From Body to Digital Space: A Bibliometric and Thematic Mapping of Embodied Pedagogy and Technology in Dance Education

Hana Shilfia Iraqi[1], Serly Safitri[2]
[1,2]Arts Education, Faculty of Languages and Arts, Universitas Negeri Semarang

Mia Fahmiati[3]
[3]Drama, Dance and Music Department, Faculty of Language and Arts, Universitas Negeri Padang

Abstract

Digital technologies are increasingly reshaping dance education, yet the relationship between technological mediation and embodied pedagogy remains conceptually fragmented across educational, cognitive, and computational research. This study maps the intellectual, geographical, and thematic development of research at the intersection of embodied pedagogy, digital technology, and dance education. A bibliometric analysis was conducted on 188 Scopus-indexed publications using Biblioshiny, combining performance analysis with science mapping to examine publication growth, influential sources and authors, geographical and citation patterns, keyword co-occurrence, thematic structures, and research trends. The findings reveal a rapidly expanding and increasingly interdisciplinary research domain connecting dance education with embodied cognition, virtual reality, human–computer interaction, learning systems, motion capture, and related digital technologies. Embodied cognition remains an important conceptual foundation, while technological themes have become increasingly prominent, indicating not a displacement of bodily learning but a reconfiguration of embodiment within digitally mediated environments. Based on this convergence, the study proposes digitally mediated embodiment as a bibliometrically informed conceptual lens for understanding how digital technologies participate in the experience, representation, interpretation, and reflection of bodily movement in dance education. The study contributes an integrated perspective that moves beyond the conventional body–technology divide and provides a foundation for future empirical research on how emerging technologies can support technologically enhanced dance education while preserving its kinesthetic, affective, aesthetic, relational, and cultural dimensions.

Keywords: *embodied pedagogy; dance education; embodied cognition; digital technology; virtual reality; human–computer interaction; bibliometric analysis; digitally mediated embodiment*

Corresponding Author:
Hana Shilfia Iraqi
Arts Education, Faculty of Languages and Arts, Universitas Negeri Semarang

INTRODUCTION

Dance education is fundamentally grounded in embodied processes through which learners develop knowledge, meaning, expression, and understanding through bodily movement and sensory experience (Echague et al., 2025; Jung et al., 2026; Lindberg et al., 2023; Svalina et al., 2026; Weber, 2019). Unlike educational contexts in which knowledge is primarily communicated through written or verbal modes, dance learning relies substantially on physical demonstration, observation, imitation, kinaesthetic awareness, spatial interaction, and continuous engagement between the body and its environment (Brown et al., 2023; Dolinina, 2020; Giguere, 2025; Kim, 2025; Shi & Yao, 2026). From this perspective, the body is not merely an instrument for performing movement but also an important site through which learning and knowledge are produced. The concept of embodied pedagogy therefore provides a valuable framework for understanding how learners experience, interpret, and construct knowledge through bodily participation in dance education (Aartun & Standal, 2026; Chettaoui et al., 2022; Longley & Buck, 2019; Radin, 2025).

At the same time, technological development has increasingly altered the environments in which dance is taught, learned, created, documented, and experienced. Digital video, online learning environments, mobile technologies, motion-capture systems, virtual and augmented reality, interactive media, and other emerging technologies have expanded pedagogical possibilities beyond conventional face-to-face studio settings (Andreadou & Kazanidis, 2025; Parrish, 2016; S. Xu et al., 2025). These developments became particularly visible with the expansion of remote and digitally mediated education, which required dance educators and learners to negotiate the relationship between physical movement and technologically mediated spaces (Goletti & Milovanovic, 2022; Z. (Michael) Li, 2024). Consequently, dance education increasingly operates across interconnected physical and digital environments rather than exclusively within the traditional studio.

This development creates an important conceptual and pedagogical tension. Embodied pedagogy emphasizes corporeality, sensory experience, spatial awareness, physical interaction, and situated participation, whereas digitally mediated learning may transform how these experiences are produced and communicated. Technology can potentially extend embodied learning by enabling movement visualization, repeated observation, multimodal feedback, remote participation, movement analysis, and new forms of creative interaction (Hsia et al., 2016; L.-J. Xu et al., 2025). However, digitally mediated dance education may also raise questions concerning physical presence, kinaesthetic communication, teacher–learner interaction, access to technology, and the extent to which embodied experiences can be translated into virtual or technologically mediated environments (Berg, 2023; G. Li et al., 2026). Understanding this relationship requires attention not only to individual empirical studies but also to the broader intellectual development of the research field.

Research addressing dance education, embodiment, and technology appears across intersecting disciplinary areas, including dance and performing arts, education, embodied cognition, somatic studies, digital learning, human–computer interaction, and educational technology. Such disciplinary diversity can produce a fragmented knowledge landscape in which relevant scholarship employs different theoretical perspectives, terminologies, methodological approaches, and technological applications. Although previous reviews may have examined aspects of dance pedagogy, embodied learning, technology-enhanced education, or digital practices in the performing arts (DiGiammarino et al., 2026; J. Li & Ahmad, 2025), the extent to which existing scholarship has systematically mapped the intersection of embodied pedagogy, technology, and dance education remains to be established through a systematic search of the literature. In particular, there is a need to determine how this research domain has developed over time, which scholars and geographical contexts have shaped its development, what intellectual connections characterize the field, and which themes represent established or emerging directions.

