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«مقاله پژوهشی»

بررسی مولفه‌های طراحی بازی‌های آموزشی بر اساس جذابیت(جویسینس): یک مرور سیستماتیک

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چکیده

یادگیری مبتنی بر بازی از طریق گیم‌پلی تعاملی و جذاب به طور قابل توجهی انگیزه و درک دانش‌آموزان را در موضوعات پیچیده افزایش می‌دهد. این رویکرد با ایجاد محیط‌های یادگیری غنی، فرصت‌های متنوع یادگیری را فراهم کرده و به توسعه مهارت‌ها کمک می‌کند. یک جنبه حیاتی در طراحی بازی‌های آموزشی، ادغام اصول "جویسینس" (جذابیت) است که برای تضمین جذابیت بازی اهمیت دارد. این مطالعه به بررسی اجزای جویسینس در طراحی بازی‌های آموزشی می‌پردازد. برای شناسایی عواملی که بر جویسینس در بازی‌های آموزشی تأثیر می‌گذارند، یک مرور سیستماتیک جامع با استفاده از رویکرد ترکیبی سندلووسکی و باروسو و چارچوب PRISMA انجام شد. جستجویی در پایگاه‌های داده مانند Scopus، ScienceDirect و Emerald Insight برای مقالات منتشر شده بین ۲۰۰۴ تا ۲۰۲۴ انجام گرفت. کلمات کلیدی شامل "جویسینس"، "بازخورد"، "گرافیک"، "صدا" و "اجزای بازی" استفاده شد. این جستجو به شناسایی مقالات مرتبط کمک کرد و تحلیل آن‌ها به استخراج دیدگاه‌های کلیدی در مورد عوامل مؤثر بر جذابیت و لذت‌بخشی بازی‌ها انجامید. این مطالعه سه دسته اصلی از اجزای جویسینس را شناسایی کرد: مکانیک‌ها (۷ مؤلفه)، دینامیک‌ها (۵ مؤلفه) و زیبایی‌شناسی (۶ مؤلفه). مکانیک‌ها شامل ساختار گیم‌پلی، بازخورد درون بازی، سیستم‌های دستاورد و قدرت‌افزایی هستند. دینامیک‌ها به فرآیندهای تعاملی مانند همکاری اجتماعی، اکتشاف و مدیریت زمان می‌پردازند. زیبایی‌شناسی شامل مؤلفه‌های حسی و احساسی مانند سفارشی‌سازی آواتار، داستان بازی، طراحی گرافیکی و بازخورد چندحسی است. این دسته‌ها چارچوبی جامع برای طراحی بازی‌های آموزشی فراهم می‌کنند که تعامل، نتایج یادگیری و رضایت کاربر را بهینه می‌کند. استفاده از اجزای جویسینس به طراحان بازی این امکان را می‌دهد که بازی‌هایی طراحی کنند که نه تنها آموزشی، بلکه جذاب و لذت‌بخش باشند. این تحقیق یک چارچوب ساختاریافته برای توسعه بازی‌های آموزشی مؤثرتر فراهم می‌آورد.

واژه‌های کلیدی

بازی‌های آموزشی، جویسینس، طراحی بازی، تعامل، مکانیک‌ها، دینامیک‌ها، زیبایی‌شناسی.

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ORIGINAL ARTICLE

Investigating the Components of Educational Game Design Based on Juiciness Principles: A Systematic Review

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ABSTRACT

This study systematically investigates the design principle of "juiciness" the use of satisfying, responsive, and multisensory feedback in educational games to enhance learner engagement and effectiveness. Through a comprehensive systematic review guided by an integrated Sandelowski and Barroso and PRISMA framework, literature from ٢٠٠٤–٢٠٢٤ sourced from Scopus, ScienceDirect, and Emerald Insight was analyzed. Our analysis, employing rigorous validity measures including dual screening (Cohen’s κ = ٠,٨٩) and thematic synthesis, identified a framework of juiciness components organized into three core categories: Mechanics (encompassing structural elements such as in-game feedback systems, quest systems, achievement systems, and power-ups), Dynamics (encompassing interactive processes such as dynamic interactivity, social collaboration, exploration systems, and time management), and Aesthetics (encompassing sensory and emotional dimensions such as avatar customization, game narrative, visual and graphical structure, and multisensory feedback). The findings demonstrate that the strategic integration of these components is pivotal for creating game-based learning environments that are both compelling and pedagogically effective. The resulting framework provides a concrete and actionable roadmap for developers, instructional designers, and educators to design educational games that not only effectively achieve learning objectives but also maximize intrinsic motivation and user satisfaction through a rich and enjoyable experience. This research underscores the importance of intentional, informed design of "juicy" elements as a key determinant in the success of serious educational games.

KEYWORDS
Educational Games, Juiciness, Game Design, Mechanics, Dynamics, Aesthetics.

Introduction

The rapid advancement of digital technology has significantly impacted contemporary society, transforming the way individuals interact, work, and learn. In the face of these changes, educational systems must evolve to effectively prepare learners for the digital age. While technological advancements are crucial, a more profound transformation is needed, one that rethinks the goals, missions, content, teacher training, teaching methods, assessment procedures, and the role of the learner (Saraji & Attaran, ٢٠١١). Failure to adapt risks rendering educational systems obsolete. To meet these challenges, educational systems are exploring innovative teaching methods, with one promising approach being the integration of digital games into the learning process. Research has shown that games can enhance interaction, motivation, and learning outcomes, offering an engaging, interactive environment for students (Prensky, ٢٠٠١).

Well-designed games incorporate sound learning principles, encouraging active and reflective engagement and fostering skills such as problem-solving, technology use, and collaboration (Gee, ٢٠٠٣). One key concept in educational game design is juiciness, which refers to the design approach wherein game designers provide abundant audiovisual feedback in response to player actions to create a more satisfying and engaging experience. Hicks et al. (٢٠١٩) define juiciness as "a term that describes a game experience that contains a coherent design of game mechanics and visuals, while providing feedback to the player with both direct feedback that is confirmatory, relevant and explicit, but also offering superfluous feedback that helps to inform players about the game state, and contribute to the game being perceived as a coherent whole" (p. ١٩٧). More specifically, juiciness involves the provision of redundant feedback where a single player action triggers multiple non-functional reaction—such as visual effects, sound cues, animations, and particle effects—that collectively amplify the sense of responsiveness and delight (Hicks et al., ٢٠١٩; Kao, ٢٠٢٠). This design philosophy emphasizes creating games that feel "alive" and rewarding through excessive positive feedback, thereby enhancing player engagement and motivation through continuous sensory reinforcement (Deterding et al., ٢٠١١; Swink, ٢٠٠٩).

By incorporating these principles into game design, educators can create educational games that are not only enjoyable but also enhance the learning experience. The learner-centered approach, which prioritizes active participation and motivation, aligns with the concept of juiciness, ensuring that students remain engaged and invested in their learning (Prensky, ٢٠٠١).

A significant issue with traditional classrooms is the lack of active student engagement. In teacher-centered classrooms, instructors primarily deliver information through lectures, leaving students as passive recipients of knowledge. This approach often leads to disengagement, as students may feel disconnected from the learning process (Biswas & Ahsan, ٢٠٢٣). In contrast, modern classrooms emphasize student-centered approaches, encouraging students to actively participate in the learning process. Research has shown that this shift toward active learning increases student engagement and motivation, making modern classes more dynamic and engaging (Freeman et al., ٢٠١٤; Prince, ٢٠٠٤).

Traditional teaching methods, often devoid of meaningful interaction between teachers and students, can foster a sense of isolation, further contributing to boredom (Deslauriers et al., ٢٠١١). However, modern classrooms incorporate interactive elements such as group discussions, collaborative projects, and technology-enhanced activities. These interactions not only improve communication between teachers and students but also foster a more collaborative learning environment, thus reducing boredom and increasing student satisfaction (Johnson et al., ٢٠١٤).

Moreover, traditional classrooms often focus on theoretical knowledge without connecting it to real-world applications, which makes learning seem abstract and disconnected from students' lives (Kolb, ١٩٨٤). In contrast, modern classrooms emphasize contextual learning, where students apply their knowledge to solve real-world problems, enhancing engagement and helping students develop practical skills relevant to their future careers (Lave & Wenger, ١٩٩١). The limited use of technology in traditional classrooms further contributes to the perception of boredom, as students accustomed to using digital tools in their everyday lives may find traditional methods slow and uninteresting (Prensky, ٢٠٠١). In modern classrooms, the integration of technology provides students with access to a wide range of resources, making learning more engaging and interactive (Clark & Mayer, ٢٠١٦).

Therefore, the perceived boredom in traditional classrooms is largely due to factors such as limited student engagement, lack of interaction, absence of real-world relevance, reliance on passive learning, and limited use of technology. In contrast, modern classrooms, with their focus on active learning, real-world applications, and technology integration, offer a more engaging and dynamic learning environment that fosters greater student motivation.

In recent years, many educators and researchers have emphasized the importance of play in both formal and informal education (Whitton, ٢٠١٠). Games have been an integral part of human life for centuries, engaging individuals not only in childhood but also throughout adulthood (Huizinga, ١٩٥٥). Historically, philosophers such as Plato and Aristotle recognized the role of play in education, and educational thinkers like Froebel strongly advocated for its use in educational settings (Bruce, ٢٠٠١). Play-based learning encourages active involvement and supports experiential, problem-based learning approaches (Kolb, ١٩٨٤).

With technological advancements, computer games have emerged as a modern approach to teaching. Video games, as a significant cultural phenomenon, have become a primary source of entertainment for children and adolescents due to the growth of communication technologies. Their engaging nature has drawn considerable attention, and they have even begun to replace academic tasks and family interactions in some cases (Anderson & Dill, ٢٠٠٠; Gentile, ٢٠٠٩).

Game-based learning (GBL) offers an innovative departure from traditional, lecture-based methods that often result in passive learning. Unlike traditional instruction, which emphasizes memorization and teacher-centered delivery, GBL actively involves students in the learning process, fostering engagement, motivation, and cognitive development (Gee, ٢٠٠٣). Educational games enhance critical thinking, problem-solving skills, and knowledge retention through interactive experiences (Mayer, ٢٠١٤). They also provide a dynamic and stress-free environment, particularly for language acquisition, where they foster social interaction and boost motivation (Rama et al., ٢٠١٢).

Moreover, in teacher education and interdisciplinary fields such as healthcare, game-based learning has been found to improve instructional competencies and strengthen collaborative learning (Wouters et al., ۲۰۱۳). The increasing use of educational games highlights their potential to transform education, making learning more engaging and interactive.

Despite their widespread popularity, traditional video games primarily focus on entertainment rather than practical application. However, educational video games combine learning with entertainment, enabling players to assess their progress toward specific learning goals through their actions (Van Eck, ۲۰۰٦). The rapid development of complex video games has been fueled by advancements in information and communication technology, offering visually appealing, fast-paced, and self-directed learning experiences (Squire, ۲۰۱۱). Video games have become a staple in the lives of young people, prompting researchers to examine their cognitive, emotional, and behavioral effects (Green & Bavelier, ۲۰۱۲). Educational video games place users in simulated real-world scenarios, allowing them to enhance their emotional intelligence and practical abilities (Connolly et al., ۲۰۱۲). These games can significantly increase motivation, making them an effective tool for educational purposes (Ryan & Deci, ۲۰۰۰).

