

DGBL in Secondary School Mathematics: A Scoping Review (2020–2025)

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Abstract: Digital game-based learning (DGBL) has received increasing attention in education as a result of the rapid development of technology and its application in education. Digital educational games are particularly attractive to students and have motivational potential. However, there is a lack of research that indicates how DGBL is used in secondary mathematics education, which typically includes students aged approximately 11 to 18 years. This scoping review analyses 21 scientific papers published from 2020 to 2025 that address the use of digital game-based learning in secondary school mathematics teaching. The aim of the paper was to thematically organize existing results, identify dominant research approaches, and highlight gaps in research. A scoping review methodology was applied following PRISMA-ScR guidelines. The literature search was conducted in the Scopus and Web of Science databases. The papers were analysed according to the themes of effectiveness, student motivation and classroom engagement, teacher perceptions and attitudes, game design, mathematical reasoning and game evaluation. The results indicate the potential of DGBL to improve educational outcomes, but also the need for thoughtful game design, teacher support, and standardized game evaluation. The key research gap relates to the lack of studies focused exclusively on secondary school mathematics teaching and the underrepresentation of vocational secondary education contexts. In conclusion, the paper provides recommendations for future research and the development of DGBL in secondary school mathematics teaching.

Keywords: DGBL, Motivation, Mathematics teaching, Scoping review, Secondary school

1. Introduction

Secondary school mathematics teachers often face low levels of student motivation, especially when the application of mathematical content in their own everyday lives is not sufficiently clear to them (Muhrman, 2022). In addition, students often have difficulties in developing a deeper understanding of mathematical content, argumentation, and mathematical reasoning. In this context, learning through digital games can contribute to overcoming the aforementioned challenges due to the interactivity of games, the possibilities of their adaptation to students' levels of knowledge, and the encouragement of their curiosity and persistence in problem-solving. Digital game-based learning (DGBL) combines educational content with engaging game mechanics that provide an interactive and motivating learning environment (Hussein et al.). DGBL could improve students' understanding and retention of mathematical concepts because it simultaneously enables learning from mistakes, experimentation, and the development of strategic thinking (Hussein et al., 2022). In the context of mathematics teaching, digital educational games can significantly contribute to the improvement of students' knowledge and skills (Pan et al, 2022), while also positively affecting cognitive, affective, and behavioural aspects of learning such as memory, attitudes, motivation, interest, and active participation in class (Hui and Mahmud, 2023; Hussein et al, 2022).

Despite the growing interest in the use of digital educational games in mathematics teaching, most existing research refers to the primary school context, while the secondary school level remains insufficiently researched (Fadda et al., 2022; Gao et al., 2020; Gui et al., 2023; Hussein et al., 2022; Wang et al., 2023). Previous systematic reviews and meta-analyses have often encompassed a wide range of educational levels and general STEM areas, without a more detailed analysis of specific methodological approaches, thematic focuses, or pedagogical implications in secondary school mathematics teaching. There is also still a lack of clearer insight into how different pedagogical, technical, and design characteristics of digital games affect cognitive, motivational, and affective learning outcomes in the secondary school context (Gui et al., 2023). Therefore, the aim of this paper is to identify and describe recent research published from 2020 to 2025 that deals with the application of digital educational games in secondary school mathematics teaching, using a scoping review of the literature. Therefore, the following research question is posed: What are the characteristics and focus of previous research on the use of digital games in secondary school mathematics teaching?

2. Methodology

2.1 Search Strategy and Identification of Studies

The systematic search strategy was conducted up to and including 2025 using methodological guidelines proposed by Peters et al. (2020). It included three main phases: identification, selection, and evaluation of inclusion criteria. In the identification phase, the scientific databases Scopus and Web of Science were searched, using the same combination of keywords in both databases: "game-based learning" OR "digital game-based learning" OR "serious games" OR "educational games" OR "video games" AND "mathematics" OR "math" AND "high school" OR "secondary school" OR "upper secondary school" OR "senior high school" OR "grades 9–12". In addition to database searching, an expert in the field of digital educational games was also consulted, who provided additional papers relevant to the topic, thereby enriching the pool of potentially includable sources. In the first phase of the search, a total of 122 articles were collected: 110 from databases and 12 from the expert. All papers were exported to Microsoft Excel, where the duplicate removal function was used. One duplicate was removed, and 121 papers proceeded to the preliminary selection phase.

