problem-solving (Coleman & Money, 2020; Wang & Zheng, 2021). To find out if it is possible to develop transversal skills such as critical thinking and problem-solving, creativity and entrepreneurship, self-directed learning, collaboration, civic participation, and digital literacy, one of the content category groups evaluated in the materials collected was transversal skills. Some of the posts mentioned that the materials would help develop specific skills, though teachers could support the development of other competencies if they chose to do so. The analysis of the collected data shows varied emphasis devoted to the development of particular competencies: critical thinking and problem-solving were mentioned in 64 cases, self-directed learning in 41, and digital literacy in 15. However, creativity and entrepreneurship were only mentioned in four instances, and collaboration in 14. In 21 cases, it was unclear whether the materials supported development of any transversal skills.

While there were, in most cases, no significant differences in the categories of the Latvian and other teacher groups, some differences can be identified in three criteria of the content analysis. In the transversal skills group, collaboration was recognizable in fewer cases of materials developed by teachers from Latvia (3 cases) than in materials developed by teachers from other countries (11 cases). While the numbers are not significantly different and could be caused by cultural differences, it is a noteworthy observation that could be researched further. Another slight difference was found in the digital literacy group of skills. The data collected from the Latvian group indicate that this skill could be strengthened in 12 cases; in the other group there were slightly fewer digital materials in general (Latvian 19, other 13).

A third difference was found in the "Teachers: Resources, Teaching Tips, Teaching Articles" Facebook group, where most of the materials were created by teachers who provided their products for sale. Some had their own websites or used the Teacherspayteachers.com platform, and used this Facebook group to promote their products. Usually, teachers did not provide a single specific game but rather a bundle or collection of materials, which often included printable games.

A fourth difference related to digital games. In the Latvian group, there were 18 digital games compared to 12 digital games in the English-speaking community,

which indicates that educators in the Latvian group placed greater emphasis on incorporating digital tools into their teaching and development of materials.

The fifth difference, observed in the feedback educators provided about the materials, may be the most significant. In the English-speaking community, 15 "likes" and comments were added for all the materials analyzed, while, in the Latvian group, there were 886 "likes" and 181 comments altogether. This difference suggests a much higher level of interaction and engagement in the Latvian group, though we can only speculate on the reasons for this difference. It may reflect cultural differences in online engagement, group dynamics, or the perceived value of shared materials.

**Similarities in and Differences Between the Game Mechanics and Design Patterns of the Shared Materials**

The research question led us to identify common elements and strategies used by teachers across different educational games, and highlighted recurring patterns. In total, 26 different game mechanics were observed, and, in 24 cases, some variation of object matching was identified – this did not include an extra five cases of domino-type games that used specific domino pieces and game rules. Dice were used in 14 games, and 11 games had some form of game board resembling snakes and ladders, known in some places as circus games, that require players to move their game pieces on a board and to attempt to be the first to reach the last indicated space. Other common game mechanics were the following: eight quiz-type games, seven puzzles, seven memory games, seven riddles and word games, nine card games (of which three could be played with regular cards and six had specially made cards), and five bingo-type games. All these game mechanisms are widely known and easy to teach and play without extensive preparation time or game time.

Only three games did not include game mechanics or any gamification elements. In two cases, ordinary activities were described as games. In the first case, the player needed to find information on a specific subject on the internet – the activity included no narrative, progress, points, or any other elements that would make it game-like. The second case gave instructions on gardening using game terms but did not have actual game elements, such as putting seeds in a pot and calling it "hide and seed." In this case, games were used as metaphors. A third case involved flashcards, which have a game function, but the activity did not involve any game strategies or elements in the provided analog; these needed to be added with a digital app. This was a bit misleading for the teachers because the material shared on Facebook announced that buying these flashcards would make it possible to play a variety of games; however, it was mentioned only later that an app with a subscription was also needed for the actual gameplay.

The current research also used a gamification classification taxonomy (Toda et al., 2019) to distinguish specific characteristics and game elements in the shared games. As mentioned before, gamification and educational games are not the same; however, a gamification taxonomy can serve as a complementary tool to analyze how motivational techniques are embedded in educational games. The categories of puzzles/tasks (45) and story/atmosphere (39) dominated. Next were competition (34), chance factor (29), and specific goals/solutions (27). Not far behind was a new category that was added to evaluation taxonomy: unusual interaction (e.g., using pegs instead of a pen and pencils to mark information), which appeared in 23 games. Some categories, such as reputation, novelty, and rarity, have little to no relevance, which suggests that they have little to no importance in an educational context.

