

Digital Games and Mathematical Engagement

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Abstract

This qualitative study explores the impact of integrating digital games into mathematics instruction on students' learning motivation and teachers' teaching motivation in Arab elementary schools in Israel, from the perspectives of mathematics teachers. The study aims to examine teachers' perceptions of the pedagogical purposes underlying the use of digital games, the challenges associated with their classroom integration, and their perceived influence on both students' engagement and motivation, as well as teachers' professional enthusiasm and instructional practices.

Adopting an interpretive qualitative research design, the study draws on in-depth semi-structured interviews conducted with twenty mathematics teachers working in diverse Arab elementary school settings. The data were analyzed using thematic analysis, allowing for the identification of central themes related to teachers' beliefs, instructional goals, motivational outcomes, implementation strategies, and contextual challenges.

The findings indicate that mathematics teachers perceive digital games as interactive and effective instructional tools that enhance students' understanding of mathematical concepts, increase classroom participation, and foster positive attitudes toward learning mathematics. Teachers reported that digital games support the simplification of abstract concepts, promote active learning, and contribute to increased student motivation, particularly among learners with learning difficulties. In addition, the integration of digital games was found to positively influence teachers' own motivation, encouraging instructional innovation and greater engagement in the teaching process. Despite these benefits, the study highlights several challenges that hinder effective implementation, including limited technological infrastructure, classroom management concerns, curricular constraints, and cultural and social factors that affect the widespread adoption of digital games in Arab elementary schools.

The study concludes that integrating digital games into mathematics education represents a valuable opportunity to enhance teaching quality and learning motivation in Arab elementary schools, provided that supportive and sustainable educational

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conditions are established. The findings emphasize the need for institutional support, ongoing professional development for teachers, the provision of adequate technological resources, and the development of culturally and linguistically appropriate Arabic digital game content to ensure meaningful and effective integration.

Keywords

Digital games; Mathematics education; Learning motivation; Teacher motivation; Game-based learning; Elementary education; Arab schools in Israel.

Introduction

Mathematics is widely regarded as one of the most challenging school subjects and is often perceived by students as difficult or even intimidating. As a core component of school curricula worldwide, mathematics plays a critical role in shaping students' academic achievement and future educational and professional trajectories (Li & Schoenfeld, 2019). Nevertheless, numerous studies have indicated that learning mathematics frequently involves significant difficulties, which may result in repeated experiences of frustration, reduced motivation, and, in some cases, aversion toward the subject (Doabler et al., 2022; Finesilver et al., 2022; Rojo et al., 2022). One of the central challenges in mathematics education lies in actively engaging students in the construction of mathematical knowledge through problem solving and deep conceptual understanding, while avoiding traditional transmission-based approaches that may hinder cognitive development and meaningful learning (Hendriana et al., 2018; Hibi, 2017; Hibi, 2018; Hibi, 2022b; Hibi, 2022c; Merritt et al., 2017).

Within this context, digital game-based learning has emerged as a contemporary pedagogical approach aimed at promoting effective and meaningful learning by integrating educational content with interactive and motivating game elements. This approach is particularly relevant in elementary education, a foundational stage in which students' attitudes toward learning and motivation are formed. Digital games are considered powerful tools for capturing students' interest, fostering engagement, and encouraging active participation through challenge, exploration, and creativity. Despite these advantages, mathematics instruction in many educational settings continues to rely heavily on traditional teaching methods, which often contribute to repeated learning difficulties and low motivation among students.

In Arab elementary schools in Israel, teachers face additional challenges related to the implementation of innovative instructional approaches, including the integration of digital games in mathematics teaching. These challenges are situated within a broader context of rapid technological advancement and increasing expectations for schools to cultivate diverse skills and enhance learning experiences. Contemporary educational discourse emphasizes the need to transform learning into an active and dynamic process that encourages exploration, innovation, and student-centered engagement. In this

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regard, digital games represent an effective pedagogical tool for simplifying complex mathematical ideas, increasing students' interaction with content, making mathematics more enjoyable and accessible, and fostering critical thinking and problem-solving skills (Al-Malki, 2021; Hibi, 2020; Hibi, 2021a; Hibi, 2022d; Hibi, 2022g).