However, conventional pedagogy has been criticized for its failure to engage students, often prioritizing rote memorization and teacher-centered instruction, which limits critical thinking and meaningful interaction (Freeman et al., ۲۰۱٤). These methods typically restrict student agency, leading to disengagement and a lack of participation. They also fail to accommodate the diversity of learners and neglect the development of essential communication skills (Bonwell & Eison, ۱۹۹۱). This failure contributes to students' disconnection from the material, especially in subjects like language and science, further hindering academic achievement (Prince, ۲۰۰٤). Consequently, there is a pressing need to rethink and transform traditional teaching practices to create more engaging, inclusive, and learner-centered environments.

The challenges in games play a crucial role in player enjoyment. Players derive satisfaction from overcoming challenges, which create tension and drama. This is particularly true when players feel a sense of accomplishment or success after completing a challenge (Csikszentmihalyi, ۱۹۹۰). In game design, juiciness refers to the design technique of providing excessive positive audiovisual feedback that enhances player engagement (Juul, ۲۰۱۰). Juicy games are characterized by abundant sensory feedback, such as visual effects, sounds, and animations, that make the game feel lively and rewarding (Gray et al., ۲۰۰۵; Schell, ۲۰۰۸).

These elements are particularly crucial in educational games, as they enhance player engagement and motivation through continuous feedback and rewards (Deterding et al., ۲۰۱۱). However, research on the impact of juiciness in educational settings remains limited, despite its importance in enhancing user experience and motivation (Hicks et al., ۲۰۱۸; Hicks et al., ۲۰۱۹).

Educational games designed with juiciness in mind can significantly enhance learning experiences by making them more interactive and enjoyable. The increasing interest in juiciness is reflected in studies that demonstrate its positive effects on engagement and motivation (Kao, ۲۰۲۰; Hicks et al., ۲۰۱۹). However, developers must be cautious not to overuse juicy elements, as this could lead to cognitive overload or distract from educational content (Kao, ۲۰۲۰; Sweller, ۲۰۱۱).

The key to effective educational game design is to balance sensory richness with pedagogical clarity, ensuring that the game remains engaging without compromising learning outcomes. This research aims to address the gap in understanding how juiciness can be applied effectively in educational games by exploring the core components of juiciness and their implications for game design (Hicks et al., ۲۰۱۸; Johansen & Cook, ۲۰۲۱). Given the lack of cohesive and high-quality educational games that integrate juiciness, this research seeks to identify the primary components of juiciness in educational games and provide a framework for their implementation. By focusing on these elements, the research aims to improve the design of educational games, making them more engaging, effective, and capable of enhancing learning outcomes. This effort aligns with the growing recognition of the importance of game-based learning in education, and it will contribute to creating more engaging and pedagogically sound educational games.

Considering the established role and importance of video games in education and improving student learning processes, and recognizing the apparent lack of effective and significant initiatives in game design within the education sector, despite the existence of a few low-quality games, there is a clear need for games with a cohesive and purposeful internal design, suitable for educational purposes, and capable of engaging the audience (juiciness). Therefore, this research aims to take a small step toward addressing this need. Based on the reviewed literature, this research seeks to answer the following main question: What are the primary components of juiciness in educational games?

Research Questions

RQ۱: What are the components of "juiciness" in educational games?

RQ۲: What are the dynamics of "juiciness" in educational games?

RQ۳: What are the mechanics of "juiciness" in educational games?

RQ٤: What are the aesthetic elements of "juiciness" in educational games?

Materials and Methods

Secondary studies, such as Systematic review involve the synthesis and analysis of information from primary studies. According to Baumeister and Leary (۱۹۹۷), Systematic reviews entail a comprehensive examination of scholarly articles, books, and other relevant resources to describe, summarize, and critically evaluate existing work on a specific topic. As a valuable method for developing new and existing theories, identifying research gaps, and providing a historical overview of a research area, Systematic review have been widely adopted in academic research. In this study, we employed the seven-step approach outlined by Sandelowski and Barroso (۲۰۰۷) as a well-established framework for conducting Systematic review.

Step۱: In this study, Sandelowski and Barroso's (۲۰۰۷) seven-step meta-synthesis method was fully implemented. As shown in (Table ۱)the main research questions focused on "factors affecting game juiciness" and "factors influencing the design of educational games based on juiciness." The study population included all articles indexed in the Scopus, Science Direct, and Emerald scientific databases from ۲۰۰٤ to ۲۰۲٤. In the following sections, each of the seven steps in Sandelowski and Barroso's (۲۰۰۷) meta-synthesis method is detailed, along with an explanation of how these steps were applied in this research.

Table ۱. Research Question Parameters in PRISMA-Based Meta-Synthesis

Question answer	Question parameters
What are the factors affecting the game's juiciness? What are the factors influencing the design of educational games based on juiciness?	What?
All articles indexed in Scopus, Science Direct and Emerald scientific database	Study community (Who)?
٢٠٠٤-٢٠٢٤	Limited time (When)?

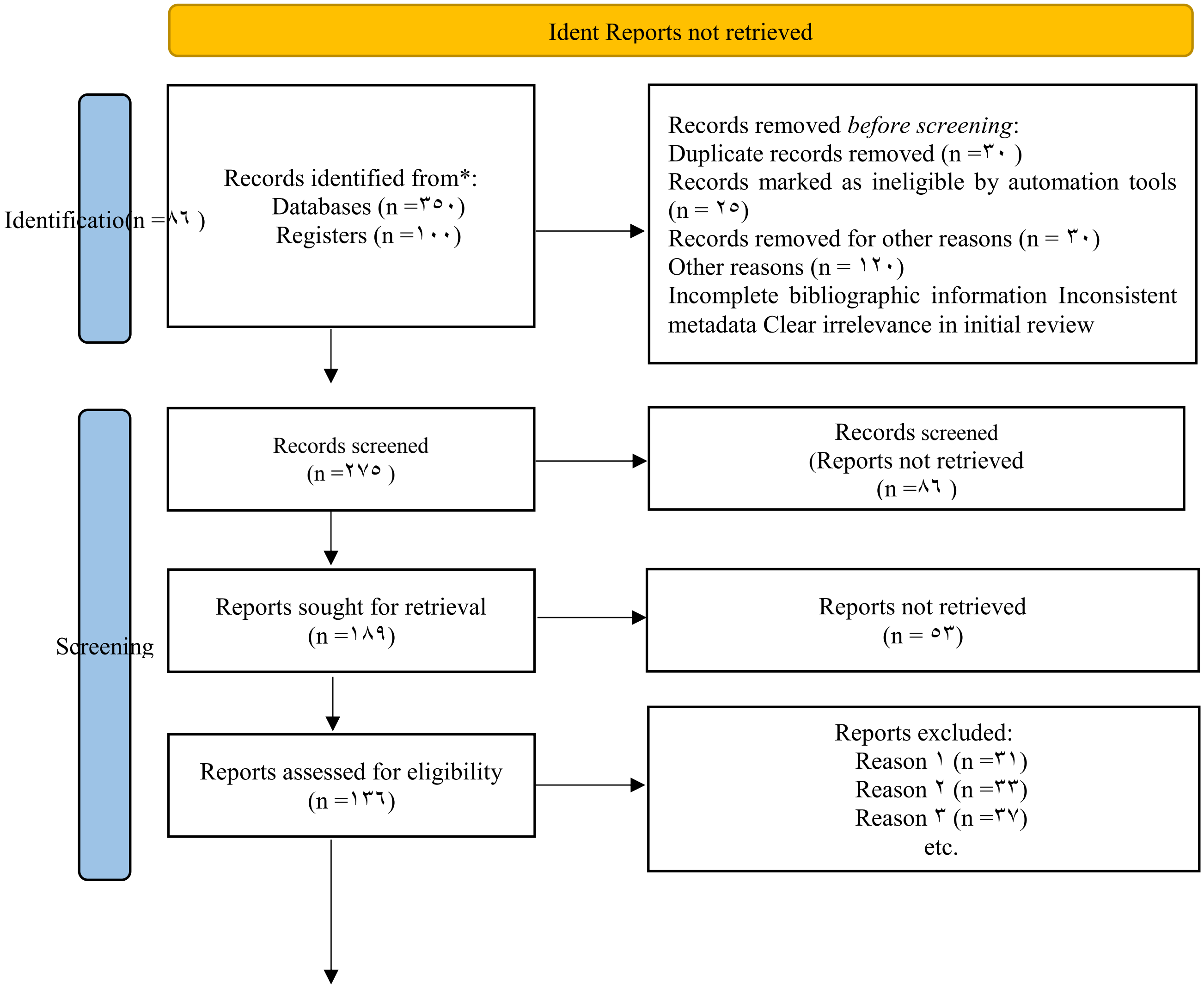
Step٢: We conducted a comprehensive search across three major scientific databases: Scopus, ScienceDirect, and Emerald. The search was limited to studies published between ٢٠٠٤ and ٢٠٢٤ to ensure relevance to contemporary game design approaches while capturing foundational work in the field.

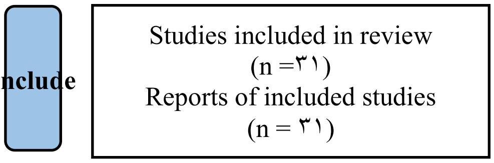
Step٣: The systematic review investigating the components of educational game design based on juiciness employed a comprehensive PRISMA methodology to ensure robust and transparent reporting. The initial identification phase yielded a substantial dataset of ٣٦٠ potentially relevant records, comprising ٣٥٠ database entries and ١٠ register entries. This preliminary corpus represented a diverse range of research outputs addressing various aspects of game feel, feedback mechanisms, and educational efficacy in serious games. The methodological rigor of the identification phase ensured broad coverage across relevant academic databases and specialized registers, establishing a solid foundation for subsequent analytical stages.

The screening phase implemented a multi-tiered filtration process that systematically excluded records based on predefined criteria. Initially, ٨٥ records were removed through preliminary screening: ٣٠ due to duplication, ٢٥ through automated eligibility assessment tools, and ٣٠ for miscellaneous reasons. This reduction resulted in ٢٧٥ records proceeding to detailed screening, where an additional ٨٦ records were excluded based on more specific criteria. The granular nature of this screening process helped maintain the integrity of the review while ensuring that only the most pertinent studies progressed to the eligibility phase. This systematic review establishes clear inclusion and exclusion criteria to investigate juiciness components in educational game design across all subject areas. The inclusion criteria encompass: (١) peer-reviewed studies focusing on educational games in any academic discipline (mathematics, science, language learning, etc.); (٢) research explicitly examining juiciness elements such as satisfying feedback mechanisms, rewarding animations, and rich audiovisual effects; (٣) empirical studies (qualitative, quantitative, or mixed-methods) published between ٢٠١٠-٢٠٢٤ in English; and (٤) accessible full-text articles from reputable databases including IEEE Xplore, ACM Digital Library, ScienceDirect, SpringerLink, and ERIC. Exclusion criteria eliminate: (١) non-educational or entertainment-focused games; (٢) studies lacking specific analysis of juiciness components; (٣) theoretical papers without empirical data; (٤) studies with small sample sizes (<١٠ participants); (٥) research using invalid measurement tools; and (٦) publications where full text is unavailable. The review employs the Joanna Briggs Institute (JBI) checklist for quality assessment, ensuring methodological rigor while maintaining focus on how juiciness enhances engagement across diverse educational game genres. This framework enables comprehensive analysis of juiciness's role in optimizing learning experiences through game design, regardless of subject matter.

