Online-Journals.org

iJIM International Journal of Interactive Mobile Technologies

iJIM | eISSN: 1865-7923 | Vol. 19 No. 23 (2025) | OPEN ACCESS

https://doi.org/10.3991/ijim.v19i23.59119

PAPER

Gamification Research in Sustainable Educational Settings: A Thematic Analysis Approach

Turgut Karakose[1], Stamatios Papadakis[2] (✉)

[1]Kütahya Dumlupinar University, Kütahya, Turkey

[2]University of Crete, Rethymno, Greece

stpapadakis@uoc.gr

ABSTRACT

Gamification has gained increasing prominence in educational research as a strategy for enhancing learner engagement, motivation, and performance. Despite a growing body of literature, a comprehensive understanding of how gamification themes have evolved over time remains limited. This study conducts a bibliometric and science mapping analysis using SciMAT to examine the thematic evolution of gamification in education based on 3,414 peer-reviewed journal articles indexed in Scopus. The analysis spans three distinct periods—1962–2009, 2010–2019, and 2020–2025—revealing a progression from peripheral and exploratory themes to more mature, theoretically grounded, and diversified research clusters. Key motor themes such as gamification, motivation, and humans persist throughout all periods, while emerging themes include special education, virtual reality, and autonomous learning. The study underscores the field's conceptual maturation and diversification in response to technological advances and pedagogical shifts, particularly in the post-pandemic era. Findings offer strategic insights for educators, researchers, and policymakers seeking to design inclusive and sustainable gamified learning environments.

KEYWORDS

gamification, motivation, science mapping, thematic evolution, bibliometric analysis, SciMAT, sustainable education, educational technology, engagement, learner-centered pedagogy

1 INTRODUCTION

In recent years, gamification has emerged as a powerful approach to enriching educational experiences by integrating game elements into non-game contexts [1]. Rooted in motivational psychology and user engagement theory, gamification has been applied across diverse educational levels—from early childhood settings to higher education institutions—to increase student motivation, persistence, and learning outcomes [2]. While early applications focused on point systems and badges, the field has gradually matured, encompassing deeper pedagogical strategies that align with constructivist, experiential, and self-determination theories [3, 4].

Karakose, T., Papadakis, S. (2025). Gamification Research in Sustainable Educational Settings: A Thematic Analysis Approach. *International Journal of Interactive Mobile Technologies (iJIM)*, 19(23), pp. 4–24. https://doi.org/10.3991/ijim.v19i23.59119

Article submitted 2025-07-09. Revision uploaded 2025-10-02. Final acceptance 2025-10-11.

© 2025 by the authors of this article. Published under CC-BY.

As digital learning environments evolve, so does the scholarly interest in gamification as both a pedagogical method and a research domain. Several systematic reviews and meta-analyses have attempted to capture this trend [5, 6, 7], yet few studies have comprehensively mapped the thematic evolution of gamification research over time. More specifically, the literature lacks longitudinal analyses that not only identify core topics but also trace how these topics emerge, decline, or transform across different educational and technological contexts.

This study addresses this gap by conducting a bibliometric and science mapping analysis using SciMAT, examining gamification-related publications indexed in Scopus across three key time periods: 1962–2009, 2010–2019, and 2020–2025. The aim is to identify strategic themes, uncover knowledge structures, and explore the conceptual evolution of gamification in sustainable educational contexts. By providing both quantitative and thematic insights, the study contributes to a more nuanced understanding of how gamification research has progressed and where it is headed.

2 MATERIALS AND METHODS

This study, aiming to reveal the intellectual evolution of gamification research across three periods of time, was designed using bibliometric research methods. The thematic growth of the field was revealed through the identification of different types of thematic strands that appeared across the periods of analysis, which was then elaborated to illuminate the intellectual evolution of the field since it first attracted researchers' attention.

2.1 Identification of resources

Resources for the current analysis were obtained from the SCOPUS database, which provides high-quality research data for bibliometric studies [8]. We started data extraction with a keyword search on SCOPUS using the following search string:

TITLE ("gamification" OR "gamified" OR "gaming" OR "gamif" OR "gamified environment" OR "gamified application" OR "applied game design" OR "digital game-based learning" OR "serious games") AND TITLE ("education*" OR "school*" OR "teacher*" OR "student*" OR "learner*" OR "pupil*" OR "classroom*" OR "learning" OR "teaching" OR "training" OR "instruction" OR "e-learning" OR "blended learning" OR "secondary education" OR "primary education" OR "elementary education" OR "preschool education" OR "pre-school education" OR "K-12 education" OR "high school" OR "junior high school" OR "middle school" OR "prep school" OR "preparatory school" OR "senior high school" OR "college" OR "college preparatory school" OR "intermediate school" OR "higher education" OR "universit*" OR "further education" OR "graduate school education" OR "tertiary-level education" OR "graded school education")*

As can be seen in the search string, the search was specified to include article titles only, without any time limitations, to avoid including research that does not directly address gamification. The data search and extraction process for the study was performed/reported according to the PRISMA 2020 protocol [9] and presented in Figure 1.

Our initial search on Scopus returned 8827 documents. Scanning through titles, we first identified duplicates and documents irrelevant to the search field (i.e., not related to gamification in the educational sense). At this stage, a total of 2291 documents were removed from the raw data set, which was then submitted to detailed

screening in light of study inclusion/exclusion criteria, which suggested the inclusion of English-only documents, gamification search in educational settings, and journal articles while excluding books, book chapters, and conference proceedings. At this stage, we not only focused on the titles but also the abstracts of the articles to enable a meticulous process of data extraction. A total of 3122 documents were removed from the dataset for being out of scope, non-English, book chapters, conference proceedings, or for other reasons, such as being a book review or a letter to the editor. As a result, the final dataset of the study included 3414 journal articles.

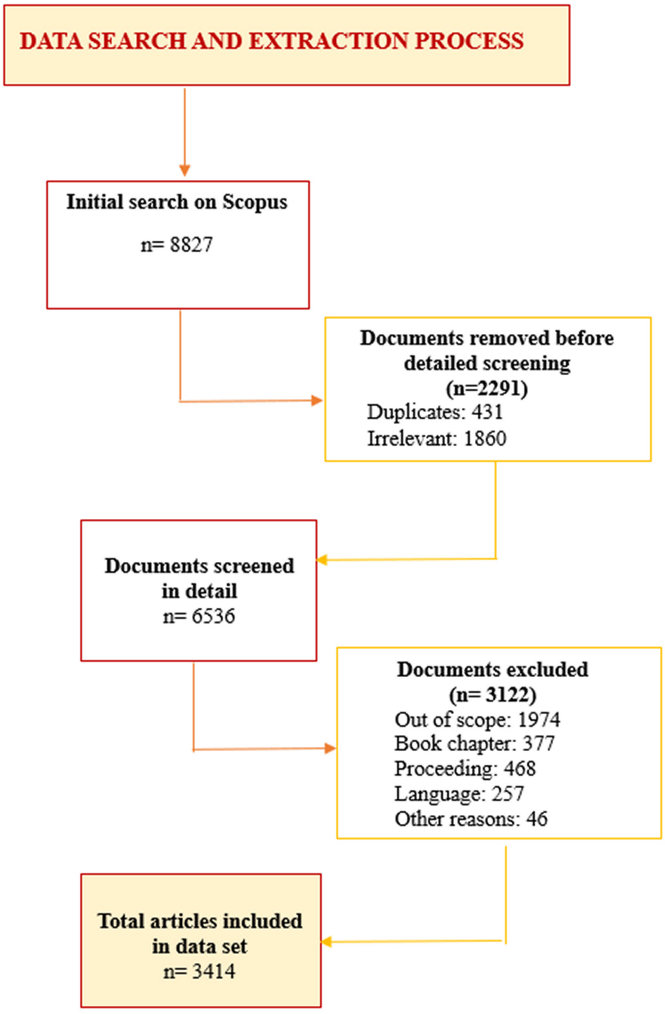


Fig. 1. PRISMA flowchart for data search and extraction

2.2 Data analysis and interpretation

The thematic strands and their evolution across periods were determined through bibliometric thematic analysis conducted using SciMAT software, which enables science mapping of a research field and reveals the thematic structure of the field throughout its intellectual development [10].

Prior to the analysis, the bibliometric data for each article in the dataset were transferred to SciMAT. First, the data was screened to determine those keywords that were very similar to each other (e.g., teacher and teachers, student and pupil). These keywords were manually categorized into a single representative keyword, a crucial step that enabled rigorous analysis [11, 12].