Moreover, recent developments in educational technology have contributed to reshaping learning environments into interactive and dynamic spaces that promote meaningful engagement and sustained motivation. These developments also highlight the importance of strong pedagogical relationships between teachers and students, as such relationships play a vital role in deepening understanding and addressing learners' diverse needs. Research underscores that fostering supportive teacher–student relationships are essential for creating effective and sustainable learning experiences, particularly when integrating innovative teaching strategies. Accordingly, educational studies continue to emphasize the value of instructional approaches that provide enjoyable, motivating learning experiences and contribute to the development of students' critical and creative thinking, as well as essential life skills required in the contemporary era (Al-Zaidi, 2011; Hibi, 2021b; Hibi, 2021f; Hibi, 2022a; Hibi, 2022e).

It is also important to note that the extent to which schools adopt and effectively utilize digital learning management systems and technological tools is strongly influenced by organizational culture. Organizational culture reflects institutional attitudes toward innovation and continuous learning, and research suggests that schools with supportive and innovation-oriented cultures are more likely to integrate technology effectively in pursuit of educational goals (Blau & Hameiri, 2016; Hibi, 2021c; Hibi, 2021d; Hibi, 2022f). In this study, a qualitative research approach was employed to examine contemporary educational practices among Arab elementary school teachers and to analyze data derived from in depth interviews with mathematics teachers. This approach aimed to achieve a deeper understanding of teachers' perspectives and experiences, as well as to identify factors influencing pedagogical practices and contributing to the development of educational policies (Harasim, 2012; Hibi, 2021e; Hibi, 2022f; Hibi, 2024d; Hibi, 2025a). Although a substantial body of literature addresses games and motivation (Detrovics et al., 2011), research specifically focusing on digital game-based learning and motivation within elementary mathematics education remains relatively limited.

In light of this gap, the present study seeks to explore the reality of integrating digital game-based learning in mathematics instruction in Arab elementary schools in Israel, from the perspectives of mathematics teachers. The study aims to investigate the perceived impact of this instructional approach on students' learning motivation, to identify the challenges that hinder its effective implementation, and to highlight the potential benefits of integrating digital games into the educational system. Within a similar framework, contemporary educational reforms increasingly emphasize preparing students to cope with modern challenges and changes by developing learning skills and life competencies essential for success in contemporary society. Accordingly,

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this study represents a step toward a deeper understanding of the role of digital games in education and toward opening new avenues for improving learning environments and instructional practices in ways that align with students' needs in the digital age. Previous research has also emphasized the potential of technology and innovative pedagogical approaches to enhance teaching and learning processes (Hanin, 2021; Hibi, 2024a; Hibi, 2024b; Hibi, 2025d; Hibi, 2025g).

From this perspective, the present study aims to address a clear theoretical and empirical gap in the Arabic-language educational literature by focusing on the experiences of mathematics teachers in Arab elementary schools in Israel regarding the use of digital games. By analyzing teachers' viewpoints on the effects of digital games on students' learning motivation and on teachers' own teaching motivation, this qualitative study seeks to provide a comprehensive and contextually grounded understanding of the opportunities and challenges associated with integrating digital games into mathematics education. Recent studies suggest that digital technologies are fundamentally reshaping students' learning habits, necessitating the development of new pedagogical strategies that respond to these transformations and enhance learning motivation and effectiveness (Yossel-Eisenbach & Davidovitch, 2022). Ultimately, this study aspires to contribute to the development of educational policy and the promotion of innovative teaching practices that align with contemporary educational demands and address the needs of both students and teachers.

Theoretical Background

Key Definitions

Digital Games in Mathematics Education

Educational digital games are contemporary technological tools employed in educational contexts to achieve specific instructional objectives within an interactive, play-based environment. In mathematics education, digital games contribute to the concretization of abstract concepts by presenting them in engaging and meaningful contexts that allow students to interact, practice repeatedly, and learn through trial and error, thereby supporting deep conceptual understanding and the development of mathematical skills (Ahmadi & Ahmadi, 2023, p. 41). According to Ahmad Al-Tayyib (2021), digital games are built upon interactive structures governed by predefined rules within closed electronic environments and are designed to foster a range of mathematical concepts, including geometric and logical skills. Similarly, Ibrahim and Al-Sulaiman (2025) argue that educational digital games represent a form of active, student-centered learning, in which learners perform structured actions within enjoyable and competitive environments to achieve clearly defined educational goals. Salem (2022) further emphasizes that digital games integrate learning and entertainment into an interactive model aimed at enhancing students' motivation and attitudes toward mathematics. Omar (2025) characterizes digital games as interactive

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instructional approaches that present mathematical content in engaging ways that capture students' attention and facilitate comprehension, while Al-Ghamdi (2025) highlights that the alignment between game mechanics and instructional objectives is a critical determinant of the effectiveness of digital games, particularly when supported by appropriate teacher guidance.