During the eligibility assessment, ١٨٩ reports were identified for potential retrieval, though ٥٣ proved inaccessible despite comprehensive search efforts. The remaining ١٣٦ reports underwent rigorous eligibility assessment, during which ١٠١ reports were excluded based on three primary criteria: ٣١ under the first exclusion parameter, ٣٣ under the second, and ٣٧ under the third. This systematic evaluation process was crucial in establishing a refined corpus of studies that specifically addressed the core research questions regarding juiciness in educational game design. The detailed documentation of exclusion reasons ensures transparency and replicability of the review methodology. The final synthesis phase incorporated ٣١ studies (Figure٢) that met all inclusion criteria and quality standards, representing approximately ٨,٦٪ of the initial dataset. These studies formed the empirical foundation for analyzing how juiciness components contribute to educational game effectiveness. The relatively selective inclusion rate reflects the stringent quality controls implemented throughout the review process and ensures that the findings represent the most methodologically sound and relevant research in the field. This final corpus provides a robust evidence base for understanding the relationship between game feel mechanics and educational outcomes in serious games, while also highlighting potential areas for future research in this emerging field.

Figure ٢. Identification and Selection of Articles According to the PRISMA Framework





Step Four - Extracting Results: In this phase, selected articles were reviewed iteratively to identify distinct content findings where primary studies were conducted. After choosing key documents and reports, codes were systematically extracted from selected texts. For this purpose, a systematic review method was applied to analyze the findings of the articles, with each extracted factor being assigned a code. Then, these codes were categorized into overarching concepts based on their content, allowing themes to emerge from the codes and concepts. The coding results were validated by academic experts in the relevant field.

Step Five - Qualitative Analysis and Synthesis of Findings: During the analysis, the researcher conducts a thematic examination, organizing classifications based on the similarity and interrelationship of the emerging themes to represent them most accurately. In this study, articles were initially categorized according to the research topic, coded based on both explicit and implicit factors, and subsequently re-coded based on the primary codes and their interrelationships to identify dimensions. Further coding was conducted to classify these dimensions to facilitate the comprehensive development of a causal model that addresses the research questions.

Step Six - Verification of Extracted Codes: The validity of the proposed conceptual framework was ensured through content validity. This validity assessment was conducted in two aspects: the first involved utilizing elements and factors presented in previous research, which themselves had established validity; the second involved validation of the derived model by domain-specific experts and scholars. In the qualitative section of this study, two experts were informed of the research scope and confirmed the alignment of the results with the research objectives.

To assess the reliability of the final designed framework, the Kappa coefficient (κ) can be employed, as it measures agreement levels. In this case, either the entire work or all required elements are organized in a checklist format with binary responses (yes/no) to streamline feedback and save time. The checklist is provided to two experts, and after receiving their responses, the following formula is used to calculate the Kappa coefficient, which yields a value between -١ and +١.

$$\kappa = \frac{P_{٠} - P_E}{١ - P_{٠}}$$

Cohen’s Kappa coefficient and Scott’s Pi differ in calculating expected agreement. In Scott’s Pi formula, the observed proportions for each value in a category are squared. In contrast, Cohen’s Kappa multiplies the proportion for a specific value in a category used by one coder by the proportion of the same value used by the second coder. These proportions are then summed to obtain the expected agreement. A coefficient value greater than ٠,٦ indicates acceptable reliability (table ٢).

Table ٢. The Kappa statistic, based on expert consensus.

Agreement Strength	Kappa Statistic Value	Kappa Statistic Value in This Study
Low	٠ to ٠,٢٠	٠,٨٢
Below Average	٠,٢١ to ٠,٤٠	
Average	٠,٤١ to ٠,٦٠	
Good	٠,٦١ to ٠,٨٠	
Excellent	٠,٨١ to ١,٠٠	

The high agreement coefficient, above ٠,٨, indicates an excellent level of agreement.

Step٧: Based on previous studies and extracted codes, ٢٨ criteria and ١٠٤ indicators were identified in the section of factors affecting the game design pattern for a "juiciness" basis (Table ٣).

What game design elements are essential for creating a highly enjoyable and engaging 'juiciness' experience? and Given the identified ٢٨ criteria and ١٠٤ indicators for 'juiciness' in games through our research, what specific design patterns can maximize a player's 'juiciness' experience? Within these patterns, what elements should be prioritized, and how can we balance these elements effectively?"

Table ٣. The pattern of educational game design based on juiciness

Educational JUICINESS COMPNENTS	MDA category	Criterion	Indicator	Resources
Interactivity	Dynamics	Interactive game environment	Dependent environment; environment with change among group members; conditions based on group synthesis and analysis	(Swink, ٢٠٠٨) (Hicks, ٢٠٢٠) (Helena et al., ٢٠٠٧) (Hicks et al., ٢٠١٨) (Caroux et al., ٢٠١٥) (Nadia & Nadia, ٢٠١٢)
	Dynamics	Need for strategy and decision-making	The role of decisions for each person, the role of individual decision on the fate of the group; the role of the situation and the effects of each person on the group; The role of decision-making changes	
	Dynamics	Player interaction	importance of mission completion based on participation, coordination role, quantity of relationships, quality of relationships.	
	Dynamics	Team plays	Unique integration, covering social needs, social adaptation	
Gameplay and in-game feedback	Mechanics	Contextual Feedback	Coordination of conditions with the situation, necessary changes according to the circumstances, pattern changes according to the situation, and differentiation based on the process	(Abdul Jabbar & Felicia, ٢٠١٥; K Hicks et al., ٢٠١٩) (Pichlmair & Johansen, ٢٠٢١) (Kao, ٢٠٢٠) (Drachen & Canossa, ٢٠٠٩) (Drachen & Canossa, ٢٠٠٩; Huang et al., ٢٠١٩)
	Aesthetics	Emotional	"Creating excitement; increasing	

Educational JUICINESS COMPNENTS	MDA category	Criterion	Indicator	Resources
		feedback	excitement; changing excitement; creating different emotions based on the goal."	(Liao et al., ٢٠١٩)
	Mechanics	Content feedback	Content aligned with the type of game; rewards based on the content performed; alignment of content and process within the game	
avatar	Aesthetics	Exclusive	Customized; specific features; resemblance to the player's characteristics Avatar-Player Similarity،	(Dominic et al., ٢٠١٥) (Dominic et al., ٢٠١٦) (Sabine et al., ٢٠١٠) (Jorge et al., ٢٠٠٩) (Burleigh et al., ٢٠١٨)
	Aesthetics	Diversity	Superpower indicators; imaginative, distinctive features	
	Mechanics	Upgradability	Appearance; power-based; evolutionary	
Game Story	Aesthetics	story challenges	story challenges, story variety, unpredictability, creativity	(Emily et al., ٢٠١٩) (Atanasov, ٢٠١٣) (Rapeepisarn et al., ٢٠٠٨) (Arsenault, ٢٠٠٩; Hua et al., ٢٠٠٩) (Shin & Chung, ٢٠١٧) (Silpasuwanchai & Ren, ٢٠١٧)
	Aesthetics	Game Genre	Perceptive, cognitive, movement, imaginative, emotional	
	Aesthetics	Role in the Story	Role adaptability, role alignment; changes in the story flow; role coordination	
	Aesthetics	Storytelling	Continuity, clear rhythm, narrative structure	
Visual and Graphical Structure	Aesthetics	Game Graphics	Graphic quality, graphic design, visual appeal	(Soylucicek, ٢٠١٢) (Kieran Hicks et al., ٢٠١٩) (Bevz, ٢٠٢٣)co (Kathrin et al., ٢٠١٣) (Laurier & Reeves, ٢٠١٣) (Stephen et al., ٢٠١٨) (Bateman et al., ٢٠١٠) (Kieran Hicks et al., ٢٠١٩)
	Aesthetics	Color	Color diversity, color quality; color harmony; color changes	
	Aesthetics	Effect Structure	٣٦٠-degree view, overlay structure, structural quality	
Power-Ups	Mechanics	Hidden Powers	Increased ability, extended duration, enhanced speed, improved accuracy; increased coordination	(Denisova & Cook, ٢٠١٩) (Filip & Filip, ٢٠١١) (Swink, ٢٠٠٨) (Denisova & Cook) (IGN-Gameguides, ٢٠٢٠) (Filip & Filip, ٢٠١١)
	Mechanics	Special Features	Shortcuts, special services, leap achievements	
	Mechanics	Uniqueness	Distinct appearance, role differentiation from other players; different interactions	
Multisensory Experiences	Mechanics	Game Mechanics	Power changes, sensory changes, increased tactile sensation, reduced tactile sensation	(Victoria et al., ٢٠٢٠) (Tao et al., ٢٠٢١) (Gyeore et al., ٢٠٢٣) (Lyu et al., ٢٠٢٣) (Natalia et al., ٢٠١٨) (Gougeh & Falk, ٢٠٢٢) (Hicks, ٢٠٢٠) (Gyeore et al., ٢٠٢٣)
	Mechanics	Sensory Integration	Combining touch and sight, combining touch and sound; integrating touch, sound, and sight; sensory and tactile shocks	
Music and	Aesthetics	Enhancing	Excitement, emotional states,	(Yang et al., ٢٠١٩)

Educational JUICINESS COMPNENTS	MDA category	Criterion	Indicator	Resources
Sound		Emotion	sensory changes, immersion	(Wharton & Collins, ۲۰۱۱) (Grimshaw et al., ۲۰۱۳) (Jolie et al., ۲۰۲۱) (Rogers, ۲۰۱٤) (Collins, ۲۰۰۸) (Nacke et al., ۲۰۱۰) (Abia & Caroux, ۲۰۱۸) (Nacke et al., ۲۰۱۰)
	Aesthetics	Significance	Making things appear important; assigning roles to situations, giving warnings, reporting game progress	
	Aesthetics	Music Diversity	Notes, musical instruments, songs	
Image	Aesthetics	Image Type	Angle, image type, shape changes in the image, content overlay of images	(Håvard & Håvard Andreas, ۲۰۲۲) (Håvard & Håvard Andreas, ۲۰۲۲) (Swalwell, ۲۰۱۵) (Clemens et al., ۲۰۱۸) (Clemens et al., ۲۰۱۸) (Adeshina Sirajdin et al., ۲۰۲۰) (Adeshina Sirajdin et al., ۲۰۲۰)
	Mechanics	Camera Movements	Slow movements; fast movements; continuous speed changes, movement structure, forward and backward image shifts	
	Mechanics	Focuses	Image zooming; zooming on characters, zooming on positions, zooming on the environment	
Education juiciness Components	MDA Category	Criterion	Indicators	Resources
Quest System	Mechanics & Dynamics	Progressive Challenge Design	۱. Adaptive difficulty scaling based on player performance ۲. Clear milestone achievements ۳. Branching quest paths with meaningful choices	Hamari, J., & Nousiainen, T. (۲۰۱۵). 'Why Do Teachers Use Game-Based Learning Technologies?'
Achievement System	Aesthetics	Reward Psychology	۱. Immediate feedback mechanisms ۲. Visual progression tracking ۳. Milestone celebration events	Dicheva, D., & Dichev, C. (۲۰۱۵). 'Gamification in Education: Where Are We in ۲۰۱۵?'
Social Collaboration	Dynamics	Peer Learning Integration	۱. Team-based problem solving ۲. Knowledge sharing mechanisms ۳. Collaborative challenge completion	Romero, M., & Usart, M. (۲۰۱۳). 'Serious Games Integration in an Entrepreneurship Massive Online Course'
Interactive Storytelling	Aesthetics	Narrative Engagement	۱. Character-driven plot development ۲. Player choice impact on story ۳. Environmental storytelling elements	Dickey, M. D. (۲۰۱۵). 'Aesthetics and Design for Game-based Learning'
Skill Tree Progression	Mechanics	Competency Development	۱. Visual skill mapping ۲. Multiple advancement paths ۳. Skill application scenarios	Toda, A. M., et al. (۲۰۱۹). 'A Taxonomy of Game Elements for Gamification in Educational Contexts'
Resource Management	Mechanics & Dynamics	Strategic Planning	۱. Resource allocation decisions ۲. Long-term strategy development ۳. Resource optimization	Arnab, S., et al. (۲۰۱۵). 'Mapping Learning and Game Mechanics for Serious Games Analysis')