Analysis of game types by number of players seems to indicate a decreasing effect. Most games could be adjusted to involve different numbers of players, but from the data it is obvious that there were fewer games for large numbers of players than games for fewer players. The content analysis revealed 55 solo games, 42 for two players, 37 for small groups (3–6 players), and 27 games that could be played by the whole class. Although games are good for building cooperation skills, it seems that teachers prefer to develop games for individual work. Therefore, it would seem practical to integrate the rules and feedback mechanisms in the game itself; however, this was done fully in only 15 cases and partly in six games, which means that additional explanation by the teacher was required. In most cases (87), rules were explained by the teacher, and in four examples, video instructions were provided.

Similar situations were detected in the feedback category. For 62 of the games that were analyzed, there was no indication of how or what feedback could be provided, and it was not clear whether it would need to be provided mostly by the teachers. In 24 cases, the game gives an indication of right or wrong play; however, in only six cases were additional explanations for the gameplay given. In 13 cases, it was found that feedback needed to be given by other students. Digital games can be programmed to provide feedback during or after the game via printed materials, and it can reduce the teacher's workload if other students are involved in checking their peers' work and providing feedback.

Regarding feedback provided after the game, only one collection of games provided free access to detailed feedback that teachers could use after playing games and using other materials included in the collection. In only three cases were correct answers or other helpful tips provided for the educational games, and in 96 cases, no feedback was given at the end of the game. This may be because educators continue with instructional activities with different pedagogical strategies after employing these brief game activities, and only then reflect on the

whole learning process. However, it is advisable to also give feedback after small activities.

The last main category evaluated visual design. In 81% of cases, teachers followed basic game design for color compatibility, information hierarchy, and consistent style. The most common problems were observed with the rules for composition of game elements, which were followed in only 34 cases. In 13 cases, the color contrast could have been slightly better, and one game needed to be reworked to improve the visual design. Visual design should be taken into consideration in the development of games to ensure that students can understand the information given to them. Visual design, especially graphics and other visual stimuli, plays a crucial role in capturing students' attention, maintaining their interest, and enhancing engagement with educational content. Properly designed visuals help guide students through the educational journey by making complex concepts more accessible and engaging. These visual stimuli often lead to improved cognitive outcomes because they enhance the users' experience by providing clearer feedback, maintaining interest, and helping learners to stay immersed in the game environment (Ishak et al, 2023; Pasqualotto et al., 2023).

The next criterion for game evaluation was "the choice and arrangement of fonts" to "ensure readability." In 38 games, no text was used, perhaps because the games were for younger students. Of the other 62 games, the font they used ensured readability in 43 cases. This means that, in 31% of cases, developers needed to pay more attention to the selection of fonts.

Analysis of the games retrieved from two teacher Facebook groups shows that, while educators were actively creating and sharing good educational games, there is room for improvement in terms of understanding what constitutes a well-planned educational game with higher-order learning objectives and well-structured game elements. Moreover, if visual design aspects were improved, game clarity can be improved and a balanced cognitive load can be supported (Pasqualotto et al., 2023).

## 5. Conclusion and Recommendations

This research provided valuable insights into the characteristics, usability, and educational value of games that were developed and shared by teachers on Facebook. One potential limitation of this study is the reliance on content analysis as the only method of data collection. It may not have captured the full complexity of the aspects explored. Future research could benefit from employing a mixed-methods approach that combined both quantitative and qualitative data to provide a more comprehensive understanding of the topic and enrich the findings. Another limitation was Facebook's data search mechanism, which may have affected the consistency and variations of the materials collected for analysis. A comparison to other social media or group platforms may have given a broader

perspective on the types of educational games teachers share, and may reveal additional trends or gaps that were not captured on Facebook alone.

In light of these limitations and findings, the following conclusions were drawn.

- Educators have a strong understanding of educational games, and only a small percentage of misconceptions were identified.
- Most educational games shared by teachers are printable, likely because of ease of use and accessibility, though this preference also reflects the challenges of implementing digital games.
- Latvian teachers used digital games slightly more frequently than teachers in international English-speaking groups (Latvian 19, English 13).
- Only 4% of the games were designed for high school students, which shows a gap in the use of educational games at higher education levels.
- Clear learning objectives were found in only 25% of the materials; many focused on lower-order thinking skills such as remembering and understanding.
- Clear visual design in educational games can significantly benefit students' learning by enhancing their ability to focus on key concepts and minimizing cognitive load.
- Only one case showed learning objectives connected to the "evaluation" or "creation" level of Bloom's revised taxonomy and only one case achieved the higher levels of Bloom's taxonomy.
- More than half (54%) of games lacked clear instructions for teachers on how to implement the games and the potential for feedback. While this may be an area for experimentation, the lack of guidance could hinder the education value of the materials, especially for teachers who are unfamiliar with a game-based learning approach.
- Materials often focused on developing critical thinking and self-directed learning, but creativity, collaboration, and entrepreneurship were underrepresented.
- While common game mechanics, such as quizzes, puzzles, and memory games, dominated and mechanics were well-suited for brief classroom activities, they could be enhanced with better integration of feedback systems, goals, and more innovative interactions.
- While 81% of the games used basic visual design principles, composition, contrast, and font readability were problematic in 31% of cases. Poor visual design can increase cognitive load and reduce the effectiveness of the educational experience.
- Integrating game-based learning principles into teacher training programs may enhance educators' ability to design effective, engaging educational games that align with pedagogical goals.