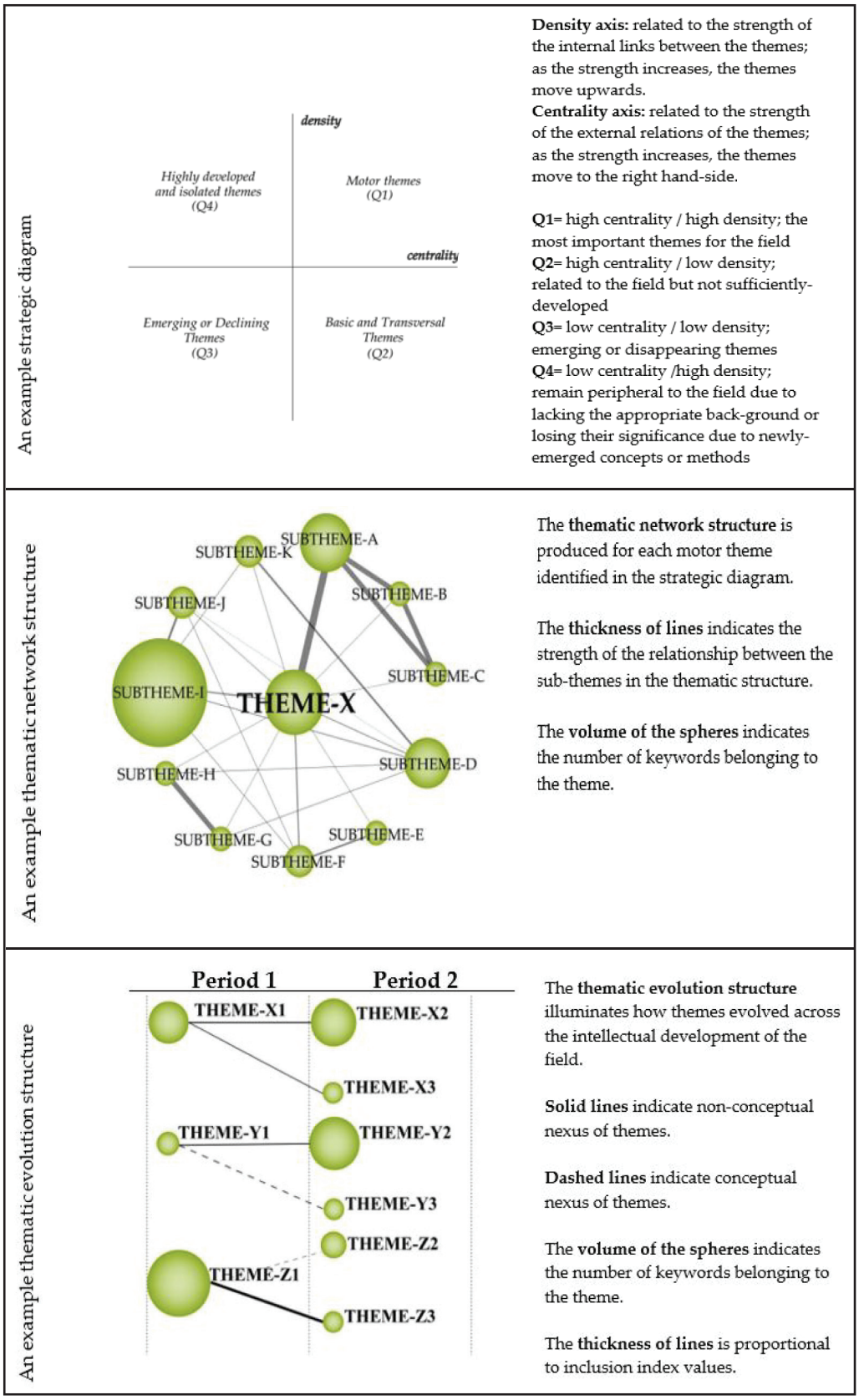


Fig. 2. Data analysis and interpretation guidelines [10, 13]

The analysis was conducted using the clustering algorithm and the inclusion index options of the software to identify thematic clusters and the relationships between the themes involved in these clusters. The relationships between the themes were evaluated through calculating density and centrality values of the themes, which also reveals four basic types of themes for each period of analysis: (1) motor themes; (2) basic and transversal themes; (3) emerging/declining themes; and (4) highly-developed and isolated themes. Details regarding the analysis and interpretation of results obtained using SciMAT software are presented in Figure 2.

In accordance with the purpose of the study to reveal how thematic and intellectual strands in the gamification research field evolved over time, the analysis was conducted across three consecutive periods, which were determined by the researchers based on the accumulated number of publications included in the dataset. Period 1 extended from 1962 to 2009, Period 2 from 2010 to 2019, and Period 3 from 2020 to 2025.

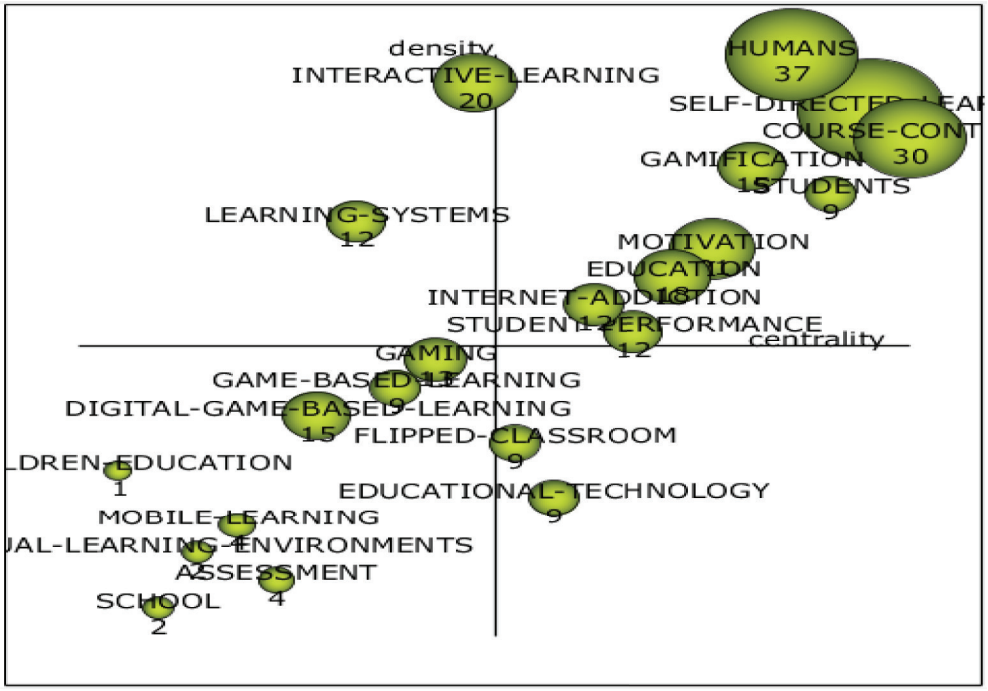
3 FINDINGS

3.1 Thematic structure analysis

Period 1 (1962–2009). The first thematic analysis, conducted with articles published between 1962 and 2009, revealed a total of 21 themes, all of which are presented in the strategic diagram in Figure 3.

Among the themes presented in Figure 3, nine were placed in the first quartile of the strategic diagram due to their high centrality and density values. These themes, HUMANS, SELF-DIRECTED-LEARNING, COURSE-CONTENTS, GAMIFICATION, STUDENTS, MOTIVATION, EDUCATION, INTERNET-ADDICTION, and STUDENT-PERFORMANCE, were the motor themes that led the growth of the gamification research field during this period. On the other hand, the FLIPPED-CLASSROOM and EDUCATIONAL-TECHNOLOGY themes were found to be basic and transversal themes, which were significant for the development of the field but did not receive sufficient attention. During the first period, a large variety of emerging themes were observed involving the themes of GAMING, DIGITAL-GAME-BASED-LEARNING, CHILDREN-EDUCATION, MOBILE-LEARNING, VIRTUAL-LEARNING-ENVIRONMENTS, ASSESSMENT, and SCHOOL. Considering that this analysis addressed the initial period of the gamification research field, all these themes could be regarded as emerging themes, i.e. themes that began to attract research attention, rather than declining ones. The highly developed and isolated themes of the period were identified as the INTERACTIVE-LEARNING and LEARNING-SYSTEMS themes. These two themes remained peripheral to the research field during the first period despite having a strong capacity to establish a stronger theoretical ground.