2.2 Selection Process and Evaluation of Studies

A total of 121 papers were reviewed based on their titles and abstracts. In this phase, the aim was to exclude articles that did not meet the criteria of the scoping review (Figure 1). The year 2020 was set as the starting point of the time frame, when the COVID-19 pandemic triggered a global shift towards digital forms of teaching and learning. This period was marked by an “explosion” of digital educational solutions, among which digital games occupied an important place. Previous review studies (e.g. Hussein et al., 2022; Pan et al., 2022) mostly covered the period up to 2020, which is why it was necessary to extend the review to more recent studies that reflect changes in pedagogical practices, game design, and teachers’ digital competences resulting from this period.

Category	Inclusion Criteria	Exclusion Criteria
Educational level	Studies referring to the secondary school context	Studies focusing only on primary or higher education
Subject area	Focus on mathematics teaching	Focus on general STEM areas without separate data for mathematics
Type of game	DGBL	Non-digital games (e.g. board games, chess) or games without a clear educational function
Type of publication	Scientific articles and review papers ("Article" and "Review")	Other forms (e.g. editorials, conference abstracts, non-empirical contributions)
Language	Published in English	Published in other languages without an available English translation
Availability	Full text available	Full text not available
Publication period	Published between 2020 and 2025	Published before 2020

Figure 1: Inclusion and Exclusion Criteria

After the initial screening, 36 articles were assessed as potentially relevant. The full texts of two papers were not available, and they were therefore excluded from the analysis. In the third phase, a full-text reading of the papers followed (n = 34), including an analysis of conclusions, methodology, and other key sections in order to determine whether the papers met the established inclusion criteria. An additional 13 papers were excluded from the analysis because they involved (a) non-digital games, (b) undefined age groups, (c) inclusion of only students younger than 11 years, and (d) a lack of focus on mathematics teaching. A total of 21 papers were included in the final analysis (Figure 2).