Educational JUICINESS COMPNENTS	MDA category	Criterion	Indicator	Resources
			challenges	
Exploration System	Aesthetics	Discovery Learning	١. Hidden content rewards ٢. Interactive environment design ٣. Progressive area unlocking	Boyle, E. A., et al. (٢٠١٦). 'An Update to the Systematic review of Empirical Evidence of Gaming'
Challenge Towers	Mechanics	Mastery Development	١. Tiered difficulty levels ٢. Skill-specific challenges ٣. Performance benchmarks	Kapp, K. M. (٢٠١٢). 'The Gamification of Learning and Instruction')
Knowledge Crafting	Dynamics	Content Creation	١. Information synthesis tools ٢. Knowledge combination mechanics ٣. Creation sharing system	Prensky, M. (٢٠١٤). 'Digital Game-Based Learning'
Time Management	Mechanics & Aesthetics	Efficiency Learning	١. Time-based challenges ٢. Priority management tasks ٣. Resource optimization under time constraints	Clark, D. B., et al. (٢٠١٦). 'Digital Games for Learning: A Systematic Review'

Table ٤ illustrates the juiciness components (sensory richness or "juice") of educational games based on the MDA framework (Mechanics, Dynamics, Aesthetics). In this framework, Mechanics refer to the core rules and foundational game components, Dynamics to the emergent behaviors and interactions produced during gameplay, and Aesthetics to the emotional responses and desirable player experiences (e.g., pleasure, immersion, and motivation). The table indicates that elements such as Power-Ups, Challenge Towers, Skill Tree Progression, Multisensory Experiences, Gameplay & Feedback, Resource Management, Quest System, and Achievement System primarily operate at the Mechanics level, directly tied to programmable rules and systems. Conversely, features like Interactivity, Social Collaboration, Knowledge Crafting, and Interactive Storytelling align more with Dynamics, arising from player-system interactions. Components including Game Story, Music & Sound, Visual Structure, and Exploration System predominantly contribute to Aesthetics, enhancing sensory and emotional engagement. Certain elements, such as Achievement System, Interactive Storytelling, Avatar, Image, and Time Management, span multiple MDA layers, underscoring their pivotal role in fostering comprehensive juiciness in educational games where visual, auditory, and interactive richness not only boosts learning motivation but also delivers a pleasurable and memorable experience for learners.

Table ٤. Juiciness Components of Educational Games Based on the MDA Framework

Characteristic	Mechanics	Dynamics	Aesthetics
Power-Ups	Yes	No	No
Challenge Towers	Yes	No	No
Skill Tree Progression	Yes	No	No
Multisensory Experiences	Yes	No	No
Interactivity	No	Yes	No
Social Collaboration	No	Yes	No
Knowledge Crafting	No	Yes	No

Game Story	No	No	Yes
Music & Sound	No	No	Yes
Visual Structure	No	No	Yes
Exploration System	No	No	Yes
Gameplay & Feedback	Yes	Yes	No
Resource Management	Yes	Yes	No
Quest System	Yes	Yes	No
Interactive Storytelling	No	Yes	Yes
Avatar	No	Yes	Yes
Image	Yes	No	Yes
Time Management	Yes	No	Yes
Achievement System	Yes	Yes	Yes

Figures ٢, ٣ and ٤ presents a conceptual model of juiciness elements in educational games, structured around the MDA framework (Hunicke et al., ٢٠٠٤), which categorizes game design into Mechanics (M: core rules and systems), Dynamics (D: runtime behaviors and player interactions), and Aesthetics (A: emotional and sensory experiences). Mechanics (in blue) encompass foundational elements like Quest Systems for progressive challenges, Skill Trees for competency development, Power-Ups and Challenge Towers for mastery, Resource Management for strategic planning, and Team Play for social dynamics. Dynamics (in green) emerge from player engagement, including Social Interactions for peer learning, Knowledge Crafting for content creation, Player Interactions for coordination, Interactive Storytelling for narrative immersion, Exploration Systems for discovery learning, and Contextual Feedback for situational adaptation. Aesthetics (in yellow/orange) focus on sensory appeal, such as Achievement Systems leveraging reward psychology, Music & Sound for emotional enhancement, Avatar Design with customization, Visual elements (graphics, color, effects), Time Management for efficient learning, and Multisensory Integration. Overlapping zones (e.g., M+D, D+A, M+A, M+D+A) highlight interconnected elements that amplify juiciness, fostering immersive, motivating, and effective educational experiences by blending structural rules, emergent play, and affective responses.

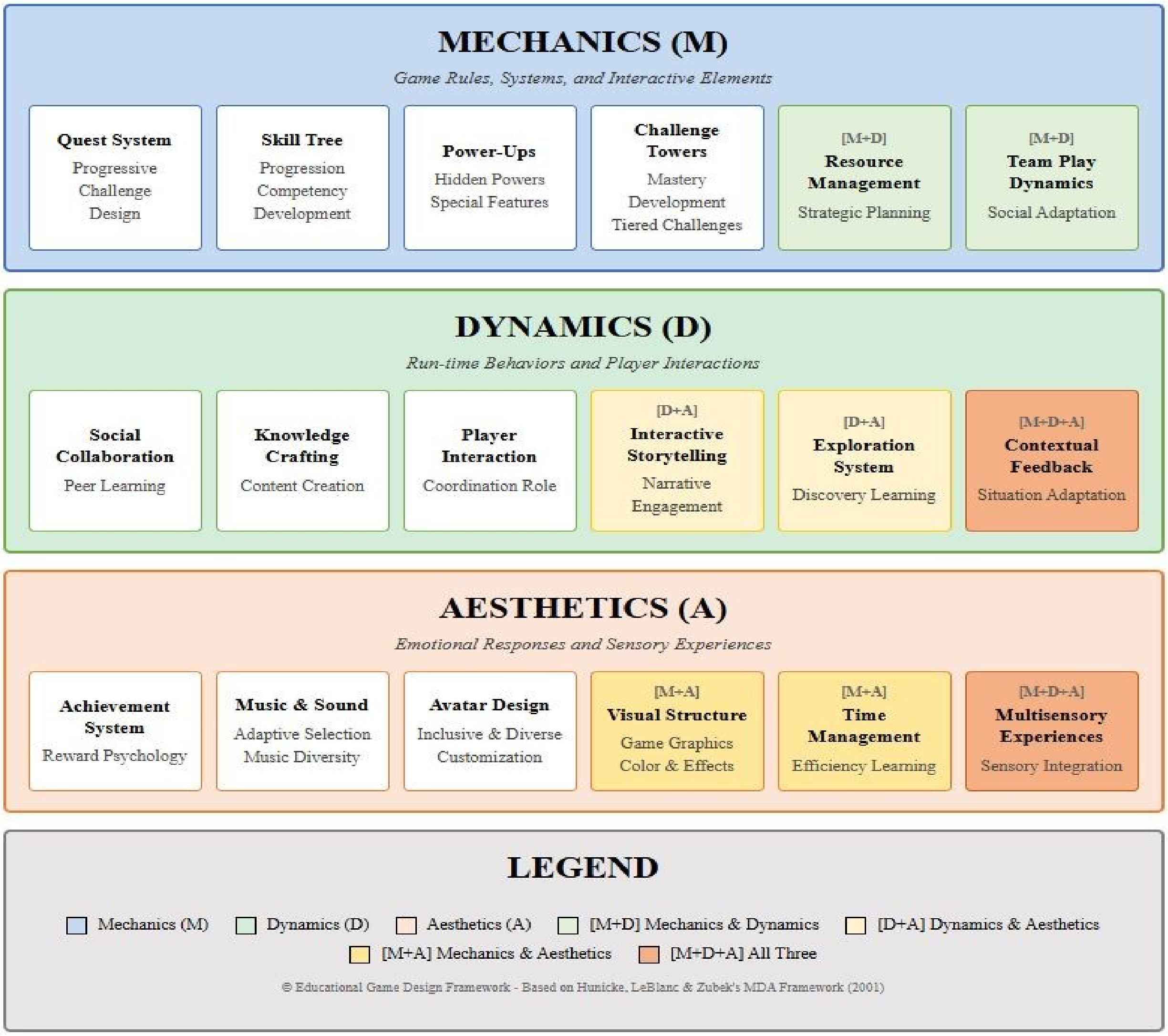


Figure ۲. A Conceptual Model of Juiciness Elements in Educational Games

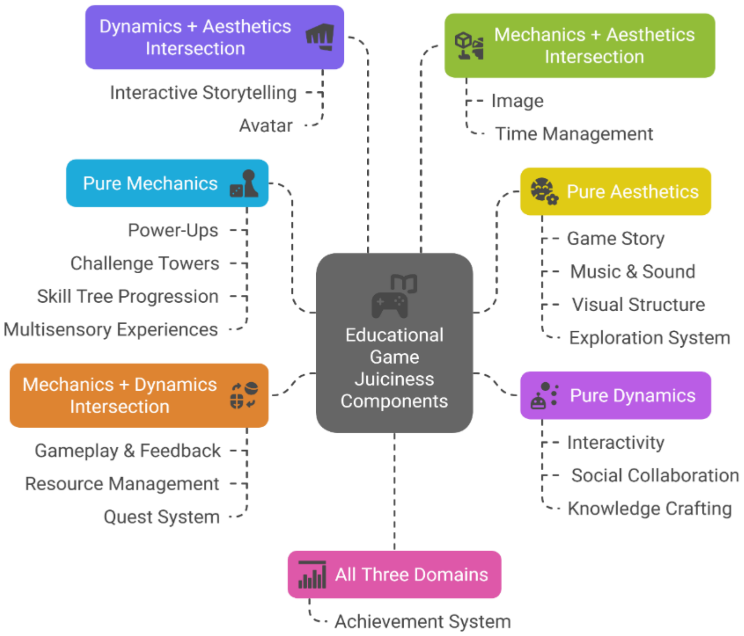


Figure ٣. A Conceptual Model of Juiciness Elements in Educational Games Based on the MDA Framework