Students' Learning Motivation

Learning motivation constitutes a fundamental pillar of the educational process and refers to the internal or external psychological forces that drive students to engage actively in learning activities, whether stemming from intrinsic curiosity or extrinsic rewards and achievement goals (Ahmadi & Ahmadi, 2023, p. 40; Kim et al., 2017). Numerous studies have demonstrated that digital games play a significant role in enhancing learning motivation by providing enjoyable environments that incorporate challenge, immediate feedback, rewards, and interaction, leading to increased participation and improved academic performance (Behnamnia et al., 2020; Keller, 2008; Russo et al., 2021; Reinders & Wattana, 2015). Research has also shown that students exhibit behaviors indicative of heightened intrinsic motivation during gameplay, such as persistence, sustained attention, enjoyment, and willingness to overcome challenges, all of which enhance the effectiveness of digital games as motivational learning tools (Robson, 2014; Behnamnia et al., 2020, pp. 8–9). Moreover, digital games have been found to reduce mathematics related anxiety by transforming abstract mathematical content into enjoyable learning experiences (Ahmadi & Ahmadi, 2023, p. 41). However, the motivational impact of digital games depends not only on their design features but also on their alignment with instructional objectives and the teacher's role in facilitation, guidance, and continuous reinforcement (Hibi, 2024c; Hibi, 2024e; Hibi, 2025b; Hibi, 2025c; Zirawaga et al., 2017).

Teachers' Motivation to Use Digital Games

Teachers' motivation refers to their psychological and professional readiness to adopt innovative instructional strategies, and this readiness plays a decisive role in the successful integration of digital tools into classroom practice. Studies indicate that the use of digital games not only motivates students but also enhances teachers' enthusiasm for experimenting with new teaching approaches and instructional technologies (Hayak & Avidov-Ungar, 2023, p. 246; Behnamnia et al., 2020, p. 9). Teachers' motivation to use digital games is influenced by several factors, including digital competence, beliefs about instructional effectiveness, and the level of institutional support available. Prior research demonstrates that professional development opportunities and organizational support directly affect teachers' willingness to integrate digital games into mathematics instruction (Abed Algani et al., 2021; Li, 2017; Shamma, 2021, p. 3297). Although many teachers acknowledge the potential of digital games to attract students' attention, challenges related to time constraints, limited resources, and insufficient training continue to impede their widespread adoption (Russo et al., 2021, p. 413). Nonetheless,

teachers who hold positive attitudes toward digital games often exhibit high intrinsic motivation and a strong desire to improve teaching quality and student engagement (Hibi, 2025e; Hibi, 2025f; Shamma, 2021, p. 3301).

Mathematics Education in Arab Elementary Schools in Israel

Teaching mathematics in Arab elementary schools in Israel involves a range of pedagogical challenges, most notably low student motivation and difficulties in fostering active engagement with abstract mathematical concepts. In response to these challenges, educators increasingly seek innovative instructional tools that can transform learning environments into interactive and motivating spaces. Educational digital games have emerged as a prominent strategy due to their capacity to merge entertainment with learning, present mathematical content in engaging formats, support conceptual understanding, and increase students' enthusiasm for learning mathematics.

Theoretical Frameworks Underpinning the Study

Game Based Learning Theory

Game-based learning theory is grounded in the premise that recreational activities particularly digital games extend beyond mere entertainment to function as advanced interactive learning tools. Scholars such as Prensky (2001) argue that games create motivating learning environments characterized by challenge and enjoyment, which promote active student engagement and enhance learning effectiveness. This perspective suggests that digital game environments enable learners to interact with educational tasks at varying levels of complexity, thereby supporting gradual cognitive and academic development. Gee (2009) emphasizes the unique affordances of digital games in allowing students to learn at their own pace while receiving immediate feedback that facilitates self-regulation and continuous improvement. These features contribute to the development of critical thinking by encouraging decision-making, experimentation, trial and error, and exploratory learning processes essential for understanding abstract mathematical concepts. Furthermore, Williams-Pierce (2019) highlights that game-based learning supports the development of higher-order cognitive skills, including problem-solving, logical reasoning, and creativity, which are particularly relevant to mathematics education. In the present study, game-based learning theory serves as a conceptual lens for analyzing teachers' experiences with digital games and understanding how these tools transform classrooms into active learning environments that promote deep engagement rather than superficial entertainment.