a) Period 1 (1962–2009)



b) Performance scores

Cluster	h-index	Cites	Centrality Range	Density Range
COURSE-CONTENTS	30	3436	1	0.86
SELF-DIRECTED-LEARNING	42	7755	0.95	0.9
STUDENTS	9	1976	0.9	0.76
HUMANS	37	4299	0.86	1
GAMIFICATION	15	1679	0.81	0.81
MOTIVATION	21	3453	0.76	0.67
EDUCATION	18	1763	0.71	0.62
STUDENT-PERFORMANCE	12	3118	0.67	0.52
INTERNET-ADDICTION	12	534	0.62	0.57
EDUCATIONAL-TECHNOLOGY	9	376	0.57	0.24
FLIPPED-CLASSROOM	9	702	0.52	0.33
INTERACTIVE-LEARNING	20	5389	0.48	0.95
GAMING	13	663	0.43	0.48
GAME-BASED-LEARNING	9	1034	0.38	0.43
LEARNING-SYSTEMS	12	481	0.33	0.71
DIGITAL-GAME-BASED-LEARNING	15	2018	0.29	0.38
ASSESSMENT	4	204	0.24	0.1
MOBILE-LEARNING	4	728	0.19	0.19
VIRTUAL-LEARNING-ENVIRONMENTS	2	85	0.14	0.14
SCHOOL	2	75	0.1	0.05
CHILDREN-EDUCATION	1	44	0.05	0.29

Fig. 3. Strategic diagram and relevant performance scores for Period 1

The results of the thematic network analysis, which reveal the relevant sub-themes of the previously identified motor themes, are presented in Figure 4.

Period 1 (1962–2009)

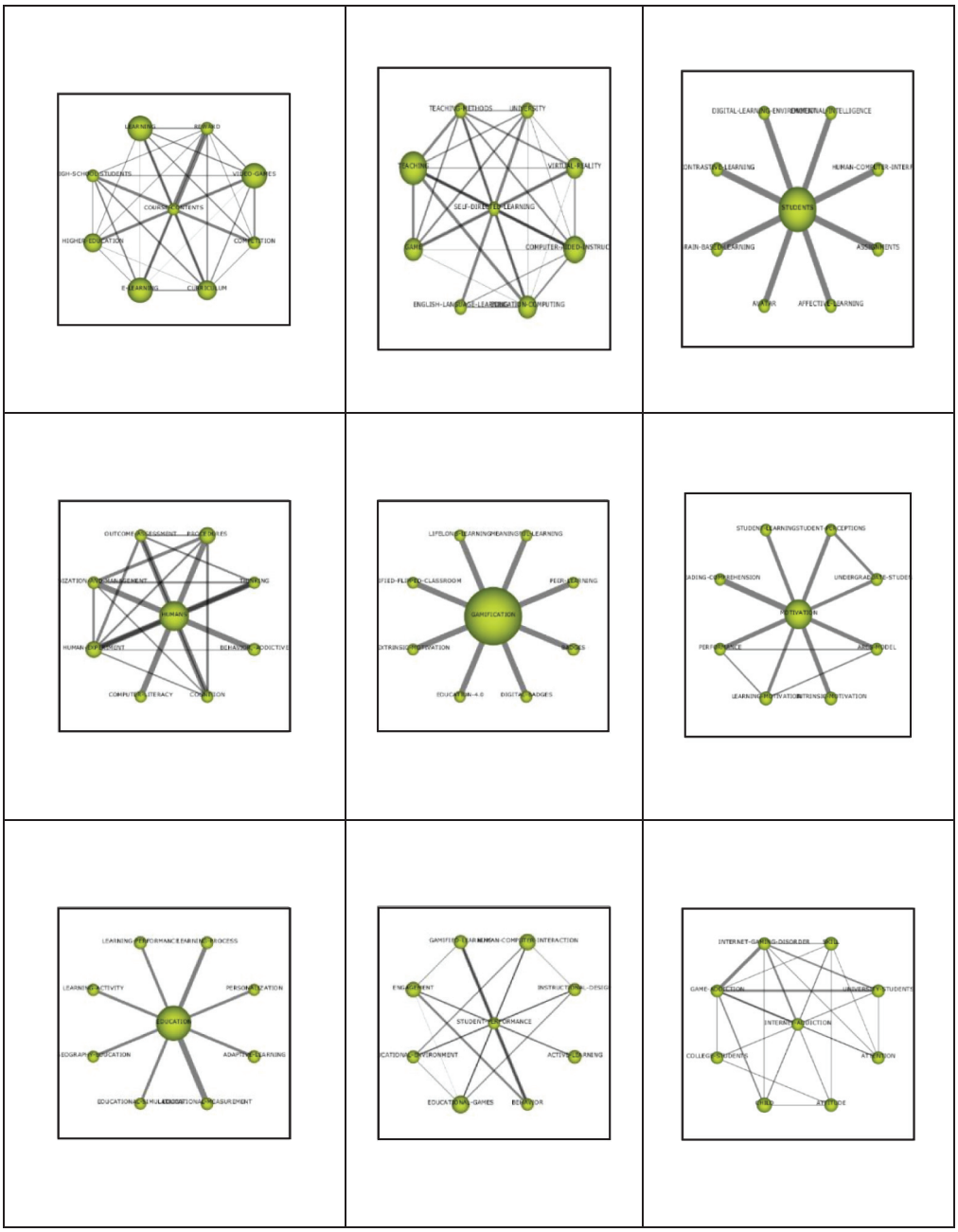


Fig. 4. Thematic network structures for Period 1

The analysis revealed that the motor theme of COURSE-CONTENTS had associations with eight interrelated sub-themes–*learning, reward, video-games, competition, curriculum, e-learning, higher-education*, and *high-school students*. These sub-themes indicate that this line of research mainly focused on the integration of gamification into the curriculum, particularly in high school and higher education contexts.

The motor theme of SELF-DIRECTED-LEARNING was linked to the sub-themes of *teaching-methods, university, teaching, virtual-reality, game, computer-aided-instruction*, and *English-language-learning*. These themes were also interrelated, with a stronger connection between the teaching and computer-aided instruction themes.

These results indicate that this line of research particularly addresses ways of enhancing self-directed learning opportunities by creating a computer-integrated learning context.

The motor theme of STUDENTS comprised the sub-themes of *digital-learning-environment, emotional-intelligence, contrastive-learning, human-computer-interaction, brain-based-learning, assignments, avatar*, and *affective-learning*, indicating that some research during this period addressed the use of different methods to enhance the learning experience of students with diverse needs.

The motor theme of HUMANS was associated with the *outcome-assessment, procedures, organization-and-management, thinking, human-experiment, behavior-addictive, computer-literacy*, and cognition sub-themes. This study seemingly focused on the interaction of human and computer skills to provide better learning opportunities.

The motor theme of GAMIFICATION was linked with the sub-themes of *lifelong-learning, meaningful-learning, gamified-flipped-classroom, peer-learning, extrinsic-motivation, badges, education-4.0*, and *digital-badges*. Despite having no interrelationships, these sub-themes were strongly associated with the GAMIFICATION theme, indicating that each of these themes was addressed, perhaps separately, perhaps as a means or end of integrating gamification into education in the digital era.

The motor theme of MOTIVATION comprised the sub-themes of *student-learning, student-perceptions, reading-comprehension, undergraduate-student, performance, the ARCS model, learning motivation*, and *intrinsic-motivation*. These results indicate that this line of research focused on understanding whether gamification could be a means of enhancing student learning through increasing their motivation to learn, particularly through supporting intrinsic motivation and the motivation cycle (particularly focused on the ARCS motivation model).