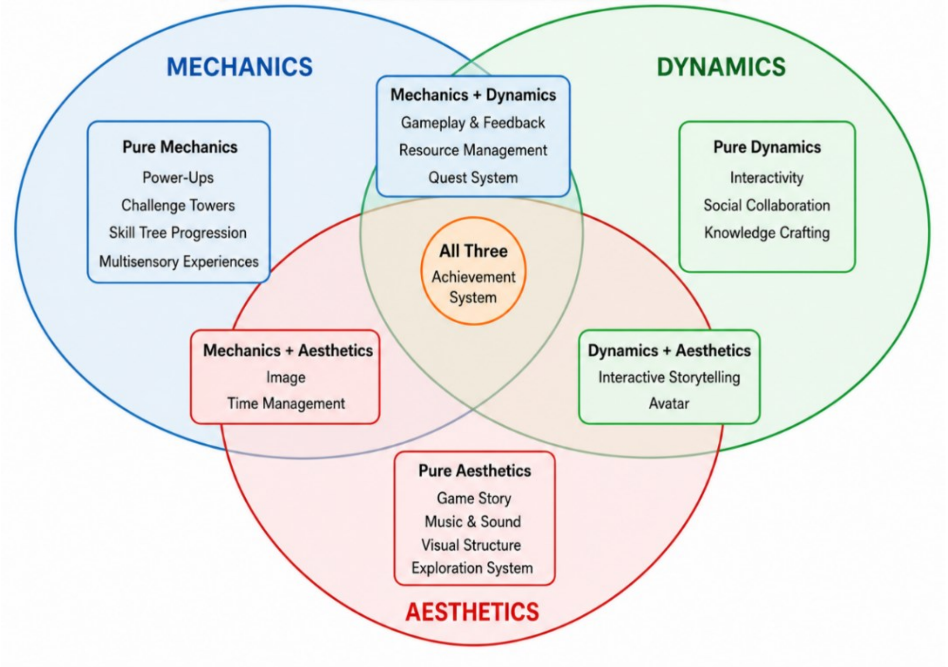


Figure ٤. A Conceptual Model of Juiciness Elements in Educational Games Based on the MDA Framework(B)

Result

Based on the findings, four criteria related to interactive environments, the need for strategy and decision-making, player interaction, and team play are identified according to ١٤ indicators: a dependent environment, an environment with changes among group members, conditions based on group synthesis and analysis, the role of decisions for each person, the impact of individual decisions on the group's fate, the role of the situation and the effects of each individual on the group, changes in decision-making, team play, the importance of mission completion based on participation, the role of coordination, the quantity and quality of relationships, unique integration, and social adaptation. These elements are associated with interactivity in the game design model for a basis of "JUICINESS."

Additionally, three criteria—contextual feedback, emotional feedback, and content feedback—are based on ١١ indicators: coordination of conditions with the situation, necessary changes according to circumstances, changes in patterns based on the situation, differentiation by process, creating excitement, increasing excitement, changing excitement, and creating different emotions depending on the content goal, rewards based on the content performed, and the alignment of content and process in the game. These elements contribute to the feedback compatibility aspect in the game design model for the "JUICINESS" basis.

Furthermore, based on the findings, three criteria—exclusivity, diversity, and upgradability—are linked to nine customized indicators: specific features, similarity to the player's conditions, superpower indicators, imagination, distinctive features, appearance, power-based, and evolutionary aspects. These elements pertain to avatar-related factors in the game design model for "JUICINESS."

For story-related aspects, four criteria—story challenges, game genre, role in the story, and storytelling—are identified based on ١٥ indicators: story diversity, unpredictability, creativity, cognitive, perceptual, movement, imaginative, and emotional load, role adaptability, role alignment, changes in the story flow, role coordination, continuity, rhythm, and narrative structure. These elements are connected to the story-related factors in the game design model for "JUICINESS."

Three criteria related to the game's graphics, color, and effect structure are based on ١٠ indicators: graphic quality, graphic design, visual appeal, color diversity, color quality, color harmony, color changes, ٣٦٠-degree view, overlay structure, and structural quality. These elements contribute to the visual and graphic structure in the game design model for "JUICINESS."

For power-ups, three criteria—hidden powers, special features, and uniqueness—are derived from ١٣ indicators: increased ability, extended duration, enhanced speed, improved accuracy, increased coordination, shortcuts, special services, leap achievements, different appearance, and role differentiation from other players. These elements are associated with power-up factors in the game design model for "JUICINESS."

Two criteria related to game mechanics and sensory integration are identified based on eight indicators: power changes, sensory changes, increased tactile sensation, reduced tactile sensation, combining touch and sight, combining touch and sound, integrating touch, sound, and sight, and sensory and tactile shocks. These elements are related to multisensory experiences in the game design model for "JUICINESS."

Three criteria related to enhancing emotion, significance, and music diversity are based on ١١ indicators: excitement, emotional states, sensory changes, immersion, making things appear important, assigning roles to situations, giving warnings, reporting game progress, notes, musical instruments, and songs. These elements contribute to sound and music-related aspects in the game design model for "JUICINESS."

Finally, three criteria related to image type, camera movements, and focuses are identified based on ١٣ indicators: angle, image type, shape changes in the image, content overlay of images, slow and fast movements, continuous speed changes, movement structure, forward and backward image shifts, and zooming in on characters, positions, and environments. These elements are linked to image-related factors in the game design model for "JUICINESS."

Number of criteria and indicators, highlighting its pedagogical depth and systematic integration into learning processes. A total of ten components are identified, each aligned with the Mechanics, Dynamics, and Aesthetics (MDA) framework. The "Quest System" includes three indicators under the criterion of Progressive Challenge Design, emphasizing adaptive difficulty, milestone achievements, and branching paths. Similarly, "Achievement System" focuses on Reward Psychology, with three indicators addressing feedback, visual tracking, and milestone celebrations. "Social Collaboration" integrates Peer Learning through three indicators related to team problem-solving, knowledge sharing, and collaborative challenges.

Other components, such as "Interactive Storytelling" and "Skill Tree Progression," each also feature three indicators tied to their criteria of Narrative Engagement and Competency Development, respectively. Notably, "Resource Management" emphasizes Strategic Planning through three decision-making and optimization indicators, while "Exploration System" incorporates Discovery Learning with three engaging design elements. Finally, "Challenge Towers," "Knowledge Crafting," and "Time Management" consistently present three indicators each, addressing their respective criteria of Mastery Development, Content Creation, and Efficiency Learning. This systematic alignment ensures that each component is deeply analyzed, making the table a valuable resource for understanding gamified educational practices in a comprehensive manner. The consistent presence of three indicators per component reflects a deliberate design, supporting robust implementation and review.

Discussion

The systematic review of literature on juiciness in educational game design reveals several significant insights into how these components contribute to creating engaging and effective learning experiences. The MDA (Mechanics, Dynamics, Aesthetics) framework applied to educational games demonstrates the multifaceted nature of juiciness and its potential impact on learning outcomes.

Our analysis indicates that juiciness extends beyond mere visual or auditory embellishments; it represents a holistic approach to game design that addresses cognitive, emotional, and social aspects of the learning experience. The mechanics components, including gameplay feedback, quest systems, and achievement structures, create a scaffolded learning environment that provides immediate reinforcement and clear progression paths for learners. These elements align with established educational theories such as operant conditioning and mastery learning, suggesting that well-designed juicy mechanics can support pedagogical objectives while maintaining engagement.

The dynamics components identified in our review highlight the importance of interactivity and agency in educational games. The presence of social collaboration features, exploration systems, and adaptable difficulty levels allows for personalized learning experiences that can accommodate diverse learning styles and abilities. This finding correlates with contemporary educational approaches that emphasize student-centered learning and differentiated instruction.

Perhaps most interestingly, the aesthetics components demonstrate that sensory and narrative elements contribute significantly to the educational value of games. Avatar customization and game story, for instance, provide opportunities for identity exploration and contextual learning that can deepen understanding and retention of educational content. The multisensory feedback systems facilitated through visual and audio elements create immersive learning environments that can enhance cognitive processing through multiple channels of information.

A notable pattern emerging from our analysis is the interconnected nature of these components. The most effective educational games integrate mechanics, dynamics, and aesthetics in ways that mutually reinforce learning objectives. For example, achievement systems (mechanics) become more meaningful when connected to exploration systems (dynamics) and embedded within compelling narratives (aesthetics). This suggests that juiciness should be considered as an integrated design principle rather than a collection of isolated features.

Conclusion

This systematic review has established a comprehensive framework for understanding juiciness in educational game design through nineteen distinct components organized within the mechanics, dynamics, and aesthetics categories. The findings demonstrate that juiciness is a sophisticated design concept that significantly influences the effectiveness of educational games by enhancing engagement, motivation, and learning outcomes. The research reveals that juicy game design creates a positive feedback loop where increased engagement leads to greater persistence, which in turn results in improved learning. By incorporating appropriate juiciness components, educational game designers can create experiences that are not only informationally rich but also intrinsically rewarding, addressing one of the fundamental challenges in educational technology: maintaining student engagement over time. Our analysis also highlights the evolving nature of juiciness in educational games, with recent developments in technology enabling more sophisticated implementations of these components. The increasing accessibility of game development tools has democratized the creation of educational games, making it possible for educators with limited technical expertise to incorporate juiciness principles into their instructional materials. While this review provides a structured framework for understanding juiciness in educational game design, it also reveals areas where further research is needed. The relative importance of different juiciness components may vary depending on factors such as learner age, subject matter, and learning context. Additionally, the optimal balance between educational content and juicy elements remains an area for exploration, as does the long-term impact of juicy educational games on knowledge retention and transfer.

Conflict of Interest

The authors hereby declare that no conflicts of interest exist in connection with the research and publication of this article. This study was conducted independently, without any financial, commercial, or personal relationships that could have influenced the outcomes or interpretations presented. The authors confirm that all aspects of the research process, including study design, data collection, analysis, and reporting, were carried out objectively and free from any external bias.

Practical and Research Recommendations

Practical Recommendations

١. **Balanced Integration**: Educational game designers should strive for a balanced integration of mechanics, dynamics, and aesthetics components rather than focusing exclusively on one category. Our findings suggest that the most effective educational games incorporate elements from all three categories in ways that support learning objectives.

٢. **Age-Appropriate Juiciness**: The implementation of juiciness components should be calibrated according to the target audience's age and developmental stage. Younger learners may benefit from more explicit visual and auditory feedback, while older students might appreciate more sophisticated narrative elements and complex achievement systems.

٣. **Educator Involvement**: Involve educators in the game design process to ensure that juiciness components enhance rather than distract from learning objectives. Educators can provide valuable insights into how game elements can be aligned with curriculum standards and pedagogical approaches.

٤. **Accessibility Considerations**: Design juiciness components with accessibility in mind, ensuring that learners with different abilities can benefit from these elements. For example, provide multiple modes of feedback (visual, auditory, haptic) to accommodate various learning preferences and needs.

٥. **Cultural Relevance**: Incorporate culturally relevant aesthetics and narratives to increase relatability and engagement for diverse learner populations. This approach can make educational content more meaningful and contextually relevant.

Research Recommendations

١. **Longitudinal Studies**: Conduct longitudinal studies to assess the long-term impact of juicy educational games on knowledge retention, skill development, and transfer of learning to non-game contexts.