In summary, practical implications of the research highlight the need for teacher training programs to incorporate game-based learning principles, with clear guidelines and improved visual design for better usability. Educators could also focus on creating games that address higher-order thinking skills and foster transversal skills such as creativity and collaboration. Expanding the scope to include high school students and exploring additional platforms for sharing games can enhance the reach and effectiveness of educational games. Theoretical implications include refining game-based learning frameworks to target higher-level cognitive skills, exploring how games can better support transversal skills, and understanding cross-cultural differences in game usage. Additionally, new motivational aspects beyond traditional gamification taxonomies motivate further exploration into how these gamification elements can improve engagement and learning outcomes.

Six topics were identified for future research. First, the barriers preventing teachers from designing educational games for high school students, which could be curriculum complexity or teachers' perceptions of appropriate methods for these age groups, should be explored. Second, the potential to foster underrepresented transversal skills such as creativity and collaboration through educational games should be investigated. Third, because new motivational aspects outside the gamification taxonomy were identified, these aspects could be analyzed further. Fourth, this research paper focused on educational game patterns in general, and comparing the materials gathered in Latvian and English-speaking teachers' Facebook groups could expose interesting differences. Fifth, future research could explore different platforms on which teachers share their materials, such as the previously mentioned Teacherspayteachers.com or other social network platforms. The sixth recommendation is to explore student perspectives, and to assess the impact of teacher-designed games on student learning outcomes.

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**Appendix 1**

| **1. GENERAL INFORMATION ABOUT THE MATERIALS** | |
|---|---|
| **1.1. Age group for which learning material/game is designed** | **Preschool**<br>**Primary school**<br>**Elementary school**<br>**Secondary school or High school**<br>**Cannot be determined/not mentioned** |
| **1.2. Paid or Free** | **Paid**<br>**Free** |
| **1.3. Format** | **Digital (used in a digital environment)**<br>**Analog**<br>**Printable (requires user to print out)**<br>**Online (real-time, e.g., Zoom platform)**<br>**In-person (e.g., word games in a circle)** |
| **1.4. Methodological Guidelines (For the Educator)** | **Provided and clearly defined**<br>**Provided but not clearly defined**<br>**Not provided/not known/not in English** |
| **1.5. Preparation Time for the Teacher (Materials)** | **Preparation time less than 10 minutes**<br>**Up to 20 minutes**<br>**Longer than 20 minutes**<br>**Varies/unknown** |
| **1.6. Playtime for Students (Including Learning Rules)** | **Playtime less than 15 minutes**<br>**Up to 30 minutes**<br>**Longer than 30 minutes**<br>**Unknown/cannot be determined** |
| **1.7. Rules and Usage Information** | **Included in the Facebook post**<br>**Provided as a supplement/inside the game**<br>**Not included anywhere** |

| | |
|---|---|
| **1.8. Social Media Viewer Feedback** | **"Likes"**<br>**Comments** |
| **1.9. Author of the Material** | **Created by the educator/Facebook user (unless stated otherwise)**<br>**Enhanced by the educator (e.g., translated, adapted from another source)**<br>**The educator/Facebook user references another author/source**<br>**Cannot be determined/unknown**<br>**Enhanced with audio/video instructions or explanations (linked with category 7):**<br>**Video tutorial**<br>**Audio explanations**<br>**Video overview of material content (not usage)**<br>**Not applicable** |
| **1.10. Platform Used to Develop the Digital Material** | **Set/combined formats**<br>**Microsoft PowerPoint**<br>**Genially**<br>**HTML**<br>**Unity or other game engine**<br>**Flipatty**<br>**Word/PDF**<br>**YouTube/Video**<br>**Google Slides**<br>**Specialized product/professionally developed**<br>**Wordwall** |
| **2. LEARNING ASPECTS** | |
| **2.1. Type of Material** | **Game**<br>**Gamification**<br>**Play**<br>**Simulation (e.g., role-playing, situational enactment)**<br>**Not a game (common misconceptions)**<br>**Interactive presentation** |