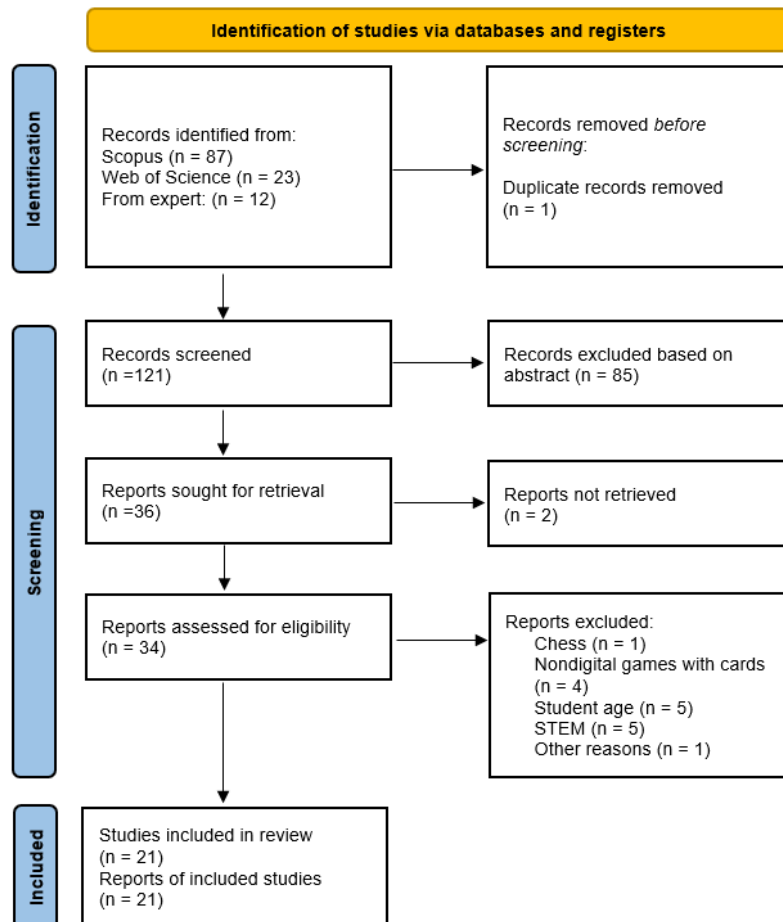


Figure 2: PRISMA-ScR Diagram

2.3 Data Extraction and Analysis

For each included paper, data were extracted on authorship, publication year, country, educational level and school type, participant characteristics, game type and purpose, research objectives, design and instruments, and key findings on DGBL in mathematics teaching. Studies spanning multiple educational levels were included if relevant to secondary education; where context was unclear, they were retained to support the scoping aim of broadly mapping evidence (Munn et al., 2018).

Data extraction and coding were conducted independently by both authors using a predefined Excel sheet, with discrepancies resolved through discussion to ensure reliability. An inductive thematic analysis (Saldaña, 2015) identified key themes: effectiveness of DGBL, student motivation and classroom activity, mathematical reasoning and problem solving, game design, pedagogical potential, and teachers' perceptions. Papers were grouped accordingly, with some assigned to multiple categories. Additionally, a descriptive analysis examined publication trends, school types, and methodological approaches. Results are presented narratively and in tables, providing a clear overview of the field and highlighting both established findings and research gaps in DGBL for secondary mathematics education.

3. Results

3.1 Descriptive Overview of Papers

This section presents different distributions of the papers included in the scoping review (Figure 3). The analysis includes: (a) the distribution of papers by year of publication, (b) participant characteristics, (c) the type of schools from which participants come, and (d) the type of research.

No.	Authors (year)	Educational level / participants / age	Aims	Type of study (design, methods)	Key findings on the effects of DGBL	Thematic focus
1	Abu Bakar et al. (2023)	Secondary school / Students / 15 years	Determine the impact of the game on students' performance and attitudes	Mixed / quasi-experiment / pre- and post-test, interview, observation	Improved performance, higher motivation and collaboration	E, T, R
2	Alabdulaziz (2023)	Secondary school / Students / 17 years	Impact on achievement, anxiety, motivation, autonomy	Quantitative / experiment / pre- and post-test	Improved achievement, motivation and autonomy; lower anxiety	E, M
3	Arzmann et al. (2023)	Primary and secondary / Students	Meta-analysis of the effect of GBL	Meta-analysis	Positive effect on cognition, motivation, behavior	E, R
4	Barbieri et al. (2021)	Primary and secondary / Teachers and students / 12–16 years	Encouraging engagement in mathematics teaching and progress in knowledge	Mixed / quasi-experimental embedded case study / pre- and post-test, questionnaire, interview, observation	Improved achievement and motivation	E, M, T
5	Christopoulos et al. (2024)	Secondary school / Students / 14–15 years	Immersion and progress in knowledge	Quantitative / quasi-experiment / pre/post-test	Progress in knowledge; immersion is not a key factor	E, M
6	Estrada Molina et al. (2022)	Primary and secondary, higher education / Students	Identify usability standards and evaluation criteria for DGBL	Systematic review	Effects are better when games are adaptive and structured	E, M
7	Hidayat et al. (2024)	Primary and secondary (vocational), higher education / Students	Determine types of online games, methodologies, contexts for Gen Z	Systematic review	DGBL improves motivation and problem solving	E
8	Hui et al. (2023)	Kindergarten to university / Students	Cognitive and affective effects of DGBL	Systematic review	Improvement in problem solving, strategic thinking, automatization	E, M, R
9	Hussein et al. (2022)	Primary and secondary (vocational) / Students	Analyse DGBL through a multidimensional framework	Systematic review	Positive effects on knowledge, motivation, behavior	E, R
10	Jensen & Skott (2022)	Primary and secondary / Students	Explore reasoning through games	Systematic review	Encourages exploration, conjectures, justifications	G, D, R
11	Jukić Matić & Jukić Bokun (2023)	Secondary school / Teachers and students / 15–18 years	Present the state and challenges in DGBL	Thematic review	Boosts motivation; challenging in secondary school	D, V
12	Jukić Matić & Marković (2025)	Secondary school / Teachers and students / 15 years	Explore engagement through DGBL and teachers' strategies	Qualitative / case study / observation, audio recordings	Increased engagement; TDS useful tool	E, D, V, R
13	Jukić Matić & Palha (2025)	Secondary school (vocational) / Teachers and students / 15–18 years	Examine potential of constructionist games	Mixed / survey	Deeper understanding, higher motivation	E, V, R
14	Jukić Matić et al. (2023)	Secondary school (vocational schools) / Teachers	Teachers' attitudes toward DGBL	Quantitative / survey	Useful tool for motivation, but predominantly for practice	E
15	Kaczmarz & Dubé (2022)	Kindergarten to secondary / Students	Effect of approaches on types of knowledge	Meta-analysis	Direct instruction most effective for factual knowledge	E, V, R
16	Karimpour et al. (2024)	Primary and secondary / Students	Impact on engagement and outcomes	Systematic review	Increases engagement; may cause anxiety	E, M
17	Magat (2023)	Secondary school (vocational) / Teachers	Examine game-based curriculum	Mixed / survey	Effective teaching tool, especially in distance learning	D, T, V
18	Mandala et al. (2025)	Secondary school (vocational) / Teachers and students / 14–15 years	Develop a game for spatial reasoning	Mixed / developmental research	Moderate improvement in spatial reasoning	E, D, V
19	Otero et al. (2024)	Secondary school / Students / 14–15 years	Role of the game in learning metric relations	Qualitative / case study	Makes abstract relations more meaningful	E, M
20	Pan (2022)	Primary and secondary / Students	Effect of games on motivation, interest, achievement	Systematic review	Increased motivation; better understanding of fractions	E, D, R
21	Saal et al. (2025)	Primary and secondary / Teachers	Factors influencing adoption of DGBL	Qualitative / interviews	Facilitates engagement; reduces workload	E, M, T