٢. **Component Effectiveness**: Investigate the relative effectiveness of specific juiciness components for different subject areas, learning objectives, and learner profiles to develop more targeted design guidelines.

٣. **Measurement Tools**: Develop and validate standardized tools for measuring juiciness in educational games to facilitate more rigorous comparative studies and benchmark analyses.

٤. **Cognitive Load Considerations**: Explore the relationship between juiciness and cognitive load to determine optimal levels of juiciness that enhance rather than hinder learning processes.

٥. **Emerging Technologies**: Investigate how emerging technologies such as virtual reality, augmented reality, and artificial intelligence can enhance juiciness components in educational games and create new opportunities for immersive learning experiences.

٦. **Cross-Cultural Perspectives**: Examine how cultural factors influence the perception and effectiveness of juiciness components in educational games across different societies and educational systems.

By addressing these practical and research recommendations, the field can advance toward more sophisticated and evidence-based approaches to incorporating juiciness in educational game design, ultimately enhancing the learning experience and outcomes for students across various educational contexts.

References

Abdul Jabbar, A. I., & Felicia, P. (٢٠١٥). Gameplay engagement and learning in game-based learning: A systematic review. *Review of Educational Research*, ٨٥(٤), ٧٤٠-٧٧٩. https://doi.org/١٠,٣١٠٢/٠٠٣٤٦٥٤٣١٥٥٧٧٢١٠

Abia, A., & Caroux, L. (٢٠١٩). Effects of self-selected music and the arousal level of music on user experience and performance in video games. In S. Bagnara, R. Tartaglia, S. Albolino, T. Alexander, & Y. Fujita (Eds.), *Proceedings of the ٢٠th Congress of the International Ergonomics Association (IEA ٢٠١٨)* (pp. ١٤٨-١٥٦). Springer. https://doi.org/١٠,١٠٠٧/٩٧٨-٣-٣١٩-٩٦٠٧١-٥_١٦

Adeshina, S. O., Ibrahim, H., & Teoh, S. S. (٢٠٢٠). Literature survey on multi-camera system and its application. *IEEE Access*, ٨, ١٧٢٨٨٩-١٧٢٩٢٢. https://doi.org/١٠,١١٠٩/ACCESS.٢٠٢٠,٣٠٢٤٥٦٨

Alamri, I. K. A. (٢٠٢٤). Gameful learning investigating the impact of game elements, interactivity, and learning style on student success. *Multidisciplinary Scientific Journal*, ٧(٣), ٢٠٢٥١٠٨. https://doi.org/١٠,٣١٨٩٣/multiscience.٢٠٢٥١٠٨

Anderson, C. A., & Dill, K. E. (٢٠٠٠). Video games and aggressive thoughts, feelings, and behavior in the laboratory and in life. *Journal of Personality and Social Psychology*, ٧٨(٤), ٧٧٢-٧٩٠.

Arnab, S., Lim, T., Carvalho, M. B., Bellotti, F., de Freitas, S., Louchart, S., Suttie, N., Berta, R., & De Gloria, A. (٢٠١٥). Mapping learning and game mechanics for serious games analysis. *British Journal of Educational Technology*, ٤٦(٢), ٣٩١-٤١١. https://doi.org/١٠,١١١١/bjet.١٢١١٣

Arsenault, D. (٢٠٠٩). Video game genre, evolution and innovation. *Eludamos: Journal for Computer Game Culture*, ٣(٢), ١٤٩–١٧٦. https://doi.org/١٠,٧٥٥٧/٢٣,٦٠٠٣

Ashfaq, M., Saleem, A., & Mumtaz, S. N. (٢٠٢٣). Exploring the teachers' and students' perceptions regarding the impact of innovative technologies on quality education. *Journal of Development and Social Sciences*, ٤(٢), ٢٩–٣٩. https://doi.org/١٠,٤٧٢٠٥/jdss.٢٠٢٣(٤-II)٠٣

Atanasov, S. (٢٠١٣). Juiciness: Exploring and designing around experience of feedback in video games [Master's thesis, Uppsala University]. DiVA portal. https://www.diva-portal.org/smash/record.jsf?pid=diva٢:١٤٨٢١٨٩

Banakou, D., Groten, R., & Slater, M. (٢٠١٣). Illusory ownership of a small body produces the self-perception of a taller, slimmer body. *Psychological Science*, ٢٤(١١), ٢٢٢٢-٢٢٣٠.

Banakou, D., Hanumanthu, P. D., & Slater, M. (٢٠١٦). Virtual embodiment of white people in a black virtual body leads to a sustained reduction in their implicit racial bias. *Frontiers in Human Neuroscience*, ١٠, ٦٠١.

Banakou, D., Kishore, S., & Slater, M. (٢٠١٨). Virtually being Einstein results in an improvement in cognitive task performance and a decrease in age bias. *Frontiers in Psychology*, ٩, ٩١٧.

Bateman, S., Mandryk, R. L., Gutwin, C., & Genest, A. (٢٠١٠). Useful junk? The effects of visual embellishment on comprehension and memorability of charts. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. ٢٥٧٣-٢٥٨٢). ACM. https://doi.org/١٠,١١٤٥/١٧٥٣٣٢٦,١٧٥٣٧١٦

Bevz, M. (٢٠٢٣). Exploring the use of color as an informational layer in video game design [Master's thesis, Universidade do Porto]. Repositório Aberto UP. https://repositorio-aberto.up.pt/bitstream/١٠٢١٦/١٥٢٠٣٢/٢/٦٣٦٨١٥.pdf

Biswas, S., & Ahsan, T. (٢٠٢٣). Student-centered pedagogy: Enhancing engagement and learning outcomes. *Educational Research Review*, ٤٥, ١٠٠٥١٢.

Bizzocchi, J. (٢٠١٢). Understanding the role of body movement in player engagement. *Human-Computer Interaction*, ٢٧(١-٢), ٦٦-٩٩. https://doi.org/١٠,١٠٨٠/٠٧٣٧٠٠٢٤,٢٠١٢,٦٨٨٤٦٨

Bonwell, C. C., & Eison, J. A. (١٩٩١). *Active learning: Creating excitement in the classroom*. George Washington University.

Boyle, E. A., Hainey, T., Connolly, T. M., Gray, G., Earp, J., Ott, M., Lim, T., Ninaus, M., Pereira, J., & Ribeiro, C. (٢٠١٦). An update to the systematic literature review of empirical evidence of the impacts and outcomes of computer games and serious games. *Computers & Education*, ٩٤, ١٧٨-١٩٢. https://doi.org/١٠,١٠١٦/j.compedu.٢٠١٥,١١,٠٠٣

Bruce, T. (٢٠٠١). *Learning through play: Babies, toddlers and the foundation years*. Hodder & Stoughton.

Burleigh, T. L., Stavropoulos, V., Liew, L. W. L., Adams, B. L. M., & Griffiths, M. D. (٢٠١٨). Depression, internet gaming disorder, and the moderating effect of the gamer-avatar relationship: An exploratory longitudinal study. *International Journal of Mental Health and Addiction*, ١٦(١), ١٠٢-١٢٤. https://doi.org/١٠,١٠٠٧/s١١٤٦٩-٠١٧-٩٨٠٦-٣

Caroux, L., Isbister, K., Le Bigot, L., & Vibert, N. (٢٠١٥). Player–video game interaction: A systematic review of current concepts. *Computers in Human Behavior*, ٤٨, ٣٦٦-٣٨١. https://doi.org/١٠,١٠١٦/j.chb.٢٠١٥,٠١,٠٦٦

Cinciripini, N., Migliorini, F., Piantadosi, C., Cravero, I., Wilson, M., & Meyer, G. (٢٠١٨). The effects of substitute multisensory feedback on task performance and the sense of presence in a virtual reality environment. *PLOS ONE*, ١٣(٢), e٠١٩١٨٤٦. https://doi.org/١٠,١٣٧١/journal.pone.٠١٩١٨٤٦

Clark, D. B., Tanner-Smith, E. E., & Killingsworth, S. S. (٢٠١٦). Digital games, design, and learning: A systematic review and meta-analysis. *Review of Educational Research*, ٨٦(١), ٧٩-١٢٢. https://doi.org/١٠,٣١٠٢/٠٠٣٤٦٥٤٣١٥٥٨٢٠٦٥

Clark, R. C., & Mayer, R. E. (٢٠١٦). *E-learning and the science of instruction: Proven guidelines for consumers and designers of multimedia learning* (٤th ed.). Wiley.

Clemens, W., Held, D., & Albrecht, H. (٢٠١٨). Slow motion in films and video clips: Music influences perceived duration and emotion, autonomic physiological activation and pupillary responses. *PLOS ONE*, ١٣(٦), e٠١٩٩١٦١. https://doi.org/١٠,١٣٧١/journal.pone.٠١٩٩١٦١

Collins, K. (٢٠٠٨). *Game sound: An introduction to the history, theory, and practice of video game music and sound design*. MIT Press.

Connolly, T. M., Boyle, E. A., MacArthur, E., Hainey, T., & Boyle, J. M. (٢٠١٢). A systematic literature review of empirical evidence on computer games and serious games. *Computers & Education*, ٥٩(٢), ٦٦١-٦٨٦.

Csikszentmihalyi, M. (١٩٩٠). *Flow: The psychology of optimal experience*. Harper & Row.

Denisova, A., & Cook, E. (٢٠١٩). Power-ups in digital games: The rewarding effect of phantom game elements on player experience. In *Proceedings of the Annual Symposium on Computer-Human Interaction in Play* (pp. ١٦١-١٦٨). ACM. https://doi.org/١٠,١١٤٥/٣٣١١٣٥٠,٣٣٤٧١٩٤

Deslauriers, L., Schelew, E., & Wieman, C. (٢٠١١). Improved learning in a large-enrollment physics class. *Science*, ٣٣٢(٦٠٣١), ٨٦٢-٨٦٤.

Deterding, S., Dixon, D., Khaled, R., & Nacke, L. (٢٠١١). From game design elements to gamefulness: Defining gamification. In *Proceedings of the ١٥th International Academic MindTrek Conference* (pp. ٩-١٥). ACM.

Dicheva, D., & Dichev, C. (٢٠١٥). Gamification in education: Where are we in ٢٠١٥? In *Proceedings of E-Learn: World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education* (pp. ١٤٤٥-١٤٥٤). Association for the Advancement of Computing in Education (AACE).

Dickey, M. D. (٢٠١٥). *Aesthetics and design for game-based learning*. Routledge. https://doi.org/١٠,٤٣٢٤/٩٧٨٠٢٠٣١٢٦٧٠٧

Drachen, A., & Canossa, A. (٢٠٠٩). Toward gameplay analysis via gameplay metrics. In *Proceedings of the ١٣th International MindTrek Conference: Everyday Life in the Ubiquitous Era* (pp. ٢٠٢-٢٠٩). ACM. https://doi.org/١٠,١١٤٥/١٦٢١٨٤١,١٦٢١٨٧٨

Freeman, S., Eddy, S. L., McDonough, M., Smith, M. K., Okoroafor, N., Jordt, H., & Wenderoth, M. P. (٢٠١٤). Active learning increases student performance in science, engineering, and mathematics. *Proceedings of the National Academy of Sciences*, ١١١(٢٣), ٨٤١٠-٨٤١٥.

