Recirculating Foundational Problems: Four Decades of Educational Computing in the JECR Archive (1987–2024)

Abstract

This editorial presents a structured synthesis of the thematic development of the Journal of Educational Computing Research (JECR) from 1987 to 2024, drawing on a computational analysis of 1,597 articles. Applying Latent Dirichlet Allocation (LDA), the analysis identifies thirteen thematic structures that reveal both the enduring commitments and the emerging orientations of the journal across nearly four decades. Themes such as problem-solving through programming and self-efficacy in programming education have constituted persistent research agendas since the journal's earliest volumes, while computational thinking and game-based learning have gained substantial momentum since 2015. These patterns suggest that JECR's intellectual identity is best understood not as a sequence of discrete topical shifts, but as a sustained process in which a bounded set of foundational problems is repeatedly re-articulated under changing technological and epistemic conditions. The editorial situates this trajectory in relation to contemporary developments in artificial intelligence and educational technology, arguing that the journal's historical archive offers an indispensable conceptual framework for interpreting present-day transformations.

Keywords: topic modelling, educational computing, latent Dirichlet allocation, thematic evolution, JECR

INTRODUCTION

When I assumed the role of Editor-in-Chief of the Journal of Educational Computing Research in early 2025, a central responsibility was to develop a historically grounded account of how the journal has contributed to shaping the intellectual boundaries of educational computing as a field. This editorial forms part of JECR's reflection on nearly four decades of scholarship, offering a structured synthesis of its thematic development from 1987 through to 2024. It is motivated by the view that editorial stewardship of a long-running scholarly journal entails not only curatorial continuity, but periodic interrogation of how its published record functions as a site through which the field's central questions are articulated, stabilised, and reconfigured over time.

Retrospective analyses of long-established journals have become an established practice in educational technology research, offering both intellectual accountability and

strategic orientation for the field. Studies examining the British Journal of Educational Technology (Bond et al., 2019), Computers & Education (Zawacki-Richter & Latchem, 2018), Education and Information Technologies (Tatnall & Fluck, 2022; Ozyurt & Ayaz, 2022), the International Journal of Lifelong Education (Nylander et al., 2022), and the International Review of Research in Open and Distributed Learning (Torres-Vergara et al., 2025) have each demonstrated the analytical value of examining a journal's publication record as a coherent epistemic object. These analyses converge on a shared insight: that the thematic evolution of a scholarly journal is not reducible to the sum of its individual articles, but reflects the deeper conceptual architecture through which a field organises and reproduces its central questions. This editorial contributes to that tradition by applying the same analytic lens to JECR's archive.

What becomes evident in JECR's archive is not simply thematic change, but a more specific and analytically consequential pattern: the recirculation of foundational problems under shifting epistemic and technological conditions. Across the journal's publication history, a relatively stable set of concerns has repeatedly returned to prominence — among them, how learning can be modelled and supported through computational systems, how educational environments can be designed in relation to emerging technologies, and how cognition is represented, mediated, and augmented through digital tools. These concerns do not persist in an unchanged form. Rather, they are continually re-specified as new methodological approaches, technological infrastructures, and theoretical vocabularies emerge. JECR's intellectual identity is therefore best understood not in terms of topic turnover, but as a sustained process through which a bounded set of foundational problems is repeatedly re-articulated, generating both continuity and transformation within the field's knowledge structure.

This editorial draws on the JECR corpus from 1987 to 2024, enabling a unified longitudinal perspective on the journal as an evolving epistemic system rather than a sequence of discrete publication phases. To support this synthesis, computational approaches to large-scale text analysis were employed to identify latent thematic structures across the archive, with particular attention to how topics cohere, persist, and shift over time. The analysis was conducted in collaboration with invited co-authors with expertise in computational methods and research synthesis, ensuring both methodological robustness and careful interpretive alignment between statistically derived structures and substantive research meaning. In this framing, computational modelling is not treated as an explanatory endpoint, but as a means of

rendering visible structural regularities in a corpus whose scale and temporal depth exceed the limits of conventional narrative synthesis.

The significance of this retrospective analysis is sharpened by the current phase of rapid transformation in educational computing, particularly the widespread integration of artificial intelligence systems, large-scale learning analytics, and data-intensive educational infrastructures. While such developments are frequently framed as marking a sharp discontinuity in the field's evolution, JECR's historical record suggests a more nuanced interpretation. Many of the conceptual tensions now central to AI in education; questions of adaptivity, learner modelling, agency, and computational mediation, are not novel in origin, but rather represent the reconfiguration of problems that have long been negotiated within the journal's intellectual space. The value of conducting this analysis now, in 2026, lies precisely in this: the field stands at an inflection point where the pace of technological change risks obscuring the deeper continuities that make contemporary developments intelligible. From this perspective, the archive does not merely document the past; it clarifies the structural logic of the present.