E = effectiveness, D = game design, M = motivation, T = teacher perceptions, V = evaluation, R = mathematical reasoning

Figure 3: Studies included in the scoping review

3.1.1 Distribution of papers by year of publication

The analysis of the distribution of papers by year of publication (Figure 4) covers the period from 2020 to 2025. The aim of this analysis was to determine whether there are trends in the publication of research on the use of digital educational games in mathematics teaching in secondary schools and whether there has been an increase in scientific interest in this topic during the observed period. The highest number of papers was recorded in 2023, which can be linked to the consequences of the pandemic and post-pandemic period, during which there was an accelerated development and implementation of digital educational technologies in teaching.

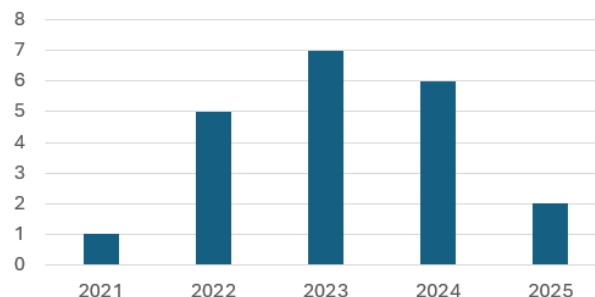


Figure 4: Distribution of Papers by Year of Publication (2020–2025)

3.1.2 Focus according to participants and type of school

In the analysis of the included studies, it is particularly important to understand who the groups targeted by the research are, that is, who the researchers focused on when examining the use of digital games in mathematics teaching (Figure 3). Of the total of 21 papers included in this review, nine were conducted exclusively in the secondary school context, while several papers also included students from other educational levels. For example, six papers include combined samples of primary and secondary school students, and three papers even include the higher education level. In addition to studies focused on students, three papers deal exclusively with mathematics teachers. Five papers include both students and teachers as participants, which enabled a two-way insight into the use of digital games in teaching, on the one hand through the student experience, and on the other through teaching practices and professional reflections.