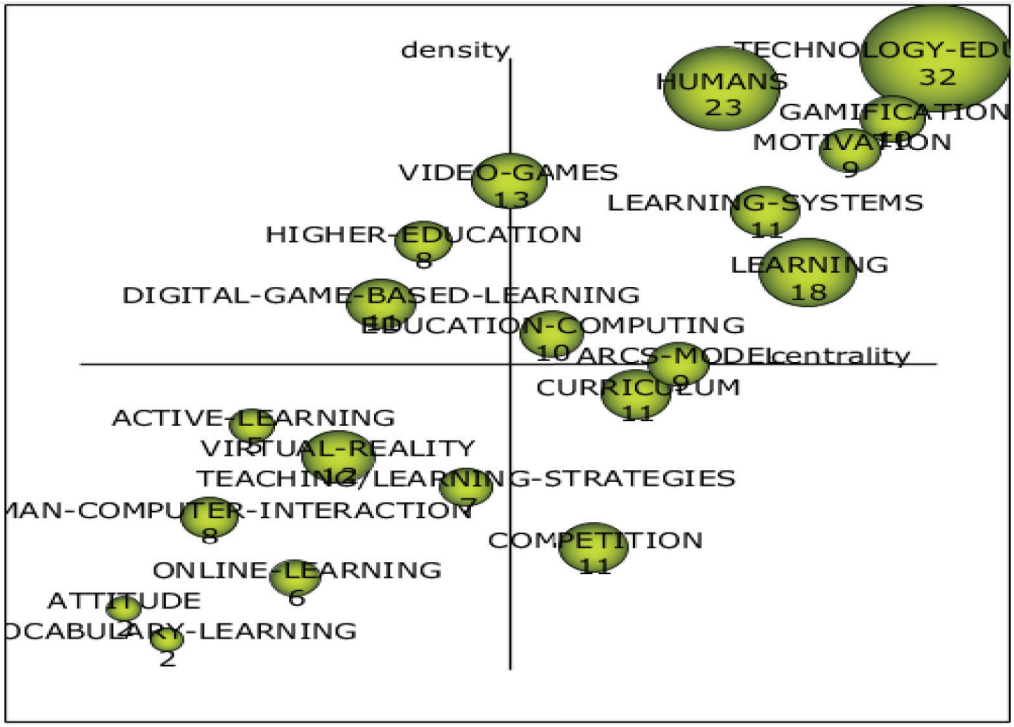
The EDUCATION motor theme had strong relations with the sub-themes of *learning-performance, learning-process, learning-activity, personalization, geography-education, adaptive learning, educational-simulation*, and *educational-measurement*. This study seemingly addressed how gamification could be used to enable customized learning and how this can be measured.

The STUDENT-PERFORMANCE cluster network involved the sub-themes of *gamified-learning, human-computer-interaction, instructional-design, engagement, instructional-design, educational-environment, active-learning, educational-games*, and *behavior*. Among these various themes, *gamified-learning* and *behavior* sub-themes had the strongest association with the STUDENT-PERFORMANCE motor theme.

The motor theme of INTERNET-ADDICTION was closely related to the *internet-gaming-disorder, skill, game-addiction, university-students, college-students, attention, child*, and *attitude* sub-themes. Altogether, it can be inferred that this study particularly focused on the gaming or internet-using attitudes/behaviors of different groups, such as college/university students or children.

Period 2 (2010–2019). The second cycle of thematic analysis, conducted with the involvement of articles published between 2010 and 2019, revealed a total of 20 themes, all of which are presented in the strategic diagram in Figure 5.

a) Period 2 (2010–2019)



b) Performance scores

Cluster	h-index	Cites	Centrality Range	Density Range
TECHNOLOGY-EDUCATION	32	3855	1	1
GAMIFICATION	10	252	0.95	0.9
MOTIVATION	9	373	0.9	0.85
LEARNING	18	1912	0.85	0.65
LEARNING-SYSTEMS	11	484	0.8	0.75
HUMANS	23	1362	0.75	0.95
ARCS-MODEL	9	279	0.7	0.5
CURRICULUM	11	472	0.65	0.45
COMPETITION	11	397	0.6	0.2
EDUCATION-COMPUTING	10	321	0.55	0.55
VIDEO-GAMES	13	579	0.5	0.8
TEACHING/LEARNING-STRATEGIES	7	452	0.45	0.3
HIGHER-EDUCATION	8	406	0.4	0.7
DIGITAL-GAME-BASED-LEARNING	11	344	0.35	0.6
VIRTUAL-REALITY	12	1293	0.3	0.35
ONLINE-LEARNING	6	205	0.25	0.15
ACTIVE-LEARNING	5	130	0.2	0.4
HUMAN-COMPUTER-INTERACTION	8	226	0.15	0.25
VOCABULARY-LEARNING	2	24	0.1	0.05
ATTITUDE	2	23	0.05	0.1

Fig. 5. Strategic diagram and relevant performance scores for Period 2

As shown in Figure 5, the motor themes underlying the development of the gamification research field during the second period were TECHNOLOGY-EDUCATION, HUMANS, GAMIFICATION, MOTIVATION, LEARNING-SYSTEMS, LEARNING, EDUCATION-COMPUTING, and ARCS-MODEL. It can be clearly seen that some of the sub-themes identified in the cluster networks of the first period, such as ARCS motivation theory and learning systems, and some motor themes identified for the

first period continued their significance during the second period, such as humans, gamification, and motivation themes.

The CURRICULUM and COMPETITION themes were found to be basic and transversal themes during the second period, while the themes of VIDEO-GAMES, HIGHER-EDUCATION, and DIGITAL-GAME-BASED-LEARNING had become highly developed and isolated themes. On the other hand, the themes of ACTIVE-LEARNING, VIRTUAL-REALITY, TEACHING/LEARNING-STRATEGIES, HUMAN-COMPUTER-INTERACTION, ONLINE-LEARNING, and ATTITUDE were placed in the quartile of the emerging/declining themes.

The results of the thematic network analysis regarding the motor themes of the second period are presented in Figure 6.

Period 2 (2010–2019)

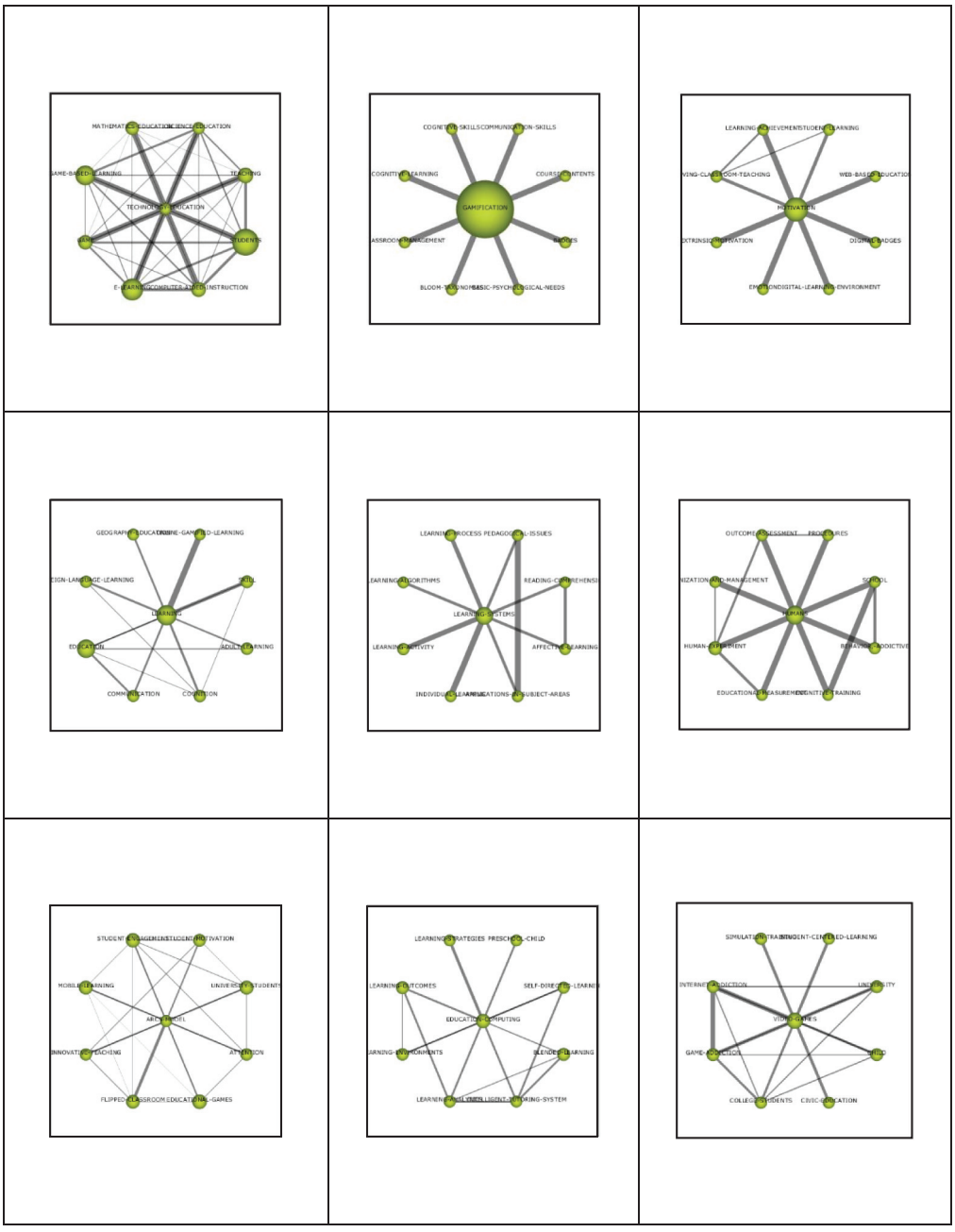


Fig. 6. Thematic network structures for Period 2

As shown in Figure 6, the cluster network of the TECHNOLOGY-EDUCATION motor theme involved the sub-themes of *mathematics-education, science-education, game-based-learning, teaching, games, students, e-learning*, and *computer-assisted-instruction*, all of which were interrelated and had strong associations with the technology education theme. This line of research was clearly focused on technology-enhanced teaching/learning.