Bibliometric analysis provides an appropriate approach for addressing these questions because it enables the systematic examination of publication patterns and the intellectual and conceptual structures of a research domain (Aria & Cuccurullo, 2017; Donthu et al., 2021). Through performance analysis and science-mapping techniques, bibliometric methods can identify publication and citation trends, influential authors and sources, geographical and institutional contributions, collaboration structures, and relationships among frequently occurring concepts. Keyword co-occurrence and thematic mapping are particularly relevant to the present study because they can reveal how concepts associated with embodiment, pedagogy, dance, and technology cluster together and how their relationships evolve across the literature.

Accordingly, this study aims to map the development, scholarly structure, citation influence, and thematic evolution of research at the intersection of embodied pedagogy, technology, and dance education. By combining bibliometric performance analysis with science-mapping techniques, the study examines how the field has developed over time and across publication sources, identifies the principal scholarly and geographical contributors, evaluates the citation influence of key publications, maps the dominant conceptual and thematic structures, and traces the evolution of research themes from body-centred pedagogical perspectives toward digitally mediated learning environments. In doing so, the study seeks to provide a structured account of an emerging interdisciplinary research domain, clarify patterns of concentration and collaboration, and identify the thematic directions that are shaping its recent development. The study is guided by the following research questions:

RQ1. How has research on embodied pedagogy, technology, and dance education developed over time and across publication sources?

RQ2. Who are the major scholarly contributors to this research domain, and how are research production, citation influence, and international collaboration geographically distributed?

RQ3. Which publications have exerted the greatest citation influence within this research domain?

RQ4. What concepts and thematic structures characterize research on embodied pedagogy, technology, and dance education?

RQ5. How have research themes evolved from body-centred pedagogical perspectives toward digitally mediated learning, and which topics characterize the recent research frontier?

METHODS

This study employed a bibliometric approach to map the development, scholarly structure, citation influence, and thematic evolution of research at the intersection of embodied pedagogy, technology, and dance education. The analysis combined performance indicators and science-mapping techniques to examine publication trends, source characteristics, author and country contributions, citation influence, keyword relationships, and thematic structures. The methodological procedure consisted of two main stages (data collection from Scopus and bibliometric analysis using Biblioshiny).

Data Collection

Bibliographic data were retrieved directly from the Scopus database on 1st October 2026. Scopus was selected because of its broad coverage of peer-reviewed literature across the social sciences, arts and humanities, psychology, education, and computer science, making it suitable for examining an interdisciplinary research domain that spans dance education, embodied cognition, and digital technology.

The search terms were combined using Boolean operators and applied to the title, abstract, and keyword fields in Scopus. The exact search query used to retrieve the dataset was: ("embodied pedagogy" OR "embodied learning" OR "embodied cognition" OR "embodied teaching" OR "embodied knowledge" OR "somatic pedagogy" OR "somatic learning" OR "kinesthetic learning" OR "kinaesthetic learning") AND ("dance education" OR "dance pedagogy" OR "dance teaching" OR "dance learning" OR "dance training" OR "dance teacher education") AND ("digital technolog*" OR "educational technolog*" OR "technology-enhanced learning" OR "digital learning" OR "online learning" OR "virtual learning" OR "digital pedagogy" OR "artificial intelligence" OR "virtual reality" OR "augmented reality" OR "mixed reality" OR "extended reality" OR "motion capture" OR "computer vision" OR "digital media" OR "digital archive*" OR "remote learning" OR "video-based learning") AND (LIMIT-TO (DOCTYPE , "ar") OR LIMIT-TO (DOCTYPE , "cp")) AND (LIMIT-TO (LANGUAGE , "English"))

No publication-year restriction was applied during the Scopus search, allowing the dataset to capture all relevant publications available up to the date of data retrieval. The search results were restricted to publications written in English and to the document types Article and Conference Paper. No additional PRISMA-based screening or manual inclusion and exclusion procedure was conducted after applying these database settings. The resulting bibliographic records therefore constituted the final dataset used for the bibliometric analysis. A total of 188 publications were retrieved from Scopus and exported in BibTeX format with the bibliographic metadata required for analysis, including authors, titles, publication years, source titles, affiliations, countries, author keywords, abstracts, cited references, and citation information.

Bibliometric Analysis

The 188 retrieved publications were analyzed using Biblioshiny, the web-based interface of the Bibliometrix R package. Biblioshiny was used for both performance analysis and science mapping to address the research questions of the study.

Performance analysis was conducted to examine annual scientific production, publication sources, author contributions, geographical distribution, collaboration patterns, and citation influence. Bradford's Law was applied to identify the core sources contributing to the research domain. Author-level analysis was used to examine patterns of scholarly productivity and citation influence, while country-level analysis was conducted to identify scientific production, corresponding-author distribution, and patterns of national and international collaboration. Citation analysis was used to examine the intellectual influence of publications and contributing countries within the dataset.