Within this framing, JECR can be understood as a sustained epistemic infrastructure of educational computing, in which the field's foundational questions are not merely recorded but repeatedly reconstructed through evolving theoretical and methodological commitments. Accordingly, this editorial offers a structured and transparent synthesis of JECR's thematic evolution, with particular attention to the recurring configurations through which the journal has defined and redefined the relationship between learning, cognition, and computational systems.

ANALYTICAL FRAMEWORK

This editorial draws on a corpus of 1,597 articles published in JECR between 1987 and 2024, systematically retrieved from Web of Science and Scopus. Latent Dirichlet Allocation (LDA), a probabilistic machine learning approach for identifying latent structures in unlabelled text data (Blei, 2012; Kherwa & Bansal, 2020), was applied to titles, abstracts, and keywords. This methodological approach has been used productively in recent journal-level analyses, including studies of e-learning research (Gurcan et al., 2021), librarianship and information science (Aslan & Özyurt, 2026), and the broader educational technology landscape (Mostafa, 2022; Chen et al., 2019). Following comprehensive preprocessing and coherence-based iterative model selection, thirteen thematic structures were identified (K=13, c_v=0.5266). The

corpus is bounded at 2024. While data collection was undertaken in mid-2025, the inclusion of records from that year would introduce distributional instability into the topic model, as the annual publication cycle had not reached the threshold of completeness necessary for coherent latent structure extraction. The 2024 endpoint therefore reflects a methodologically grounded decision rather than an indexing or accessibility constraint. Themes were labelled through a structured Theme Naming Process (TNP) involving expert consensus, designed to ensure interpretive alignment between statistically derived outputs and substantive research meaning. Full methodological details are available from the authors upon request.

THEMATIC STRUCTURE OF THE JECR ARCHIVE

The analysis yielded thirteen themes, presented in Table 1 in order of publication volume. Together they account for all 1,597 articles in the corpus and span the full range of topics that have constituted JECR's intellectual agenda across nearly four decades.

Table 1. JECR Topic Modelling Themes Overview

Theme	Thematic Profile	n	Pt (%)
Technology Acceptance in Education	Addresses how technology is adopted and perceived in educational contexts, including acceptance models, teacher-related factors, and the integration of tools such as TPACK.	188	12%
Attitude towards Technology	Focuses on learners' attitudes toward computers, including the effects of gender, anxiety, and prior experience, as well as measurement tools and performance differences.	170	11%
Self-Efficacy in Programming Education	Investigates learners' beliefs about their abilities in programming education, covering instructional strategies, cognitive development, assessment, and achievement.	153	10%
Game-Based Learning	Focuses on how games are used as educational tools to increase motivation, engagement, and performance, including digital environments and instructional strategies.	147	9%
Problem Solving through Programming	Investigates how programming supports the development of problem-solving skills, especially in early education settings, highlighting the role of logic and cognitive processes.	146	9%
Reading and Writing in EFL	Explores reading and writing instruction in EFL settings, with emphasis on feedback, learner strategies, outcomes, and comprehension development.	125	8%
Teachers' Technology Integration	Focuses on how teachers adopt and integrate technology in their teaching, including professional development, ICT usage, and institutional support.	113	7%

Theme	Thematic Profile	n	Pt (%)
Cognitive Style in Online Learning	Investigates how individual cognitive styles affect learning in online environments, including metacognition, learner control, and adaptive strategies.	103	6%
Computational Thinking	Covers how computational thinking is approached in educational contexts, highlighting its cognitive, digital, and collaborative dimensions.	103	6%
Web Tools in Education	Examines the use of web tools and platforms in education, including instructional strategies, evaluation processes, and virtual environments.	97	6%
Digital Pedagogical Agents	Explores the use of pedagogical agents in digital learning environments, including design principles, learner interaction, feedback, and behaviour.	95	6%
Knowledge Acquisition via Online Sources	Investigates how knowledge is acquired through online sources such as hypermedia and hypertext, focusing on cognitive processes and digital environments.	85	5%
Interaction in Digital Classrooms	Looks at how interaction occurs in digital classrooms, reflecting on the teacher's role and how students connect with content and one another.	72	5%

Note. Themes are ordered by publication volume. n = number of articles; Pt = percentage share.