Self Determination Theory

Self Determination Theory (SDT), developed by Ryan and Deci (2000), provides a robust framework for understanding the sources of intrinsic motivation in educational

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settings. The theory posits that motivation is enhanced when three fundamental psychological needs are satisfied: competence, autonomy, and relatedness. Competence refers to learners' perceptions of their ability to succeed and overcome challenges; findings from teacher interviews suggest that digital games offer progressively challenging tasks that align with students' skill levels, thereby enhancing academic confidence and perceived competence. Autonomy is reflected in students' freedom to make choices and control their learning pathways within game environments, as digital games often allow learners to progress at their own pace and select strategies independently. Relatedness pertains to the sense of social connection and belonging, which is fostered through collaborative gameplay, peer interaction, and constructive competition. Drawing on SDT, the present study examines how digital game-based learning environments enhance both students' and teachers' motivation by supporting intrinsic engagement, professional satisfaction, and sustained involvement in the teaching–learning process.

Methodology

Research Design

This study adopted a qualitative interpretive research design aimed at gaining an in-depth understanding of mathematics teachers' perceptions regarding the integration of digital games in elementary mathematics instruction and its influence on learning and teaching motivation. A qualitative approach was deemed appropriate, as it allows for the exploration of participants' experiences, beliefs, and meanings within their authentic educational contexts. Such an approach is particularly suitable for examining complex pedagogical phenomena that are shaped by contextual, cultural, and social factors (Harasim, 2012).

By focusing on teachers' narratives and reflections, the study sought to capture the nuanced ways in which digital games are perceived, implemented, and evaluated in everyday classroom practice. This design aligns with interpretive research traditions that emphasize understanding educational practices from the perspectives of those directly involved, rather than measuring outcomes through predetermined variables.

Participants

The study sample consisted of twenty mathematics teachers (male and female) working in Arab elementary schools in Israel. Participants were purposefully selected to represent a range of educational settings, professional experience levels, and school environments, thereby enhancing the richness and diversity of perspectives. All participants were actively teaching mathematics at the elementary level and had varying degrees of experience with digital technologies and digital game-based instruction.

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Participation in the study was voluntary, and teachers were informed of the study's objectives prior to data collection. Ethical considerations were addressed by ensuring participants' anonymity and confidentiality, and all data were used solely for research purposes.

Data Collection Instrument

Data were collected through in depth semi structured interviews, which enabled participants to express their views freely while allowing the researcher to probe specific issues related to the study's objectives. The interview protocol included open ended questions focusing on several key areas: teachers' conceptualizations of digital games in mathematics education, perceived pedagogical goals of using digital games, experiences with classroom implementation, perceived effects on students' learning motivation and engagement, perceived effects on teachers' own motivation and instructional practices, and challenges associated with integrating digital games into mathematics teaching.

Semi structured interviews were selected as the primary data collection method because they offer a balance between consistency across participants and flexibility to explore emerging themes in greater depth. This approach facilitated the collection of rich, detailed data reflecting teachers' authentic experiences and professional judgments.

Procedure

The interviews were conducted individually with each participant at times and locations convenient for the teachers, ensuring a comfortable and open conversational environment. Each interview lasted approximately 45–60 minutes and was conducted in the participants' preferred language to allow for clear and nuanced expression. With participants' consent, interviews were audio-recorded and later transcribed verbatim for analysis.

Throughout the data collection process, the researcher maintained a reflective stance, documenting observations and emerging insights to support analytic rigor and reflexivity. This iterative process allowed for continuous refinement of interview prompts and facilitated deeper engagement with the data.

Data Analysis

The interview data were analyzed using thematic analysis, following a systematic process of coding, categorization, and theme development. Initially, transcripts were read multiple times to achieve immersion in the data and to identify meaningful units related to the research questions. These units were then coded inductively, allowing themes to emerge from the data rather than being imposed a priori.

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Subsequently, codes were organized into broader categories representing central themes, such as pedagogical objectives, motivational effects, instructional practices, and implementation challenges. This analytic process enabled the identification of recurring patterns and relationships across participants' responses, while also preserving individual variations in perspective. The use of thematic analysis supported a comprehensive and coherent interpretation of teachers' experiences and perceptions.