| | |
|---|---|
| | **Collection of materials** |
| **2.2. Definition of Learning Objectives** | **Clearly defined learning objective**<br>**Partially defined**<br>**Not mentioned/unknown** |
| **2.3. Learning Objectives Based on Bloom's Revised Taxonomy** | **Remembering**<br>**Understanding**<br>**Application**<br>**Analysis**<br>**Evaluation**<br>**Creation**<br>**No discernible learning objective (entertainment-focused)**<br>**Collection of materials** |
| **2.4. Task Flow/Scaffolding** | **Developed**<br>**Not developed/not applicable/unknown** |
| **2.5. Adaptability of Material to Learning Needs** | **Yes**<br>**Partially**<br>**No** |
| **2.6. Development of Transversal Skills** | **Critical thinking and problem-solving**<br>**Creativity and entrepreneurship**<br>**Self-directed learning**<br>**Collaboration**<br>**Civic participation**<br>**Digital literacy**<br>**Not applicable/unknown** |
| **3. GAME ELEMENTS** | |
| **3.1. Game Mechanism:** | **Treasure hunt**<br>**Quiz-type game**<br>**Building/creation**<br>**Dobble (spotting or naming pairs)**<br>**Object matching**<br>**Puzzle**<br>**Memory game (finding pairs)**<br>**Domino**<br>**Hangman (can include other elements)** |

| | |
|---|---|
| | **Dice game**<br>**Branched narrative**<br>**Card games (standard cards, e.g., "Go Fish," Uno)**<br>**Specialized cards, card games**<br>**Map/territory conquest**<br>**Riddles/word games**<br>**Drawing games (e.g., Pictionary)**<br>**Storytelling games (e.g., Mad Libs)**<br>**Conversation game**<br>**Charades**<br>**Letter games (e.g., Scrabble)**<br>**Circus-type game**<br>**Bingo**<br>**Nearpod/Booklet/Quizlet (can switch games)**<br>**Movement games/room-based games (e.g., musical chairs)**<br>**Point and click**<br>**RPG**<br>**Various/multiple mechanisms combined** |
| **3.2. Purpose of the Game/Material:** | **Solve a puzzle/task**<br>**Compete against others**<br>**Act out a story**<br>**Earn the most points**<br>**Develop a world/character/object**<br>**Initiate a conversation**<br>**Flashcards/reminders**<br>**Various/multiple purposes combined** |
| **3.3. Game Type by Number of Players:** | **Solo (or together with a teacher)**<br>**In pairs**<br>**Group**<br>**Entire class/unlimited**<br>**Various/multiple player options combined** |
| **3.4. Rule Explanation:** | **Explained by the teacher/students read them**<br>**Integrated into the game/material (digital materials)**<br>**Video tutorial** |

| | |
|---|---|
| **3.5. Feedback Options During the Game:** | **Provided, with explanations**<br>**Provided, without explanations**<br>**Given by peers**<br>**Not provided/unknown/must be given by the teacher** |
| **3.6. Feedback After the Game:** | **Provided, with explanations**<br>**Provided, without explanations**<br>**Not provided/unknown/must be given by the teacher** |
| **3.7. Included Game Elements:** | **Development; levels**<br>**Points; statistics**<br>**Recognition**<br>**Time pressure**<br>**Chance**<br>**Forced choice**<br>**Economy**<br>**Rarity**<br>**Social pressure**<br>**Competition**<br>**Collaboration**<br>**Reputation**<br>**Novelty**<br>**Restarting (e.g., retry after a mistake)**<br>**Puzzle/task**<br>**Goal (solution)**<br>**Emotions**<br>**Story/atmosphere; narrative**<br>**Avatar**<br>**Character/helper**<br>**Risk of losing something**<br>**Unusual interaction (e.g., marking with a peg instead of a pen)**<br>**Creation/conquest of something**<br>**Various/multiple elements combined/not applicable** |
| **4. DESIGN ASPECTS** | |
| **4.1. Adherence to Basic Design Elements** | **Composition (e.g., framing, grouping, and use of negative space)**<br>**Contrast** |

| | |
|---|---|
| | **Color compatibility**<br>**Information hierarchy**<br>**Visual graphic elements and images used appropriately for the theme**<br>**Consistent style**<br>**Collection of materials/not applicable** |
| **4.2. Font Choice and Placement Ensures Readability** | **Yes**<br>**Partially**<br>**No**<br>**No written information used/not applicable** |
| **4.3. Cognitive Load Management** | **Yes**<br>**Partially**<br>**No (overloaded)**<br>**Not applicable** |
| **Comments** | |