The motor theme of GAMIFICATION was closely related to the sub-themes of *cognitive-skills, communication-skills, cognitive-learning, course-contents, classroom-management, badges, bloom-taxonomy*, and *basic-psychological-needs*. This cluster indicated a research focus on supporting various aspects of classroom teaching and learning through gamification methods.

The motor theme of MOTIVATION was associated with the *learning-achievement, student-learning, web-based-education, extrinsic-motivation, digital-badges, emotion*, and *digital-learning-environment*. This cluster network has sustained research interest in how gamification can be integral to enhancing student motivation through digital technologies.

The cluster network of LEARNING comprises the sub-themes of *geography-education, online-gamified-learning, foreign-language-learning, skill, education, adult-learning, communication*, and *cognition*. The sub-theme of online-gamified-learning had the strongest association with the learning motor theme. Yet, the whole cluster suggests that this line of research had a particular focus on enhancing student cognition or skills in diverse educational contexts such as geography, foreign language, and adult education. The motor theme of LEARNING-SYSTEMS, on the other hand, was associated with the *learning-process, pedagogical-issues, learning-algorithms, reading-comprehension, learning-activity, affective-learning*, and *individual-learning* sub-themes.

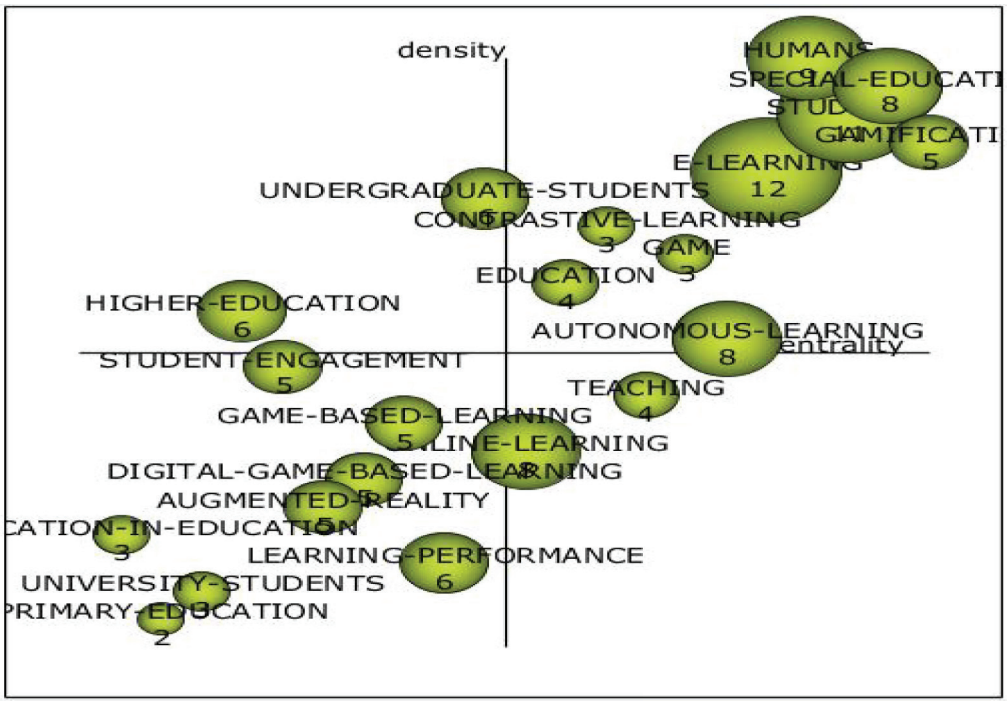
The motor theme of HUMANS had strong links with the sub-themes of *outcome-assessment, procedures, organization-and-management, school, human-experiment, behavior-addictive, educational-measurement*, and *cognitive-training*. This cluster highlights a particular focus on the human aspect of integrating technology into educational environments.

The cluster network of ARCS-MODEL involved the sub-themes of *student-engagement, student-motivation, mobile-learning, university-students, innovative-teaching, attention, flipped-classroom*, and *educational-games*, evidently addressing how gamification could cater for designing motivating educational environments through supporting several components of motivation as suggested by the ARCS motivation framework – i.e., attention, relevance, confidence, and satisfaction.

The motor theme of EDUCATION-COMPUTING was associated with a large variety of subthemes: learning-strategies, preschool-child, learning-outcomes, self-directed-learning, learning-environments, blended-learning, learning-analysis, and intelligent-tutoring-systems, each focusing on a different aspect of the teaching/learning process. The motor theme of VIDEO-GAMES was also related to various sub-themes such as *simulation-training, student-centered-learning, internet-addiction, university, game-addiction, child, college-students*, and *civic-education*.

Period 3 (2020–2025). The third cycle of thematic analysis was conducted with the involvement of articles published between 2020 and 2025, which revealed a total of 21 themes. The strategic diagram and the performance scores for the themes can be seen in Figure 7.

a) Period 3 (2020–2025)



b) Performance scores

Cluster	h-index	Cites	Centrality Range	Density Range
GAMIFICATION	5	238	1	0.86
SPECIAL-EDUCATION	8	275	0.95	0.95
STUDENTS	11	440	0.9	0.9
HUMANS	9	343	0.86	1
E-LEARNING	12	463	0.81	0.81
AUTONOMOUS-LEARNING	8	243	0.76	0.52
GAME	3	34	0.71	0.67
TEACHING	4	54	0.67	0.43
CONTRASTIVE-LEARNING	3	14	0.62	0.71
EDUCATION	4	125	0.57	0.62
ONLINE-LEARNING	8	149	0.52	0.33
UNDERGRADUATE-STUDENTS	6	121	0.48	0.76
LEARNING-PERFORMANCE	6	91	0.43	0.14
GAME-BASED-LEARNING	5	132	0.38	0.38
DIGITAL-GAME-BASED-LEARNING	5	81	0.33	0.29
AUGMENTED-REALITY	5	70	0.29	0.24
STUDENT-ENGAGEMENT	5	55	0.24	0.48
HIGHER-EDUCATION	6	93	0.19	0.57
UNIVERSITY-STUDENTS	3	33	0.14	0.1
PRIMARY-EDUCATION	2	29	0.1	0.05
GAMIFICATION-IN-EDUCATION	3	27	0.05	0.19

Fig. 7. Strategic diagram and relevant performance scores for Period 3

As shown in Figure 7, the thematic analysis yielded nine motor themes for the third period; HUMANS, SPECIAL-EDUCATION, STUDENT, GAMIFICATION, E-LEARNING, CONTRUSTIVE-LEARNING, GAME, EDUCATION, and AUTONOMOUS-LEARNING. Among these, the humans and gamification themes were also identified as the motor themes of the first and second periods, while the themes of e-learning, contrastive-learning, game, and autonomous-learning had appeared as sub-themes in different thematic clusters during the second period.

The themes of TEACHING and ONLINE-LEARNING were determined to be the basic and transversal themes of the third period, while the themes of HIGHER-EDUCATION and UNDER-GRADUATE-STUDENTS were the highly developed and isolated themes, remaining peripheral for the development of the gamification research field during this period.

The emerging/declining themes of the period were identified as STUDENT-ENGAGEMENT, GAME-BASED-LEARNING, DIGITAL-GAME-BASED-LEARNING, AUGMENTED-REALITY, GAMIFICATION-IN-EDUCATION, LEARNING-PERFORMANCE, UNIVERSITY-STUDENTS, and PRIMARY-EDUCATION.

The results of the thematic network analysis regarding the motor themes of the third period are presented in Figure 8.