Trustworthiness and Rigor

To enhance the trustworthiness of the findings, several strategies were employed. These included prolonged engagement with the data, careful documentation of analytic decisions, and the use of rich, descriptive excerpts to support interpretations. The researcher also engaged in reflexive practices to acknowledge and critically examine potential biases throughout the research process. Such strategies are widely recognized as essential for ensuring credibility, dependability, and confirmability in qualitative research.

Findings

This section presents the findings derived from the thematic analysis of in-depth interviews with mathematics teachers in Arab elementary schools in Israel. The analysis revealed several interrelated themes reflecting teachers' perceptions of digital games in mathematics education, their pedagogical purposes, their influence on students' learning motivation and classroom engagement, their impact on teachers' own motivation, and the challenges associated with implementation.

Perceived Pedagogical Value of Digital Games

Teachers consistently described digital games as effective and interactive instructional tools that contribute to enhancing students' understanding of mathematical concepts. Participants emphasized that digital games facilitate the presentation of abstract ideas in concrete and visually engaging formats, enabling students to grasp concepts more easily and meaningfully. Many teachers noted that digital games support learning through repetition, experimentation, and trial and error, which allows students to learn at their own pace and build confidence in their mathematical abilities.

Several teachers highlighted that digital games serve as a bridge between traditional curriculum content and contemporary technological practices. According to participants, this integration helps modernize mathematics instruction while maintaining alignment with curricular objectives. Teachers viewed digital games not as a replacement for conventional teaching, but as a complementary tool that enriches instruction and diversifies pedagogical strategies.

Impact on Students' Learning Motivation and Engagement

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A prominent theme emerging from the data concerned the positive impact of digital games on students' learning motivation. Teachers reported noticeable increases in students' enthusiasm, interest, and willingness to participate during mathematics lessons that incorporated digital games. Many participants indicated that students who were previously disengaged or reluctant to participate became more active and involved when learning activities were presented in a game-based format.

Teachers also observed that digital games were particularly beneficial for students with learning difficulties or low academic confidence. According to participants, these students demonstrated greater persistence, reduced anxiety toward mathematics, and increased willingness to attempt problem-solving tasks when digital games were used. The interactive and non-threatening nature of game-based learning environments was perceived as enabling students to experience success without fear of failure or negative evaluation.

In addition, teachers noted that digital games promoted collaborative learning and positive peer interaction. Game based activities encouraged discussion, cooperation, and constructive competition among students, thereby contributing to a more dynamic and inclusive classroom climate.

Influence on Teachers' Motivation and Instructional Practices

Beyond their effects on students, digital games were found to have a positive influence on teachers' own motivation and professional engagement. Many participants reported that integrating digital games into their lessons renewed their enthusiasm for teaching mathematics and encouraged them to explore innovative instructional approaches. Teachers expressed a sense of professional satisfaction when observing increased student engagement and improved classroom dynamics.

Several teachers indicated that the use of digital games prompted them to reflect on their teaching practices and to adopt more student centered approaches. Digital games were perceived as tools that support instructional creativity and flexibility, allowing teachers to tailor activities to students' needs and learning levels. In this sense, the integration of digital games was associated with enhanced teacher agency and a greater sense of ownership over instructional design.

Challenges and Barriers to Implementation

Despite the perceived benefits, teachers identified multiple challenges that hinder the effective integration of digital games in mathematics instruction. A recurring theme was the lack of adequate technological infrastructure, including insufficient access to digital devices, unreliable internet connectivity, and limited technical support within schools. These constraints were described as particularly pronounced in some Arab elementary school contexts.

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Classroom management concerns also emerged as a significant challenge. Some teachers expressed apprehension about maintaining control and ensuring focused learning during game-based activities, particularly in larger classes. Additionally, participants noted that curricular pressures and time constraints often limited opportunities to incorporate digital games consistently within the rigid structure of the mathematics curriculum.

Cultural and social factors were also highlighted as potential barriers. Teachers pointed to varying attitudes among parents and school administrators toward the use of digital games, with some perceiving them as distractions rather than legitimate educational tools. Furthermore, participants emphasized the scarcity of culturally and linguistically appropriate Arabic digital game content, which they viewed as essential for meaningful integration in Arab elementary schools.