The heatmap presented in Figure 1 renders the temporal distribution of all thirteen themes across the full archive. The most striking feature of this visualisation is not the emergence of new themes, but the persistence of foundational ones. Problem Solving through Programming and Self-Efficacy in Programming Education have been consistently present since the journal's earliest volumes, and even in periods of relative decline, they have never disappeared from the publication record. This sustained presence is itself analytically significant: it indicates that the computational pedagogy problematic has remained a structuring concern for the field across fundamentally different technological eras.

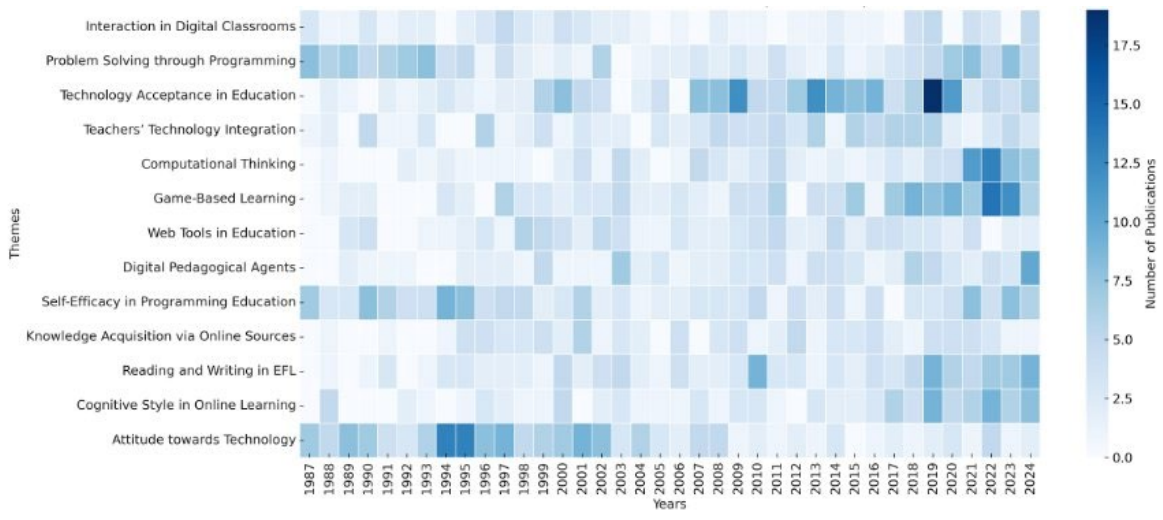

Figure 1. Distribution of Themes Over Years (Compact Heatmap)

THE RECIRCULATION OF FOUNDATIONAL PROBLEMS

The thematic structure revealed by the analysis invites interpretation not as a catalogue of discrete research topics, but as evidence of how the field has repeatedly re-posed a bounded set of foundational questions under successive technological and institutional conditions. Three patterns are particularly consequential for understanding JECR's intellectual trajectory.

Enduring Commitments: The Persistence of Programming Pedagogy

Problem Solving through Programming (n=146, 9%) and Self-Efficacy in Programming Education (n=153, 10%) constitute the most historically stable themes in the corpus. Both exhibit negative long-term slope values (Acc=−0.03), a pattern that does not signal declining relevance but rather intellectual maturation. These themes have moved from exploratory to foundational: the field no longer needs to demonstrate that programming-based instruction can develop problem-solving capacity or support learner confidence, as these propositions have become settled premises. Research energy has accordingly shifted toward specifying the conditions, learner profiles, and pedagogical designs under which these outcomes are best achieved.

Emerging Orientations: New Articulations of Persistent Questions

The most visible movement in JECR's recent publication record involves two themes that have gained substantial momentum since 2015: Computational Thinking (Acc=0.17) and Game-Based Learning (Acc=0.22). These are not straightforwardly new research agendas. Rather, they represent new articulations of questions the field has long negotiated. Computational thinking is now widely positioned as a cross-disciplinary competency encompassing abstraction, decomposition, pattern recognition, and algorithmic design (Park & Kwon, 2022; Zakaria et al., 2023), and therefore extends and reframes the programming pedagogy tradition that has structured JECR from its earliest volumes. Zhu and Deng (2024) argue that computational thinking has come to function as a foundational literacy of the information age, comparable in scope to reading and writing. The acceleration of this theme since 2020 is in part a response to pandemic-driven digitalisation and the incorporation of CT into national curricula in the United Kingdom, the United States, and elsewhere (Voogt et al., 2015).