Gee, J. P. (٢٠٠٣). *What video games have to teach us about learning and literacy*. Palgrave Macmillan.

Gentile, D. (٢٠٠٩). Pathological video-game use among youth ages ٨ to ١٨: A national study. *Psychological Science*, ٢٠(٥), ٥٩٤-٦٠٢.

Gerling, K., Birk, M. V., Mandryk, R. L., & Doucette, A. (٢٠١٣). The effects of graphical fidelity on player experience. In *Proceedings of International Conference on Making Sense of Converging Media* (pp. ٢٢٩-٢٣٧). ACM. https://doi.org/١٠,١١٤٥/٢٥٢٣٤٢٩,٢٥٢٣٤٧٣

Gorai, N. (٢٠٢٤). Enhancing learning and engagement: The integration of gamification in elementary education. https://doi.org/١٠,٥٨٥٣٢/v٣bbso٣p٢ch١

Gougeh, R. A., & Falk, T. H. (٢٠٢٢). Multisensory immersive experiences: A pilot study on subjective and instrumental human influential factors assessment. In ٢٠٢٢ ١٤*th International Conference on Quality of Multimedia Experience (QoMEX)* (pp. ١-٦). IEEE. https://doi.org/١٠,١١٠٩/QoMEX٥٥٤١٦,٢٠٢٢,٩٩٠٠٩٠٧

Gough, S., Gough, S. A., Adami-Vardavouli, N., & Dikaios, H. (٢٠١٨). The impact of visual style on user experience in games. *EAI Endorsed Transactions on Serious Games*, ٥(١٧). https://doi.org/١٠,٤١٠٨/eai.٥-١-٢٠١٨,١٥٣٥٣٥

Gray, K., Gabler, K., Shodhan, S., & Kucic, M. (٢٠٠٥). How to prototype a game in under ٧ days. Gamasutra. https://www.gamedeveloper.com

Green, C. S., & Bavelier, D. (٢٠١٢). Learning, attentional control, and action video games. *Current Biology*, ٢٢(٦), R١٩٧-R٢٠٦.

Griffiths, M. D., & Calado, F. (٢٠٠٧). Social interactions in massively multiplayer online role-playing gamers. *CyberPsychology & Behavior*, ١٠(٤), ٥٧٥_٥٨٣. https://doi.org/١٠,١٠٨٩/cpb.٢٠٠٧,٩٩٨٨

Grimshaw, M., Tan, S.-L., & Lipscomb, S. D. (٢٠١٣). Playing with sound: The role of music and sound effects in gaming. In S.-L. Tan, A. Cohen, S. Lipscomb, & R. Kendall (Eds.), *The psychology of music in multimedia* (pp. ٢٨٩-٣١٤). Oxford University Press.

Hamari, J., & Nousiainen, T. (٢٠١٥). Why do teachers use game-based learning technologies? The role of individual and institutional ICT readiness. In *٢٠١٥ International Conference on Computer Systems and Technologies - CompSysTech '١٥* (pp. ٢٤٨-٢٥٥). IEEE. https://doi.org/١٠,١١٤٥/٢٨١٢٤٢٨,٢٨١٢٤٥٢

Haroun, Y., Nambi, R., Kyagaba, D. S., & Najjemba, J. (٢٠٢٤). Rethinking English language pedagogy: An exploration of the gaps in traditional language teaching methods. *International Journal For Multidisciplinary Research*, ٦(٦). https://doi.org/١٠,٣٦٩٤٨/ijfmr.٢٠٢٤.v٠٦i٠٦,٣٢٤٤٤

Hicks, K. (٢٠٢٠). Juicy game design: Exploring the impact of 'juiciness' on player experience. [Repository]. University of Lincoln. https://repository.lincoln.ac.uk/ndownloader/files/٤٢٩٧٥٥٨٣

Hicks, K., Dickinson, P., Holopainen, J., & Gerling, K. (٢٠١٨). Good game feel: An empirically grounded framework for juicy design. In *Proceedings of the ٢٠١٨ DiGRA International Conference: The Game is the Message*. Digital Games Research Association.

Hicks, K., Gerling, K., Dickinson, P., & Vanden Abeele, V. (٢٠١٩). Juicy game design: Understanding the impact of visual embellishments on player experience. In *Proceedings of the Annual Symposium on Computer-Human Interaction in Play* (pp. ١٨٥-١٩٧). ACM. https://doi.org/١٠,١١٤٥/٣٣١١٣٥٠,٣٣٤٧١٧١

Hicks, K., Gerling, K., Richardson, G., Pike, T. W., Burman, O. H. P., & Dickinson, P. (٢٠١٩). Understanding the effects of gamification and juiciness on players. In *٢٠١٩ IEEE Conference on Games (CoG)* (pp. ١-٨). IEEE. https://doi.org/١٠,١١٠٩/CIG.٢٠١٩,٨٨٤٨١٠٥

Huang, Y., Jasin, S., & Manchanda, P. (٢٠١٩). "Level up": Leveraging skill and engagement to maximize player game-play in online video games. *Information Systems Research*, ٣٠(٣), ٩٢٧-٩٤٧. https://doi.org/١٠,١٢٨٧/isre.٢٠١٩,٠٨٣٩

Huizinga, J. (١٩٥٥). *Homo ludens: A study of the play-element in culture*. Beacon Press.

Huseinović, L. (٢٠٢٣). The relationship between digital competency, learning styles and learners' perception of traditional versus technology-assisted language learning. *MAP Education and Humanities*, ٣(١), ١٧–٣٠. https://doi.org/١٠,٥٣٨٨٠/٢٧٤٤_٢٣٧٣,٢٠٢٢,٢,٣,١٧

Izat, M., Kyyakbayeva, U., Nurgaliyeva, S., Urinova, F., & Khallokova, M. (٢٠٢٤). The implications of educational games on the development of children's intellectual abilities. *International Journal of Innovative Research in Scientific Studies*, ٨(١), ١٢٦–١٣٦. https://doi.org/١٠,٥٣٨٩٤/ijirss.v٨i١,٣٥٧٨

Johansen, M., & Cook, M. (٢٠٢١). Challenges in generating juice effects for automatically designed games. In *Proceedings of the Seventeenth AAAI Conference on Artificial Intelligence and Interactive Digital Entertainment*. AAAI Press.

Johnson, D. W., Johnson, R. T., & Smith, K. A. (٢٠١٤). Cooperative learning: Improving university instruction by basing practice on validated theory. *Journal on Excellence in University Teaching*, ٢٥(٤), ١-٢٦.

Jonasson, M., & Purho, P. (٢٠١٢). Juice it or lose it. Game Developers Conference. https://www.youtube.com/watch?v=Fy٠aCDmgnxg

Juul, J. (٢٠١٠). *A casual revolution: Reinventing video games and their players*. MIT Press.

Kao, D. (٢٠٢٠). The effects of juiciness in an action RPG. *Entertainment Computing*, ٣٤, ١٠٠٣٥٩. https://doi.org/١٠,١٠١٦/j.entcom.٢٠٢٠,١٠٠٣٥٩

Kao, D., & Harrell, D. F. (٢٠١٥). Exploring the impact of role model avatars on game experience in educational games. In *Proceedings of the ٢٠١٥ Annual Symposium on Computer-Human Interaction in Play* (pp. ٥٧١-٥٧٦). ACM. https://doi.org/١٠,١١٤٥/٢٧٩٣١٠٧,٢٨١٠٢٩١

Kao, D., & Harrell, D. F. (٢٠١٦). Toward understanding the impacts of role model avatars on engagement in computer science learning. https://www.semanticscholar.org/paper/٩١١ff٣٠٠٩٧cefb٤٦٨e٠e٨٧٦٤٧٠٨٤ade٨٧٩be٨٤b٧

Kapp, K. M. (٢٠١٢). *The gamification of learning and instruction: Game-based methods and strategies for training and education*. Pfeiffer.

Kilteni, K., Bergstrom, I., & Slater, M. (٢٠١٣). Drumming in immersive virtual reality: The body shapes the way we play. *IEEE Transactions on Visualization and Computer Graphics*, ١٩(٤), ٥٩٧-٦٠٥.

Kolb, D. A. (١٩٨٤). *Experiential learning: Experience as the source of learning and development*. Prentice-Hall.

Lave, J., & Wenger, E. (١٩٩١). *Situated learning: Legitimate peripheral participation*. Cambridge University Press.

Laurier, E., & Reeves, S. (٢٠١٣). Cameras in video games: Comparing play in Counter-Strike and the Doctor Who Adventures. In M. Broth, E. Laurier, & L. Mondada (Eds.), *Studies of video practices: Video at work* (pp. ١٨٣-٢٠٨). Routledge.

Lencucha-Nilsson, F. (٢٠١١). The power-up experience: A study of power-ups in games and their effect on player experience. In *Proceedings of DiGRA ٢٠١١ Conference: Think Design Play*. Digital Games Research Association.

Liao, G.-Y., Cheng, T. C. E., & Teng, C.-I. (٢٠١٩). How do avatar attractiveness and customization impact online gamers' flow and loyalty? *Internet Research*, ٢٩(٢), ٣٤٩-٣٦٦. https://doi.org/١٠,١١٠٨/IntR-١١-٢٠١٧-٠٤٦٣

Lown, V., Smith, J. K., Ray, N., Zhang, X., Garrett, J., & Frederick, C. M. (٢٠٢٠). Relatedness in gaming: The effect in-game touch has on player connection. *SN Applied Sciences*, ٢(١), ١-٨. https://doi.org/١٠,١٠٠٧/s٤٢٤٥٢-٠١٩-١٨٥٩-٤

Lyu, K., Brambilla, A., Globa, A., & de Dear, R. (٢٠٢٣). An immersive multisensory virtual reality approach to the study of human-built environment interactions. *Automation in Construction*, ١٥٠, ١٠٤٨٣٦. https://doi.org/١٠,١٠١٦/j.autcon.٢٠٢٣,١٠٤٨٣٦

Mangaroska, K., Larssen, K., Amundsen, A., Vesin, B., & Giannakos, M. (٢٠٢٤). Understanding engagement through game learning analytics and design elements: Insights from a word game case study. In *Proceedings of the ١٤th Learning Analytics and Knowledge Conference* (pp. ٣١٣-٣٢٣). ACM. https://doi.org/١٠,١١٤٥/٣٦٣٦٥٥٥,٣٦٣٦٨٨٥

Mayer, R. E. (٢٠١٤). *The Cambridge handbook of multimedia learning* (٢nd ed.). Cambridge University Press.