With regard to the educational context, that is, the type of secondary school, six papers clearly state that the research refers to students from general education schools, while four papers refer to students from vocational schools. The remaining papers use the broad term “secondary education” without specifying the school level or educational programme. These data indicate that the general education context is better researched, while vocational education is still insufficiently represented.

3.1.3 Types of papers according to methodological characteristics

For the purpose of a better understanding of the methodological characteristics of the analysed papers, a categorisation of studies was conducted according to the type of scientific research, research design, and methods of data collection applied by the authors (Figure 3).

A total of ten papers belong to secondary studies. Among them, seven are systematic reviews that analyse previous research on the effects of digital educational games, with an emphasis on cognitive and affective aspects of learning, methodological approaches, types of games, and evaluation criteria. Such papers contribute to the systematisation of knowledge and often serve as a starting point for future empirical research. Two papers represent meta-analyses that, through a quantitative approach, combine the results of multiple studies, enabling a more reliable assessment of the overall effect of DGBL on different learning outcomes. One paper is classified as a thematic (narrative) review, whose aim is to synthesise existing literature without a strictly defined analytical protocol, offering a descriptive and interpretative contribution.

Among empirical studies, two papers use a case study as the primary research design, relying on qualitative methods for a deeper analysis of specific educational situations in which digital game-based learning is applied. Four papers apply a quasi-experimental design, most often in the form of a pre-test–post-test approach, combining the measurement of student achievement and questionnaires for assessing motivation, and sometimes observation or interviews as additional methods. An experimental design was recorded in only one paper, which indicates methodological challenges in conducting controlled experiments in educational contexts, such as ethical limitations, difficulties with randomisation, and organisational obstacles. Three papers use a survey to examine the potential of DGBL in new contexts, while one paper is based on semi-structured interviews.

3.2 Thematic Overview of Recent Research on DGBL in Secondary School Mathematics Teaching

3.2.1 Effectiveness of digital games in mathematics teaching

The majority of studies included in this review report positive effects of DGBL on mathematics learning. Hussein et al. (2022) conclude that digital educational games contribute to improved learning outcomes compared to traditional instruction, including higher achievement, increased motivation, deeper conceptual understanding, enhanced problem-solving skills, more positive attitudes towards mathematics, and greater learner autonomy. Similar conclusions are reported by Karimov et al. (2024), whose umbrella review highlights the motivational potential of serious games and their capacity to support cognitive development and educational achievement. Furthermore, Kacmaz and Dubé (2022) emphasise that well-designed games can effectively support the development of factual, procedural, and conceptual mathematical knowledge. Despite these generally positive findings, several studies report more complex or even contradictory results. Jensen and Skott (2022) argue that some forms of game-based mathematical activity, particularly those focused primarily on task completion, may encourage procedural rather than conceptual engagement and therefore have limited impact on mathematical reasoning. Similarly, Karimov et al. (2024) note that digital educational games do not consistently lead to improved learning outcomes and may, in some cases, be associated with demotivation, anxiety, or only modest

educational benefits. These findings suggest that the effectiveness of DGBL cannot be assumed and may depend on factors beyond the mere presence of game elements.

The variability of findings across studies may be explained by differences in game design, pedagogical implementation, and contextual factors. Several authors emphasise that the alignment between game mechanics and mathematical learning objectives is crucial for achieving meaningful learning outcomes (Kacmaz & Dubé, 2022). Likewise, teacher mediation appears to play an important role, particularly when supporting reflection, reasoning, and connections between gameplay and mathematical concepts (Jensen & Skott, 2022). Factors such as school type, student age, technological infrastructure, and teacher digital competence may further influence the effectiveness of DGBL implementations. The overall evidence suggests that DGBL has considerable potential to enhance mathematics learning, but its effectiveness depends strongly on the quality of game design, pedagogical integration, and contextual support.

3.2.2 Student motivation and classroom activity

As another important theme in the analysed papers, student motivation and classroom activity were highlighted. In eight papers, it is emphasised that digital games contribute to an increase in students' intrinsic motivation, their greater interest in mathematics, and more active participation in the teaching process. Students are particularly motivated by elements of challenge, rewards, and story within the game. Arzmann et al. (2024) state that "students showed a higher level of activity and motivation when mathematical activities were structured through a game". Barbieri et al. (2023) emphasise that games "encourage intrinsic motivation because students experience challenges and rewards within the narrative structure of the game". Jensen and Skott (2022) point out that digital educational games can increase student activity and persistence, even when solving more complex mathematical tasks, especially when tasks are contextualised and connected to the rules of the game.