Period 3 (2020–2025)

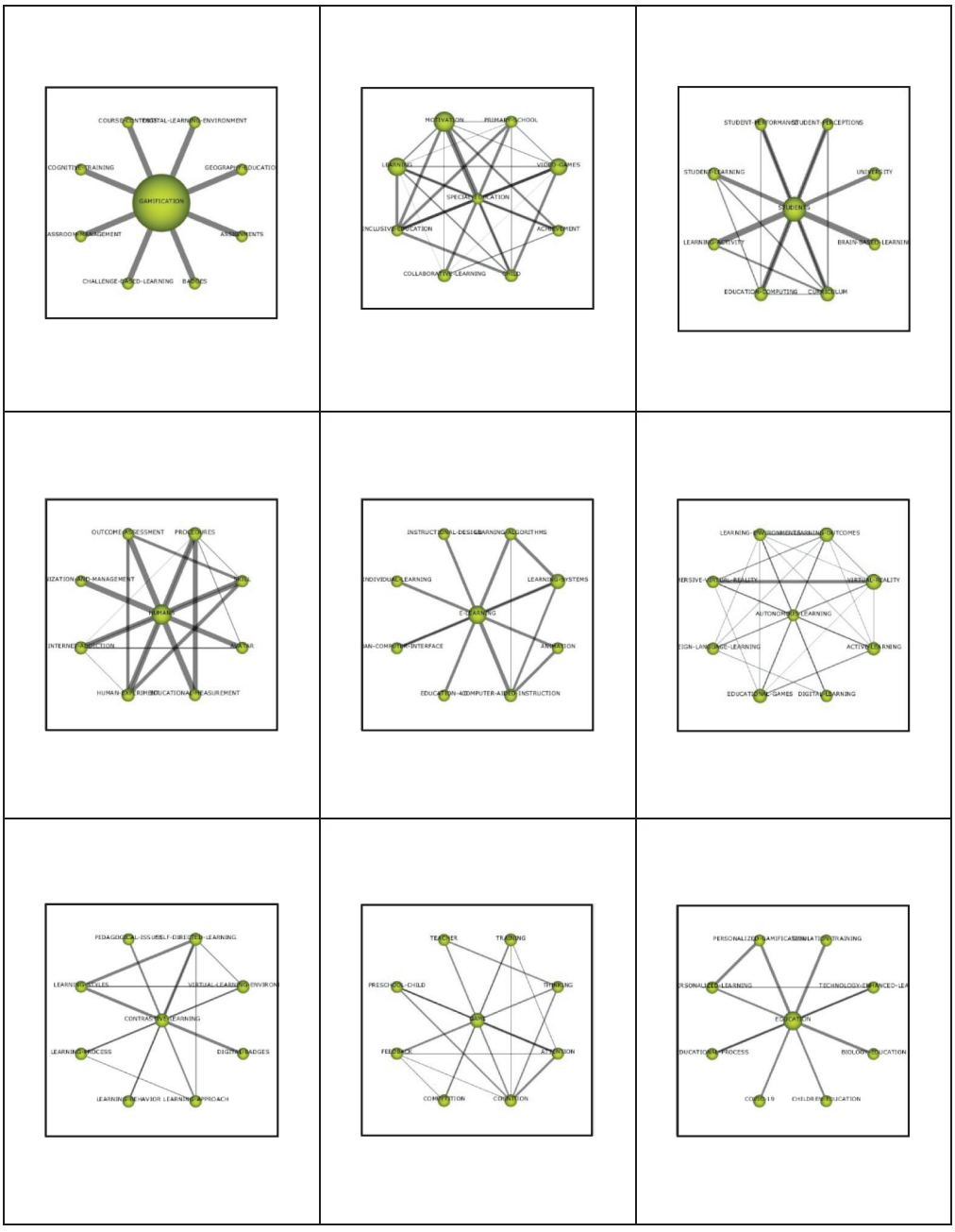


Fig. 8. Thematic network structures for Period 3

The first cluster network in Figure 8 suggests that the motor theme of GAMIFICATION had strong associations with the sub-themes of *course-content, digital-learning-environment, cognitive-learning, geography-education, classroom-management, assignment, challenge-based learning*, and *badges*. Despite their strong relationship with the gamification theme, these themes did not display any interrelationships.

The motor theme of SPECIAL-EDUCATION, which appeared for the first time during the third period, was found to be related with the sub-themes of *motivation, primary-school, learning, video-games, inclusive-education, achievement, collaborative-learning*, and *child*. This study apparently focused on how gamification could be used to enhance the learning experiences of children with special needs. On the other hand, the STUDENTS motor theme had strong relations with the *student-performance, student-perceptions, student-learning, university, learning-activity, brain-based-learning, education-computing*, and *curriculum* sub-themes.

The HUMANS cluster network displays eight strongly associated sub-themes – *outcome-assessment, procedures, organization-and-management, skill, internet-addiction, Avatar, human-experiment*, and *educational management*. This cluster displays very similar themes and relationships to those that emerged during the first and second periods.

The motor theme of E-LEARNING had associations with the *instructional-design, learning-algorithms, individual-learning, learning-systems, human-computer-interface, animation, Education-4.0*, and *computer-aided-instruction*. The AUTONOMOUS-LEARNING motor theme had links with these eight interrelated sub-themes; *learning-environments, learning-outcomes, immersive-virtual-reality, virtual-reality, foreign-language-learning, active-learning, educational-games*, and *digital-learning* while the motor theme of CONTRASTIVE-LEARNING had relationships with the sub-themes of *pedagogical-issues, self-directed-learning, learning-styles, virtual-learning-environment, learning-process, digital-badges, learning-behavior*, and *learning-approach*.

The GAME cluster network involved the sub-themes of *teacher, training, preschool-child, thinking, feedback, attention, competition,* and *cognition*, while the EDUCATION cluster network comprised the *personalized-gamification, simulation-training, personalized-learning, technology-enhanced-learning, educational-process, biology-education, COVID-19*, and *children-education* sub-themes.

3.2 Thematic evolution analysis

To be able to delineate the intellectual evolution of the gamification research field. We conducted a thematic evolution analysis, which helped identify the associations between the themes that appeared during each period of analysis [10, 11, 14]. The results of thematic evolution analysis are presented in Figure 9.

As shown by the straight and dashed lines connecting the themes from different periods, strong associations existed between the themes from the first through the third period. These relationships help illustrate how the gamification research field has thematically and intellectually evolved from 1962, when it first attracted research attention, to 2025.

The results in Figure 9 show that the themes of GEMIFICATION and HUMAN were the most enduring themes, which underlie the growth of the research field. These two themes were also linked to several other significant themes. For instance,

the GAMIFICATION theme from the first period had strong links with the MOTIVATION, HIGHER-EDUCATION, and ACTIVE-LEARNING themes of the second period, while it had associations with the STUDENT-ENGAGEMENT and AUGMENTED-LEARNING themes of the third period. The HUMANS theme, on the other hand, had close links with the LEARNING (second period), and LEARNING-PERFORMANCE (third period) themes.

The STUDENT theme of the first period was associated with the TECHNOLOGY-EDUCATION, MOTIVATION, LEARNING-SYSTEMS, HIGHER-EDUCATION, and CURRICULUM themes of the second period, all of which supported the STUDENTS theme of the third period.

The MOTIVATION theme, which appeared during the first and second periods, was linked to several other themes of the first (e.g., SCHOLL, ASSESSMENT) and the second (e.g., LEARNING-SYSTEMS, ARCS-MODEL, TEACHING-LEARNING-STRATEGIES) periods. It finally supported the growth of the SPECIAL-EDUCATION theme of the third period.

The COURSE-CONTENTS theme was associated with diverse themes from the second period, such as VIDEO-GAMES, HIGHER-EDUCATION-LEARNING, CURRICULUM, and ONLINE-LEARNING, all of which evolved into a variety of interrelated themes during the third period. Similarly, several learning-related themes that appeared during the first periods, such as SELF-DIRECTED-LEARNING, INTERACTIVE-LEARNING, GAME-BASED-LEARNING, DIGITAL-GAME-BASED-LEARNING, MOBILE-LEARNING, and VIRTUAL-LEARNING-ENVIRONEMENTS, were closely linked to the themes from the second and the third period, such as ACTIVE-LEARNING, ONLINE-LEARNING, LEARNING, LEARNING-SYSTEMES, VOCABULARY-LEARNING, and TEACHING/LEARNING-STRATEGIES themes from the second period and the LEARNING-PERFORMANCE, AUTONOMOUS-LEARNING, CONTRASTIVE-LEARNING, and AUGMENTED-REALITY.

One of the most prominent themes, the FLIPPED-CLASSROOM theme, was also closely associated with several themes from the second period, such as the TECHNOLOGY-EDUCATION, ARCS-MODEL, EDUCATIONAL-COMPUTING, ONLINE-LEARNING themes, which were also connected to several significant themes of the third period, such as E-LEARNING, GAME-BASED-LEARNING, STUDENT-ENGAGEMENT, UNIVERSITY-STUDENTS, AUTONOMOUS-LEARNING, LEARNING-PERFORMANCE, and GAMIFICATION-IN-EDUCATION.

INTERNET-ADDICTION, which appeared as a significant theme attracting research attention during the first period, did not exist during the following periods. Yet, it had close links with some of the themes from the second period, such as VIDEO-GAMES, ARCS-MODEL, and ATTITUDE. These themes from the second period were also closely associated with some prominent themes of the third period, such as SPECIAL EDUCATION, UNDERGRADUATE-STUDENTS, UNIVERSITY-STUDENTS, STUDENT-ENGAGEMENT, GAME, and TEACHING.