Mekovec, R. (٢٠٢٣). Choosing a modern teaching approach and supporting technology. In *Information Systems and Technologies: WorldCIST ٢٠٢٣, Volume ٣* (pp. ٤٨٨-٤٩٩). Springer. https://doi.org/١٠,١٠٠٧/٩٧٨-٣-٠٣١-٣٤٤١١-٤_٣٣

Mutmainah, S. (٢٠٠٨). Pengaruh penerapan metode pembelajaran kooperatif berbasis kasus yang berpusat pada mahasiswa terhadap efektivitas pembelajaran akuntansi keperilakuan. *Indonesian Journal of Accounting Research*, ١١(٣). https://doi.org/١٠,٣٣٣١٢/IJAR.١٩٤

Nacke, L. E., Grimshaw, M. N., & Lindley, C. A. (٢٠١٠). More than a feeling: Measurement of sonic user experience and psychophysiology in a first-person shooter game. *Interacting with Computers*, ٢٢(٥), ٣٣٦-٣٤٣. https://doi.org/١٠,١٠١٦/j.intcom.٢٠١٠,٠٤,٠٠٥

Nam, N. T., Duc, N. V., & Bon, B. N. (٢٠٢٤). Using educational games in teaching English, a foreign language. *International Journal of English Language Studies*, ٦(٢), ١٠٥–١١٠. https://doi.org/١٠,٣٢٩٩٦/ijels.٢٠٢٤,٦,٢,١٥

Natucci, G. C. (٢٠٢٣). Balancing game elements, learning, and emotions in game design. In *Serious Games Development and Applications* (pp. ٨٩-١١٢). Springer. https://doi.org/١٠,١٠٠٧/٩٧٨-٣-٠٣١-٢٧٦٣٩-٢_٥

Newton, E., & Lun, M. (٢٠١٩). Why story matters: A review of narrative in serious games. *Journal of Educational Computing Research*, ٥٧(١), ١٤٥-١٦١. https://doi.org/١٠,١١٧٧/٠٧٣٥٦٣٣١١٩٨٥٩٩٠٤

Nikolaeva, E., Sold Tova, N., Nekrasov, M., Nikolaev, M., & Kuzmina, E. (٢٠٢٥). The phenomenon of video games: The production of digital media of everyday life. *Journal of Lifestyle and SDGs Review*, ٥(٢), e٠٤٠٤٦-e٠٤٠٤٦.

Osimo, S. A., Pizarro, R., Spanlang, B., & Slater, M. (٢٠١٥). Conversations between self and self as Sigmund Freud—A virtual body ownership paradigm for self counselling. *Scientific Reports*, ٥, ١٣٨٩٩.

Peña, J., Hancock, J. T., & Merola, N. A. (٢٠٠٩). The priming effects of avatars in virtual settings. *Communication Research*, ٣٦(٦), ٨٣٨-٨٥٦. https://doi.org/١٠,١١٧٧/٠٠٩٣٦٥٠٢٠٩٣٤٦٨٠٢

Pichlmair, M., & Johansen, M. (٢٠٢٢). Designing game feel: A survey. *IEEE Transactions on Games*, ١٤(٢), ١٣٨-١٥٢. https://doi.org/١٠,١١٠٩/TG.٢٠٢١,٣٠٧٢٢٤١

Prensky, M. (٢٠٠١). *Digital game-based learning*. McGraw-Hill.

Prensky, M. (٢٠١٤). *Digital game-based learning* (٢nd ed.). McGraw-Hill Education.

Prince, M. (٢٠٠٤). Does active learning work? A review of the research. *Journal of Engineering Education*, ٩٣(٣), ٢٢٣-٢٣١.

Qin, H., Rau, P. L. P., & Salvendy, G. (٢٠٠٩). Measuring player immersion in the computer game narrative. *International Journal of Human-Computer Interaction*, ٢٥(٢), ١٠٧-١٣٣. https://doi.org/١٠,١٠٨٠/١٠٤٤٧٣١٠٨٠٢٥٤٦٧٣٢

Rama, P. S., Black, R. W., Van Es, E., & Warschauer, M. (٢٠١٢). Affordances for second language learning in World of Warcraft. *ReCALL*, ٢٤(٣), ٣٢٢-٣٣٨.

Rapeepisarn, K., Wong, K. W., Fung, C. C., & Khine, M. S. (٢٠٠٨). The relationship between game genres, learning techniques and learning styles in educational computer games. In *Technologies for E-Learning and Digital Entertainment* (pp. ٤٩٧-٥٠٨). Springer.

Rogers, S. (٢٠١٤). *Level up! The guide to great video game design* (٢nd ed.). Wiley.

Romadona, Y., Pratiwi Estiningtias, E., & Satriani, A. (٢٠٢٣). Interaksi guru dan siswa: Analisis mendalam terhadap kurangnya motivasi belajar di kelas akibat metode pengajaran tradisional. *Jurnal Pendidikan dan Pengajaran*, ١(٣). https://doi.org/١٠,٥٨٥٤٠/pijar.v١i٣,٤٩٦

Romero, M., & Usart, M. (٢٠١٣). Serious games integration in an entrepreneurship massive online course (MOOC). In *Serious Games Development and Applications* (pp. ٢١٢-٢٢٥). Springer. https://doi.org/١٠,١٠٠٧/٩٧٨-٣-٦٤٢-٤٠٧٩٠-١_٢١

Ryan, R. M., & Deci, E. L. (٢٠٠٠). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist*, ٥٥(١), ٦٨-٧٨.

Saraji, M., & Attaran, M. (٢٠١١). Educational transformation in the digital age. *Iranian Journal of Educational Technology*, ٧(٢), ٤٥-٥٨. [In Persian]

Schell, J. (٢٠٠٨). *The art of game design: A book of lenses*. CRC Press.

Shin, D.-H., & Chung, K. (٢٠١٧). The effects of input modality and story-based knowledge on users' game experience. *Computers in Human Behavior*, ٦٨, ١٨٠-١٨٩. https://doi.org/١٠,١٠١٦/j.chb.٢٠١٦,١١,٠٣٠

Silpasuwanchai, C., & Ren, X. (٢٠١٨). A quick look at game engagement theories. In *The Wiley handbook of human computer interaction* (pp. ٦٥٧-٦٧٩). Wiley.

Smets, J. H. K., & van der Spek, E. D. (٢٠٢١). That sound's juicy! Exploring juicy audio effects in video games. In *Entertainment Computing – ICEC ٢٠٢١* (pp. ٣١٩-٣٣٥). Springer. https://doi.org/١٠,١٠٠٧/٩٧٨-٣-٠٣٠-٨٩٣٩٤-١_٢٤

Soylucicek, S. (٢٠١٢). Graphic design on educational computer games. *Procedia - Social and Behavioral Sciences*, ٤٦, ٢٠٨٣-٢٠٨٧. https://doi.org/١٠,١٠١٦/j.sbspro.٢٠١٢,٠٥,٤٣٢

Squire, K. (٢٠١١). *Video games and learning: Teaching and participatory culture in the digital age*. Teachers College Press.

Sweller, J. (٢٠١١). Cognitive load theory. In J. P. Mestre & B. H. Ross (Eds.), *Psychology of learning and motivation* (Vol. ٥٥, pp. ٣٧-٧٦). Academic Press.

Swink, S. (٢٠٠٨). *Game feel: A game designer's guide to virtual sensation*. CRC Press.

Swink, S. (٢٠٠٩). *Game feel: A game designer's guide to virtual sensation*. Morgan Kaufmann.

Tao, X., Wu, K., & Yang, Y. (٢٠٢١). The effects of vibration on assisting game play and improving player engagement when lacking sound. In *HCI in Games* (pp. ٣٨٩-٤٠٧). Springer. https://doi.org/١٠,١٠٠٧/٩٧٨-٣-٠٣٠-٧٧٢٧٧-٢_٣٠

Toda, A. M., Klock, A. C. T., Oliveira, W., Palomino, P. T., Rodrigues, L., Shi, L., Bittencourt, I. I., Gasparini, I., Isotani, S., & Cristea, A. I. (٢٠١٩). A taxonomy of game elements for gamification in educational contexts: Proposal and evaluation. In *٢٠١٩ IEEE ١٩th International Conference on Advanced Learning Technologies (ICALT)* (pp. ٨٤-٨٨). IEEE. https://doi.org/١٠,١١٠٩/ICALT.٢٠١٩,٠٠٠٢٨

Trepte, S., & Reinecke, L. (٢٠١٠). Avatar creation and video game enjoyment: Effects of life-satisfaction, game competitiveness, and identification with the avatar. *Journal of Media Psychology*, ٢٢(٤), ١٧١-١٨٤. https://doi.org/١٠,١٠٢٧/١٨٦٤-١١٠٥/a٠٠٠٠٢٢

Vaidya, Y., & Kaushik, H. B. (٢٠٢٤). Gameful learning: Exploring the integration of board game design in education. *ShodhKosh: Journal of Visual and Performing Arts*, ٥(ICETDA٢٤). https://doi.org/١٠,٢٩١٢١/shodhkosh.v٥.iicetda٢٤,٢٠٢٤,١٢٧٤

Van Eck, R. (٢٠٠٦). Digital game-based learning: It's not just the digital natives who are restless. *EDUCAUSE Review*, ٤١(٢), ١٦-٣٠.

Viberg, H., & Viberg, H. A. (٢٠٢٢). Slow motion in videogames—gameplay over style? *Games and Culture*, ١٧(٧-٨), ١٠٧٠-١٠٩٠. https://doi.org/١٠,١١٧٧/١٥٥٥٤١٢٠٢٢١٠٩٠٩٧٤

Wharton, A., & Collins, K. (٢٠١١). Subjective measures of the influence of music customization on the video game play experience: A pilot study. *Game Studies*, ١١(٢).

Whitton, N. (٢٠١٠). *Learning with digital games: A practical guide to engaging students in higher education*. Routledge.

Wouters, P., Van Nimwegen, C., Van Oostendorp, H., & Van Der Spek, E. D. (٢٠١٣). A meta-analysis of the cognitive and motivational effects of serious games. *Journal of Educational Psychology*, ١٠٥(٢), ٢٤٩-٢٦٥.

Wulan, D. R., Nainggolan, D. M., Hidayat, Y., Rohman, T., & Fiyul, A. Y. (٢٠٢٤). Exploring the benefits and challenges of gamification in enhancing student learning outcomes. *Global International Journal of Innovative Research*, ٢(٧), ١٦٥٧–١٦٧٤. https://doi.org/١٠,٥٩٦١٣/global.v٢i٧,٢٣٨

Yang, T.-C., Chen, M. C., & Chen, S. Y. (٢٠١٩). The effects of background music on game-based learning: A cognitive style approach. *The Asia-Pacific Education Researcher*, ٢٨(٦), ٤٩٥-٥٠٨. https://doi.org/١٠,١٠٠٧/s٤٠٢٩٩-٠١٩-٠٠٤٥٠-٨

Yang, Z., & Xiao, G. (٢٠٢٢). An investigation of the relationship between English classroom environment in rural junior middle school and students' English learning boredom. *International Journal of Education and Humanities*, ٢(٣), ٤٨-٥٢. https://doi.org/١٠,٥٤٠٩٧/ijeh.v٢i٣,٣٤٣

Yue, S. (٢٠٢٤). The evolution of pedagogical theory: From traditional to modern approaches and their impact on student engagement and success. *Journal of Education and Educational Research*, ٧(٣), ٢٢٦-٢٣٠. https://doi.org/١٠,٥٤٠٩٧/j٤agx٤٣٩

Yun, G., Min, M., Lee, J., Kim, D.-G., Tan, H. Z., & Choi, S. (٢٠٢٣). Generating real-time, selective, and multimodal haptic effects from sound for gaming experience enhancement. In *Proceedings of the ٢٠٢٣ CHI Conference on Human Factors in Computing Systems* (article ٤٩٧, pp. ١-١٠). ACM. https://doi.org/١٠,١١٤٥/٣٥٤٤٥٤٨,٣٥٨٠٧٨٧