Game-Based Learning similarly reflects a deepened engagement with questions of motivation, engagement, and learner agency that have been present in JECR since at least the

early 2000s. The systematic review by Vlachopoulos and Makri (2017) documents the evidence base linking game-based environments to increased interaction and cognitive engagement; Ekici (2021) notes that the field has not yet reached saturation, a finding consistent with the continued upward slope identified in our analysis. The rise of gamification platforms such as Kahoot and Duolingo has legitimised this research area in mainstream educational settings, while the disruptions of the pandemic period focused renewed attention on interactive digital environments as solutions to participation and engagement challenges in remote learning (Manzano-León et al., 2021).

Technology Acceptance in Education (Acc=0.21) and Digital Pedagogical Agents (Acc=0.09) have also gained momentum, the latter with a particularly sharp inflection point in 2024 that coincides directly with the widespread adoption of generative AI tools in educational contexts. Lee, Hong, and Cho (2024) draw attention to the ethical dimensions of AI integration in education and argue that research in this area has become a necessity rather than an option — a view that the acceleration of the Digital Pedagogical Agents theme in JECR's recent record appears to confirm.

Maturing Questions: The Declining Salience of Attitude Research

The decline of Attitude towards Technology (Acc=−0.20) represents arguably the clearest signal of intellectual maturation in the corpus. This theme dominated the journal's early publication record, a period in which computing technologies were still widely perceived as novel and potentially disruptive, making psychological and behavioural responses to their introduction an obvious object of inquiry. As technology became embedded in everyday educational practice, the research question shifted: the issue was no longer whether students and teachers would accept digital tools, but how adoption processes unfold, what institutional and individual factors shape them, and what ethical and social consequences follow. This shift is captured in the rise of the Technology Acceptance in Education theme and, more broadly, in the field's movement toward critical and social dimensions of technology use (White & Boatwright, 2020), a call reiterated by the journals' editorial board members (Allison, et al., 2025).

JECR AS EPISTEMIC INFRASTRUCTURE

The cumulative picture that emerges from this analysis positions JECR not as a passive repository of research outputs, but as an active epistemic infrastructure through which the field's foundational questions have been progressively assembled, contested, and refined. The

journal's intellectual identity resides not in the novelty of its topics but in the consistency of the deep questions that animate them; questions about how computational systems mediate learning, how educational environments should be designed in relation to technological change, and how learner agency, cognition, and motivation can be supported through digital means.

This perspective carries a specific implication for how current developments in AI and educational technology should be interpreted. The conceptual tensions most visible in contemporary discussions — adaptivity, learner modelling, agency, computational mediation — are not innovations introduced by the AI era. They are the reconfigured expression of problems that JECR has been negotiating for nearly four decades. Recognising this continuity does not diminish the significance of present-day transformations; it clarifies them. The field is not confronting an entirely new set of questions. It is confronting familiar questions in an environment of unprecedented technological capability and institutional complexity.

For researchers working at the intersection of AI and education, JECR's historical record therefore constitutes more than background context. It provides a conceptual map of the terrain; a means of locating new contributions within the longer intellectual trajectory from which they derive meaning, and of identifying which apparent novelties represent genuine advances and which represent the re-presentation of longstanding problems in new technological vocabulary.

CONCLUSION

This editorial has offered an empirically grounded account of JECR's thematic evolution across nearly four decades of publication. The analysis reveals a field that is neither static nor discontinuous, but characterised by a patterned process of problem re-articulation in which stability resides in the persistence of core concerns and change emerges through their continual reformulation under new conditions.

Several themes — computational thinking, game-based learning, technology acceptance, and digital pedagogical agents — have gathered significant momentum in recent years, while others, such as attitude towards technology, reflect the natural maturation of research questions that have become premises rather than problems. Both patterns are consistent with a field that has developed substantial intellectual depth while remaining responsive to technological and social change.

The timing of this retrospective is deliberate. In 2026, as artificial intelligence reshapes the landscape of educational computing with a speed and scale that can make historical perspective seem like a luxury, JECR's archive argues for the opposite view: that understanding where the field has been is essential for understanding where it is going. The foundational questions that have structured this journal about learning, computation, cognition, and design, have not been resolved by the emergence of large language models or generative AI, they have been intensified. The archive does not offer answers to these questions; but it does offer the most rigorous available account of how the field has learned to ask them.

CONFLICT OF INTEREST STATEMENT

Dr Jordan Allison serves as Editor-in-Chief of the Journal of Educational Computing Research and is a co-author of this editorial. The manuscript was originally submitted as a research article and underwent external peer review under the supervision of an independent handling editor. Dr Allison was not involved in the editorial handling or decision-making process for this manuscript beyond their role as co-author. Following peer review, the independent handling editor invited the authors to revise and reclassify the manuscript as an editorial. In accordance with the journal's policy for editorial submissions, the final version was not subject to further external peer review. The authors declare no other competing interests.

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