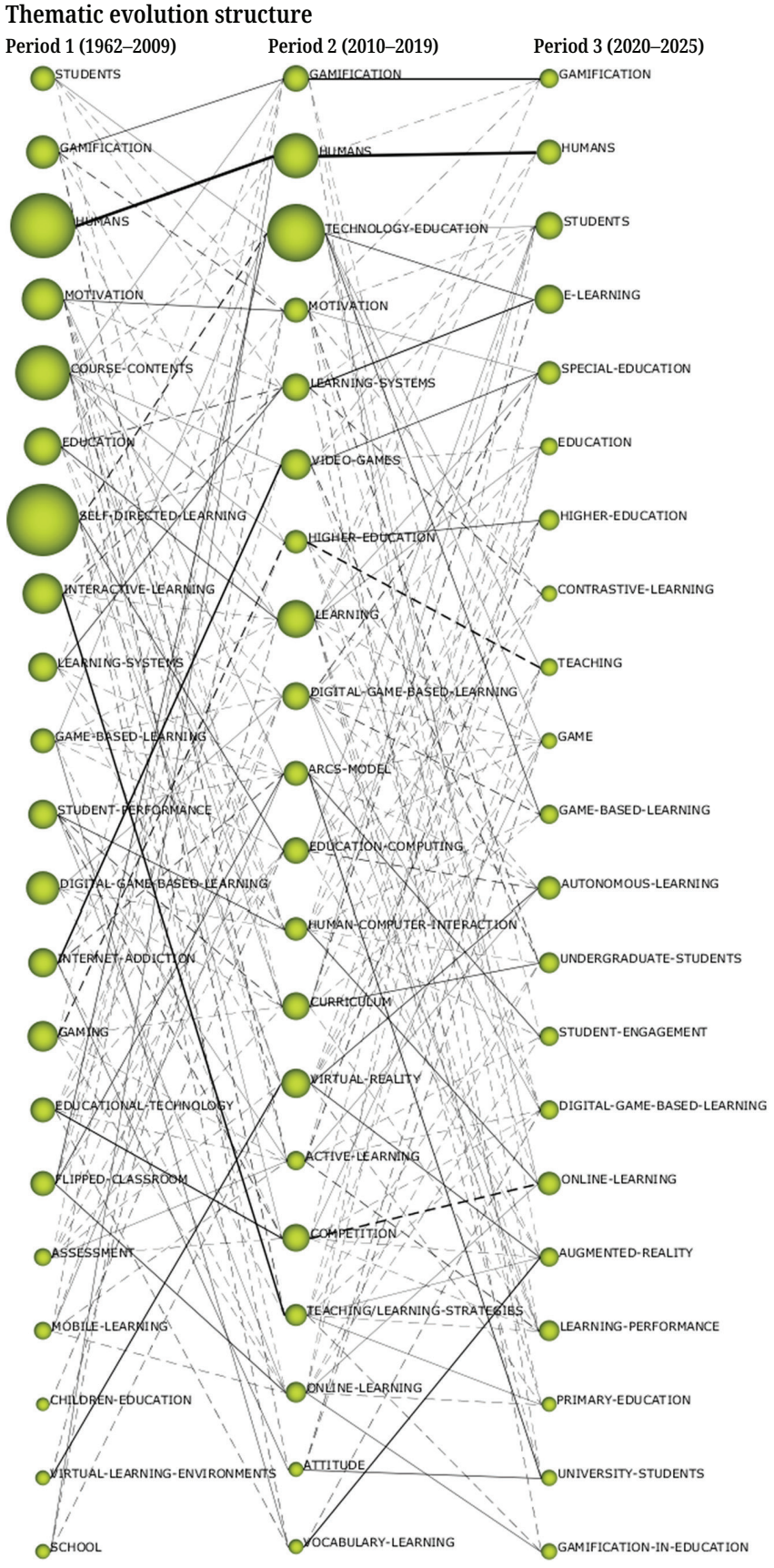


Fig. 9. Thematic evolution map

4 DISCUSSION

The results of this thematic analysis reveal a dynamic and progressively sophisticated field of inquiry. During the first period (1962–2009), themes such as performance, learning, and education surfaced as emerging focal points, albeit with low density and centrality—suggesting that gamification was then a peripheral and loosely connected concept. This is consistent with earlier findings that highlight the nascent stage of gamification before the 2010s, when it was often conflated with game-based learning or educational games [15, 16, 17, 18, 19].

The second period (2010–2019) reflects a dramatic shift, marked by the rise of core motor themes such as gamification, motivation, engagement, and students. These themes exhibit both high centrality and density, indicating that gamification had become not only widely studied but also theoretically anchored. This aligns with global trends in education, where the increasing availability of mobile and digital platforms catalyzed new forms of learner interaction and participation [20, 21, 22]. Moreover, the emphasis on motivation resonates with the application of self-determination theory [3], which underpins many gamified interventions aimed at fostering intrinsic engagement.

In the most recent period (2020–2025), the field expands further to include diversified themes such as usability, educational games, flipped learning, virtual reality, and learning outcomes. The appearance of humans as a basic and transversal theme across all three periods suggests a sustained interest in the human-centered dimensions of gamified learning. Furthermore, the evolution diagram (see Figure 9) shows conceptual continuity between earlier and later periods, with core themes like gamification, motivation, and engagement maintaining relevance while branching into new subdomains. The integration of gamification with hybrid and immersive learning contexts, especially post-pandemic, points to evolving educational paradigms [23, 24] (see Figure 10).

Fig. 10. Evolution of gamification in education across three periods: Emergence of gamification themes (1962–2009), rise of core motor themes (2010–2019), and diversification of themes (2020–2025) (Created with Napkin AI)

From a policy and practice standpoint, these findings have several implications. In higher education, gamification is increasingly used to enhance learning analytics, student retention, and active learning environments [25, 26, 27]. In K–12 education, it is associated with differentiated instruction and inclusive pedagogies, especially in STEM and language learning contexts [28]. Moreover, gamification holds potential for special education by supporting personalized learning trajectories and multisensory engagement [29]. However, successful implementation requires attention to design ethics, accessibility, and contextual relevance. Policymakers and instructional designers should therefore align gamification strategies with inclusive digital education frameworks and evidence-based pedagogical principles.

Theoretically, this study confirms the convergence of gamification research with motivational theory, digital pedagogy, and learning analytics. Future research could

deepen this understanding by investigating longitudinal learner data, cross-cultural implementations, and the intersection of gamification with AI-driven adaptive learning systems [30]. Furthermore, qualitative studies exploring learners' affective experiences and ethical perceptions of gamification would complement the current trend of quantitative evaluations.

5 CONCLUSION

This study mapped the thematic evolution of gamification research in educational settings over three decades using bibliometric and science mapping methods. Findings demonstrate a clear progression from peripheral interest to a well-structured field marked by dominant themes such as motivation, engagement, learning outcomes, and usability. The longitudinal perspective reveals both conceptual stability and diversification, highlighting the adaptability of gamification to emerging pedagogical and technological environments.

By synthesizing trends across time, this research contributes to the strategic development of gamified learning frameworks and supports evidence-based decision-making for educators, researchers, and policymakers. As the digital education landscape continues to evolve, gamification remains a fertile ground for innovation, especially when guided by human-centered design and inclusive pedagogical goals.

6 DATA AVAILABILITY STATEMENT

Data used are publicly available; no identifying information was collected or included. All the data used in this research were accessed through the Scopus database.

7 ETHICS APPROVAL AND AI USAGE DECLARATION

Ethical approval and consent to participate were not required, as this study is a bibliometric analysis based solely on previously published manuscripts. In this study, the ChatGPT AI system was used to assist the authors with managing their work and with the translation and editing of specific sentences. Additionally, Figure 10 was created using the AI tool *Napkin AI*. The use of AI tools complied with the relevant guidelines.