Need for Institutional Support and Professional Development

Across interviews, teachers stressed the importance of institutional support in facilitating the effective use of digital games. Participants called for clearer educational policies, improved technological infrastructure, and ongoing professional development opportunities focused on digital pedagogy and game-based learning. Teachers emphasized that systematic training would enhance their confidence, technical competence, and pedagogical skills, thereby enabling more purposeful and effective integration of digital games into mathematics instruction.

Discussion

The purpose of this study was to explore mathematics teachers' perceptions of integrating digital games into elementary mathematics instruction in Arab schools in Israel, with particular attention to their impact on students' learning motivation and teachers' teaching motivation. The findings provide meaningful insights into how digital game-based learning is perceived and enacted within this educational context, and they align with, while also extending, existing research in mathematics education and educational technology.

Digital Games as Motivational and Pedagogical Tools

The findings indicate that teachers perceive digital games as powerful instructional tools that enhance students' motivation and engagement in mathematics learning. This perception is consistent with prior research suggesting that game-based learning environments promote enjoyment, curiosity, and active participation, which are essential components of intrinsic motivation (Prensky, 2001; Gee, 2005; Williams-Pierce, 2019). Teachers' accounts revealed that digital games transform mathematics lessons from traditional, teacher-centered activities into interactive experiences that encourage exploration, experimentation, and sustained engagement.

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Moreover, teachers emphasized that digital games facilitate the simplification of abstract mathematical concepts and support conceptual understanding. This finding aligns with studies indicating that visual, interactive representations help students make sense of complex ideas and foster deeper learning (Ahmadi & Ahmadi, 2023; Bråting & Kilhamn, 2022). By allowing students to learn through trial and error in a non-threatening environment, digital games appear to reduce mathematics-related anxiety and promote positive attitudes toward the subject, a phenomenon widely documented in the literature (Shamma, 2021; Hayak & Avidov-Ungar, 2023).

Implications for Students' Learning Motivation

Teachers' perceptions highlight a strong relationship between the use of digital games and increased student motivation, particularly among students who previously exhibited low engagement or learning difficulties. These findings resonate with Self-Determination Theory (Ryan & Deci, 2000), which emphasizes the importance of competence, autonomy, and relatedness in fostering intrinsic motivation. Digital games were perceived to support students' sense of competence by offering graduated challenges and immediate feedback, autonomy by enabling self-paced learning and choice, and relatedness through collaborative and social gameplay.

The reported increase in students' persistence, willingness to participate, and reduced fear of making mistakes suggests that digital games create psychologically safe learning environments. This observation is consistent with earlier research demonstrating that game-based learning can promote productive struggle and sustained effort, both of which are crucial for meaningful mathematical learning (Behnamnia et al., 2020; Robson, 2014). Importantly, teachers viewed these motivational benefits as extending beyond short-term engagement, contributing to more positive long-term dispositions toward mathematics learning.

Influence on Teachers' Motivation and Professional Practice

An important contribution of this study lies in its focus on teachers' motivation, an aspect that has received comparatively less attention in the literature. The findings suggest that integrating digital games not only benefits students but also enhances teachers' professional motivation and instructional enthusiasm. Teachers reported renewed interest in teaching mathematics, increased creativity, and a greater willingness to experiment with innovative pedagogical approaches.

These findings align with previous studies indicating that observing positive student responses can significantly enhance teachers' intrinsic motivation and professional satisfaction (Behnamnia et al., 2020; Hayak & Avidov-Ungar, 2023). From this perspective, digital games function not only as instructional tools but also as catalysts for pedagogical renewal, encouraging teachers to adopt more student-centered and

flexible teaching practices. This aligns with contemporary views of the teacher's role as a facilitator of learning rather than a sole transmitter of knowledge.

Contextual and Structural Challenges

Despite the reported benefits, the findings also underscore significant challenges that constrain the effective integration of digital games in Arab elementary schools in Israel. Teachers frequently cited limited technological infrastructure, insufficient access to devices, and unreliable internet connectivity as major obstacles. These challenges echo findings from previous research highlighting persistent digital inequities in marginalized or under-resourced educational contexts (Alzubaidi et al., 2023; Hayak & Avidov-Ungar, 2023).