3.2.3 Mathematical reasoning and problem solving

Among the analysed papers, eight papers dealt with mathematical reasoning and problem solving (Figure 3). This thematic category stands out as particularly important because it includes the development of higher cognitive processes, strategic thinking, and the ability to achieve a deeper understanding of mathematical concepts, which goes beyond mere reproduction of knowledge or playing for entertainment. The analysed papers emphasise the importance of digital educational games in encouraging students to experiment, learn from mistakes, and actively solve problem situations. According to Jukić Matić and Palha (2025), digital games enable students to "experiment and learn based on their own mistakes, which contributes to a deeper understanding of mathematical relationships". Similarly, Hussein et al. (2022) point out that DGBL can facilitate the transfer of acquired knowledge to real problem tasks, thereby fostering functional mathematical literacy. Jensen and Skott (2022) identified five ways in which digital games can promote mathematical reasoning: (1) developing winning strategies, (2) exploring problem situations within a story, (3) experimenting with different parameters, (4) designing their own games with mathematical content, and (5) formulating hypotheses. However, they warn that elements such as argumentation of procedures and the presentation of proofs are still largely conditioned by teacher support, which indicates the importance of their role in guiding students and their reflection. Arzmann et al. (2023), in their meta-analysis, conclude that students who learn through DGBL achieve significantly better results in mathematics compared to those who use traditional methods. On the other hand, Abu Bakar et al. (2023) emphasise increased cognitive and content engagement of students when using digital educational games, which indicates the broader educational potential of DGBL in the context of mathematical reasoning and problem solving.

3.2.4 Design of digital mathematics games

Several studies (n = 7) clearly stand out by focusing on the design of digital games in the context of mathematics teaching (Figure 3). The central questions in these papers relate to the alignment of game mechanics with pedagogical objectives, the promotion of interactive and meaningful learning, and ensuring flexibility in accordance with different levels of students' prior knowledge. Jensen and Skott (2022) emphasise the importance of design solutions that enable experimentation, promote mathematical reasoning, and ensure inclusivity, that is, adaptability to different student profiles. In an extensive analysis, Pan et al. (2022) identified 33 different digital games with mathematical content, of which only five were explicitly intended for secondary school students. The analysis indicates the dominance of games based on behaviourist principles of learning through repetition and practice (drill-and-practice), while games based on constructivist and experiential learning models are significantly less common, although they are pedagogically more valuable. In the context of

design, Jukić Matić and Palha (2025) emphasise the importance of constructionist-oriented games, which go beyond passive reproduction of knowledge and encourage students to engage in active learning by creating their own solutions. In such games, students take on the roles of designers and researchers, whereby mathematical concepts are not presented as ready-made content, but are gradually constructed through experimentation, students' mistakes, and reflection. The authors emphasise that this approach has the greatest potential for the development of deeper mathematical understanding and creative thinking, but at the same time warn of its limited representation in teaching practice and scientific literature.