8 REFERENCES

[1] S. Deterding, D. Dixon, R. Khaled, and L. Nacke, "From game design elements to gamefulness: Defining gamification," in *Proceedings of the 15th International Academic MindTrek Conference*, Tampere, Finland, 2011, pp. 9–15. https://doi.org/10.1145/2181037.2181040

[2] F. Hamari, J. Koivisto, and H. Sarsa, "Does gamification work? A literature review of empirical studies on gamification," in *Proceedings of the 47th Hawaii International Conference on System Sciences (HICSS)*, Waikoloa, HI, USA, 2014, pp. 3025–3034. https://doi.org/10.1109/HICSS.2014.377

[3] E. L. Deci and R. M. Ryan, "The 'What' and 'Why' of goal pursuits: Human needs and the self-determination of behavior," *Psychological Inquiry*, vol. 11, no. 4, pp. 227–268, 2000. https://doi.org/10.1207/S15327965PLI1104_01

[4] K. Seaborn and D. L. Fels, "Gamification in theory and action: A survey," *International Journal of Human-Computer Studies*, vol. 74, pp. 14–31, 2015. https://doi.org/10.1016/j.ijhcs.2014.09.006

[5] I. Caponetto, J. Earp, and M. Ott, "Gamification and education: A literature review," in *Proceedings of the 8th European Conference on Games Based Learning (ECGBL 2014)*, A. De Gloria, Ed., Berlin, Germany, Reading, UK: Academic Conferences and Publishing International Limited, vol. 1, 2014, pp. 50–57.

[6] J. Koivisto and J. Hamari, "The rise of motivational information systems: A review of gamification research," *International Journal of Information Management*, vol. 45, pp. 191–210, 2019. https://doi.org/10.1016/j.ijinfomgt.2018.10.013

[7] S. Subhash and E. A. Cudney, "Gamified learning in higher education: A systematic review of the literature," *Computers in Human Behavior*, vol. 87, pp. 192–206, 2018. https://doi.org/10.1016/j.chb.2018.05.028

[8] P. Hallinger and D. Kulophas, "The evolving knowledge base on leadership and teacher professional learning: A bibliometric analysis of the literature 1960–2018," *Professional Development in Education*, vol. 46, no. 4, pp. 521–540, 2020. https://doi.org/10.1080/19415257.2019.1623287

[9] M. J. Page *et al.*, "The PRISMA 2020 statement: An updated guideline for reporting systematic reviews," *BMJ*, vol. 10, pp. 89–100, 2021. https://doi.org/10.1136/bmj.n71

[10] M. J. Cobo, A. G. López-Herrera, E. Herrera-Viedma, and F. Herrera, "SciMAT: A new science mapping analysis software tool," *Journal of the American Society for Information Science and Technology*, vol. 63, no. 8, pp. 1609–1630, 2012. https://doi.org/10.1002/asi.22688

[11] M. J. Cobo, A. G. López-Herrera, E. Herrera-Viedma, and F. Herrera, "Science mapping software tools: Review, analysis, and cooperative study among tools," *Journal of the American Society for Information Science and Technology*, vol. 62, no. 7, pp. 1382–1402, 2011. https://doi.org/10.1002/asi.21525

[12] I. MacFadden, M. Santana, E. Vázquez-Cano, and E. López-Meneses, "A science mapping analysis of 'marginality, stigmatization and social cohesion' in WoS (1963–2019)," *Quality & Quantity*, vol. 55, pp. 275–293, 2021. https://doi.org/10.1007/s11135-020-01004-7

[13] M. K. Sott *et al.*, "Process modeling for smart factories: Using science mapping to understand the strategic themes, main challenges and future trends," *Business Process Management Journal*, vol. 27, pp. 1391–1417, 2021. https://doi.org/10.1108/BPMJ-05-2020-0181

[14] M. A. Martinez, M. J. Cobo, M. Herrera, and E. Herrera-Viedma, "Analyzing the scientific evolution of social work using science mapping," *Research on Social Work Practice*, vol. 25, no. 2, pp. 257–277, 2015. https://doi.org/10.1177/1049731514522101

[15] R. N. Landers, "Developing a theory of gamified learning: Linking serious games and gamification of learning," *Simulation & Gaming*, vol. 45, no. 6, pp. 752–768, 2015. https://doi.org/10.1177/1046878114563660

[16] H. Naccache, M. Altae, and A. Barham, "Enhancing mathematics achievement: A game-based learning intervention in Qatar," *Educational Process: International Journal*, vol. 18, p. e2025481, 2025. https://doi.org/10.22521/edupij.2025.18.481

[17] S. Orhani and K. Shatri, "Impact of computer games on learning concepts in the subject of technology with ICT," *Educational Process: International Journal*, vol. 17, p. e2025299, 2025. https://doi.org/10.22521/edupij.2025.17.299

[18] B. P. Arzfi and R. Maria Montessori, "Development of digital game based learning model teaching materials to improve learning outcomes in primary schools," *Educational Process: International Journal*, vol. 15, p. e2025114, 2025. https://doi.org/10.22521/edupij.2025.15.114

[19] Z. Hu, "Game-based learning: Alternative approaches to teaching and learning strategies in health sciences education," *Educational Process: International Journal*, vol. 13, no. 2, pp. 90–104, 2024. https://doi.org/10.22521/edupij.2024.132.6

[20] J. J. Lee and J. Hammer, "Gamification in education: What, how, why bother?" *Academic Exchange Quarterly*, vol. 15, no. 2, pp. 146–151, 2011.

[21] T. Karakose and H. Polat, "Science mapping of the knowledge base on the effects of artifcial intelligence (AI)-based chatbots on student learning outcomes: A bibliometric study," in *Social Robots in Education*, in Studies in Computational Intelligence, G. Lampropoulos and S. Papadakis, Eds., Springer, Cham., vol. 1194, 2025. https://doi.org/10.1007/978-3-031-82915-4_18

[22] A. Mora, D. Riera, C. González, and J. Arnedo-Moreno, "Gamification: A systematic review of design frameworks," *Journal of Computing in Higher Education*, vol. 32, pp. 411–437, 2020. https://doi.org/10.1007/s12528-019-0920-1

[23] A. I. Zourmpakis, M. Kalogiannakis, and S. Papadakis, "A review of the literature for designing and developing a framework for adaptive gamification in physics education," in *The International Handbook of Physics Education Research: Teaching Physics*, M. F. Taşar and P. R. L. Heron, Eds., Melville, NY: AIP Publishing, 2023, pp. 5-1–5-26. https://doi.org/10.1063/9780735425712_005

[24] T. Karakose and T. Tulubas, "The role of educational leaders in the age of artificial intelligence (AI)," *Educational Process: International Journal*, vol. 16, p. e2025267, 2025. https://doi.org/10.22521/edupij.2025.16.267

[25] R. S. Alsawaier, "The effect of gamification on motivation and engagement," *International Journal of Information and Learning Technology*, vol. 35, no. 1, pp. 56–79, 2018. https://doi.org/10.1108/IJILT-02-2017-0009

[26] M. Ozdogru, T. Tulubas, T. Karakose, S. Kanadlı, A. Kardas, and S. Papadakis, "How does teacher self-efficacy mediate the relationship between student outcomes and principal leadership for learning? Results from meta-analytic structural equation modelling (MASEM)," *Acta Psychologica*, vol. 258, p. 105144, 2025. https://doi.org/10.1016/j.actpsy.2025.105144

[27] T. Karakose, T. Tülübaş, S. Kanadli, and D. Gurr, "What factors mediate the relationship between principal leadership and teacher professional learning? Evidence from meta-analytic structural equation modelling (MASEM)," *Journal of Educational Administration*, vol. 63, no. 1, p. 6376, 2025. https://doi.org/10.1108/JEA-05-2024-0160

[28] C. Cheong, J. Filippou, and F. Cheong, "Towards the gamification of learning: Investigating student perceptions of game elements," *Journal of Information Systems Education*, vol. 25, no. 3, pp. 233–244, 2014.

[29] S. Bai, K. F. Hew, and B. Huang, "Does gamification improve student learning outcome? Evidence from a meta-analysis and synthesis of qualitative data in educational contexts," *Educational Research and Reviews*, vol. 30, p. 100322, 2020. https://doi.org/10.1016/j.edurev.2020.100322

[30] C. Dichev and D. Dicheva, "Gamifying education: What is known, what is believed and what remains uncertain: A critical review," *International Journal of Educational Technology in Higher Education*, vol. 14, p. 9, 2017. https://doi.org/10.1186/s41239-017-0042-5

9 AUTHORS

Turgut Karakose is a professor of educational management and currently works at the Faculty of Education, Kütahya Dumlupinar University, Turkey. He also serves as the Editor-in-Chief of the *Educational Process International Journal*. His main research interests include educational leadership, school leadership, digital leadership, AI, psychology, and human behavior (E-mail: turgut.karakose@dpu.edu.tr).

Stamatios Papadakis is an Assistant Professor at the Department of Preschool Education at the University of Crete, Greece. His scientific and research interests include the study of mobile learning, especially using smart mobile devices and their accompanying mobile applications (apps) in preschool and primary education, with a focus on developing computational thinking and students' understanding of numbers (E-mail: stpapadakis@uoc.gr).