In addition, teachers expressed concerns related to classroom management, time constraints, and curricular pressures. These concerns suggest a tension between innovative pedagogical practices and rigid curricular structures, which may limit teachers' ability to integrate game based learning in systematic and sustained ways. Cultural and social perceptions regarding digital games also emerged as influential factors, with some parents and administrators viewing games as distractions rather than legitimate learning tools. This highlights the importance of broader cultural acceptance and awareness in supporting pedagogical innovation.

The Need for Systemic and Institutional Support

The discussion of challenges points to the necessity of institutional and systemic support for the successful implementation of digital game based learning. Teachers emphasized the need for clear educational policies, professional development opportunities, and access to high-quality, culturally and linguistically appropriate Arabic digital game content. These findings align with research emphasizing that teachers' digital competence and confidence are strongly influenced by training and organizational support (Shamma, 2021; Russo et al., 2021).

From a policy perspective, the findings suggest that integrating digital games into mathematics education requires more than individual teacher initiative. Sustainable implementation depends on coordinated efforts involving school leadership, educational authorities, curriculum designers, and technology developers. Without such support, the pedagogical potential of digital games may remain underutilized, particularly in contexts characterized by structural and socioeconomic constraints.

Conclusions

This qualitative study examined mathematics teachers' perceptions of integrating digital games into elementary mathematics instruction in Arab schools in Israel, with a focus on their impact on students' learning motivation and teachers' teaching

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motivation. The findings indicate that, from the teachers' perspectives, digital games constitute a meaningful pedagogical tool capable of enhancing student engagement, fostering positive attitudes toward mathematics, and supporting conceptual understanding through interactive and motivating learning environments.

Teachers reported that digital games contribute to transforming mathematics learning from a predominantly traditional and teacher-centered process into a more dynamic, student-centered experience. The interactive nature of digital games was perceived as particularly effective in increasing students' motivation, encouraging persistence, and reducing anxiety associated with mathematics learning, especially among students with learning difficulties or low academic confidence. These findings reinforce the view that motivation plays a central role in shaping meaningful learning experiences and that pedagogical strategies capable of addressing motivational dimensions are essential in elementary mathematics education.

Importantly, the study also highlights the impact of digital games on teachers themselves. Participants described increased professional motivation, instructional creativity, and enthusiasm for teaching mathematics when digital games were integrated into their lessons. This dual impact on both learners and educators underscores the potential of digital games not only as instructional resources but also as catalysts for pedagogical renewal and professional growth. By fostering more engaging classroom environments and promoting positive teacher student interactions, digital games appear to contribute to more satisfying and effective teaching learning processes.

Despite these positive outcomes, the study reveals that the successful integration of digital games is contingent upon contextual and structural conditions. Teachers identified several barriers, including limited technological infrastructure, insufficient access to digital devices, time constraints imposed by curricular demands, classroom management challenges, and cultural or social perceptions that may hinder acceptance of digital games as legitimate educational tools. These challenges suggest that the pedagogical potential of digital games cannot be fully realized without addressing broader systemic and institutional factors.

Educational Implications

The findings of this study carry several important implications for educational practice, teacher education, and policy development. First, they underscore the need for educational systems to recognize digital game-based learning as a legitimate and valuable pedagogical approach within mathematics education, rather than viewing it as a supplementary or peripheral activity. Integrating digital games into curricula in a structured and purposeful manner may enhance student motivation and support deeper mathematical understanding.

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Second, the study highlights the importance of ongoing professional development for teachers. Targeted training programs focusing on digital pedagogy and game-based learning can enhance teachers' technological competence, instructional confidence, and ability to align digital games with curricular objectives. Such programs should emphasize not only technical skills but also pedagogical strategies for managing classroom dynamics, assessing learning outcomes, and supporting diverse learners through game-based activities.

Third, the findings point to the necessity of institutional and policy level support. Educational authorities and school leadership are encouraged to invest in technological infrastructure, provide access to appropriate digital resources, and create supportive organizational cultures that encourage pedagogical innovation. In the context of Arab elementary schools in Israel, particular attention should be given to the development and dissemination of culturally and linguistically appropriate Arabic digital game content, ensuring relevance and inclusivity.

Finally, the study suggests directions for future research. Further investigations involving larger and more diverse samples, mixed-methods designs, and longitudinal approaches could provide deeper insights into the long-term effects of digital game-based learning on students' academic achievement, motivation, and attitudes toward mathematics. Expanding research to include students' and parents' perspectives may also contribute to a more comprehensive understanding of the social and cultural dimensions influencing the integration of digital games in education.

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