3.2.5 Evaluation of the quality and pedagogical potential of digital educational games

The quality and pedagogical potential of digital educational games were addressed in six analysed papers (Figure 3). In these papers, evaluation is approached from different perspectives: from technical and design aspects to educational effectiveness and student activity. For example, in the study by Magat (2023), a mobile educational game in the field of statistics and probability was evaluated using two evaluation instruments: MARS (Mobile App Rating Scale), which assesses engagement, functionality, aesthetics, and information quality of the application, and GMCET (Gamified Mobile Courseware Evaluation Tool), which includes criteria such as the quality of educational content, clarity of educational objectives, presentation of content, possibilities for knowledge assessment, and overall usability. The evaluation was conducted by IT experts, mathematics teachers, and professional mathematicians. While IT experts gave moderately positive ratings, teachers and mathematicians rated the game very positively across all categories. It was highlighted that elements such as reward systems, clear objectives, and personalised feedback contribute to greater motivation and student activity. Mandala et al. (2025) conducted an evaluation of the geometry game GEMBI AR, involving students, teachers, and external experts in the process. The evaluation was based on the practicality of using the game and its educational effectiveness, and the results showed improvements in students' spatial reasoning as well as high acceptance of the game among all participants in the study. Jukić Matić and Palha (2024) applied two theoretical frameworks for game evaluation: the SAMR model (Substitution, Augmentation, Modification, Redefinition), which is used to assess the level of technological integration in teaching, and the ICAP model (Interactive, Constructive, Active, Passive), which measures the level of students' cognitive engagement. The results indicate positive effects of games on collaboration, innovation, and student motivation, but also highlight challenges such as unclear rules and the need to improve game design. Kacmaz and Dubé (2022) emphasise the importance of evaluation that, in addition to measuring knowledge, includes monitoring student activity, motivation, and attitudes towards learning through digital games. Similar conclusions are drawn by Pan et al. (2022), who advocate a multidimensional approach to evaluation, which should include three key components: pedagogical impact, game design, and user experience.

3.2.6 Teachers' perceptions and attitudes

Teachers' perceptions and attitudes were analysed in only four papers (Figure 3), although they play a key role in the implementation of digital educational games in mathematics teaching. The results of the included studies indicate a complex combination of enthusiasm and scepticism, with teachers recognising the potential of digital educational games, but also expressing concerns about various obstacles to their implementation. For example, Abu Bakar et al. (2023) highlight that teachers generally believe that DGBL can increase student activity in class, but at the same time emphasise the need for additional professional development and institutional support for teachers. Jensen and Skott (2022) also point out that teachers' attitudes vary considerably, with some approaching digital games with enthusiasm and others with scepticism, which largely depends on their experience with technology and prior use of games in teaching.

4. Discussion and Conclusion

This paper presents a scoping review of research on DGBL in secondary school mathematics education published between 2020 and 2025. The findings indicate that DGBL has considerable potential to enhance teaching effectiveness, student motivation, classroom engagement, and the development of mathematical reasoning. Studies reporting positive effects are predominantly quasi-experimental and typically compare DGBL with traditional instruction; however, outcomes vary depending on context, game type, and implementation. Thematic analysis further suggests that digital games can foster higher levels of cognitive engagement. The teacher's role emerges as a critical factor in successful implementation.

Despite the growing body of literature, relatively few studies focus specifically on secondary education or address mathematics teachers' attitudes and professional needs regarding DGBL. In addition, constructionist approaches within digital game contexts and their contribution to 21st-century skills, such as problem solving,

creativity, and critical thinking (Hussein et al., 2022; Jukić Matić and Palha, 2025), remain underexplored. Game evaluation is another insufficiently developed area: most studies emphasize either user perceptions or learning outcomes, while integrated approaches are rare (Magat, 2023). Moreover, there is a lack of standardized, theoretically grounded instruments for assessing the pedagogical value of digital games. The predominance of short-term interventions further limits understanding of long-term effects on learning and motivation.

The effectiveness of DGBL depends strongly on design quality and implementation. However, some studies lack important methodological details, such as participant characteristics, game description, intervention duration, or learning outcomes, hindering robust conclusions. Overall, research in this area remains limited, particularly in vocational education, long-term impact studies, and systematic game evaluation. Further research is therefore needed to strengthen both theoretical frameworks and pedagogical applications of DGBL.

4.1 Research Limitations

This scoping review has several methodological limitations. The literature search was limited to two databases; future work should include additional sources (e.g., ERIC, Google Scholar, Education Research Complete) and non-English studies to reduce bias and improve representativeness. Some included studies involved primary or university students, which may limit precision regarding secondary education. However, they were retained because they include secondary-age participants and help capture a broader view of DGBL in mathematics across transitional educational stages, consistent with recommended scoping review practices (Munn et al., 2018; Peters et al., 2020).

Ethics Declaration: Ethical clearance was not required for the research.

AI Declaration: AI was used to edit the translation.

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