Science mapping was conducted to explore the conceptual structure of the literature. Author-keyword analysis was used to identify the most frequently occurring concepts within the dataset, while keyword co-occurrence analysis was employed to examine relationships among major research topics and their clustering within the field. The resulting conceptual network was interpreted to identify connections among embodied cognition, dance, education, digital technologies, and related interdisciplinary concepts.

Thematic mapping was subsequently performed in Biblioshiny to examine the development and relative importance of research themes. Themes were interpreted according to their centrality and density, enabling the identification of motor, basic, niche, and emerging or declining themes. Collectively, these analyses were used to examine the development and publication structure of the field, scholarly and geographical contributions, citation influence, conceptual relationships, and thematic evolution within research on embodied pedagogy, technology, and dance education.

RESULTS AND DISCUSSION

Growth and Publication Structure of the Research Domain

Annual scientific production shows a long period of limited activity followed by a pronounced acceleration in research on embodied pedagogy, technology, and dance education (see Figure 1). The field emerged sporadically, with only one publication in 2008, no publications between 2009 and 2013, and another single article in 2014. A more sustained research trajectory began in 2016 with six publications, increasing to seven in both 2017 and 2018 before slightly declining to six in 2019. Publication output subsequently expanded to 11 articles in 2020 and reached an initial peak of 19 in 2021, followed by a temporary decline to 13 in 2022 and a modest recovery to 14 in 2023. Growth accelerated again in 2024 with 19 publications, before increasing sharply to 39 in 2025 and 45 in 2026. The overall pattern shows a transition from sporadic publication activity to sustained and rapidly increasing scholarly attention, particularly during the most recent period. The 2026 value should nevertheless be interpreted cautiously because publication and indexing processes for the current year may still be ongoing.

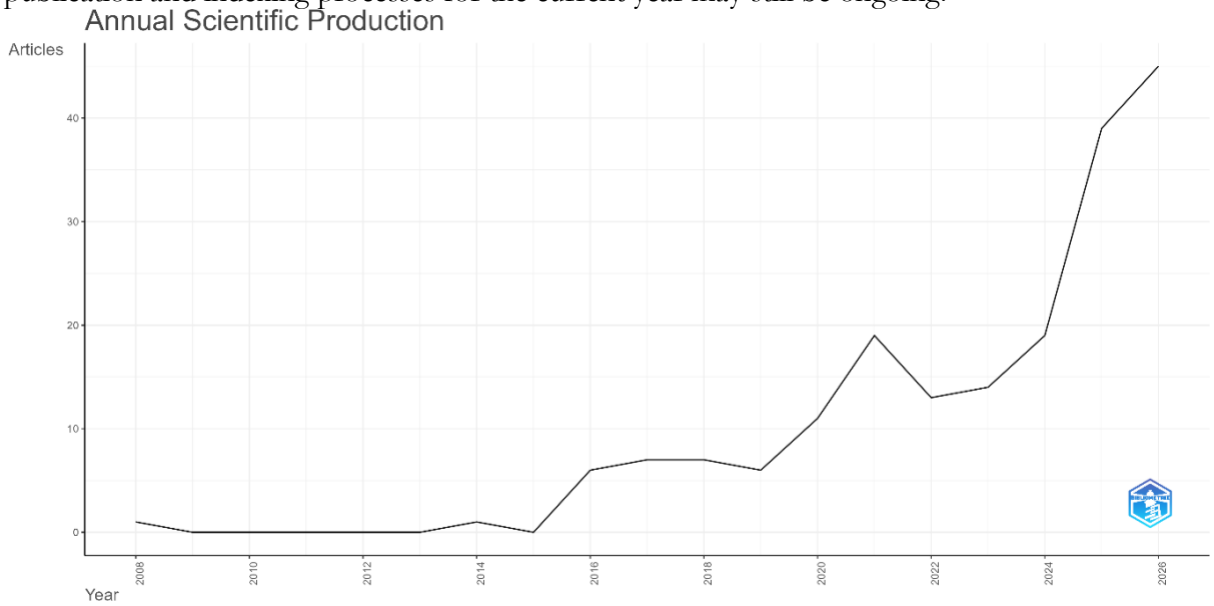


Figure 1. Annual Scientific Production in Embodied Pedagogy, Technology, and Dance Education

Publication growth is accompanied by a concentration of studies within a relatively small group of publication venues. Bradford's Law analysis identifies Frontiers in Psychology as the leading source with 10 publications, followed by Research in Dance Education with seven and the ACM International Conference Proceeding Series with six (see Figure 2). Two entries of the Conference on Human Factors in Computing Systems – Proceedings each contribute five publications, while the Journal of Dance Education contributes four. Computers and the International Journal of Education and the Arts each account for three publications, whereas ACM Transactions on Computer-Human Interaction and Advanced Electromagnetics each contribute two. The ten highest-ranked source entries collectively account for 47 publications. Their disciplinary coverage across psychology, dance education, computing, human–computer interaction, and arts education shows that the literature is distributed across several disciplinary publication contexts.

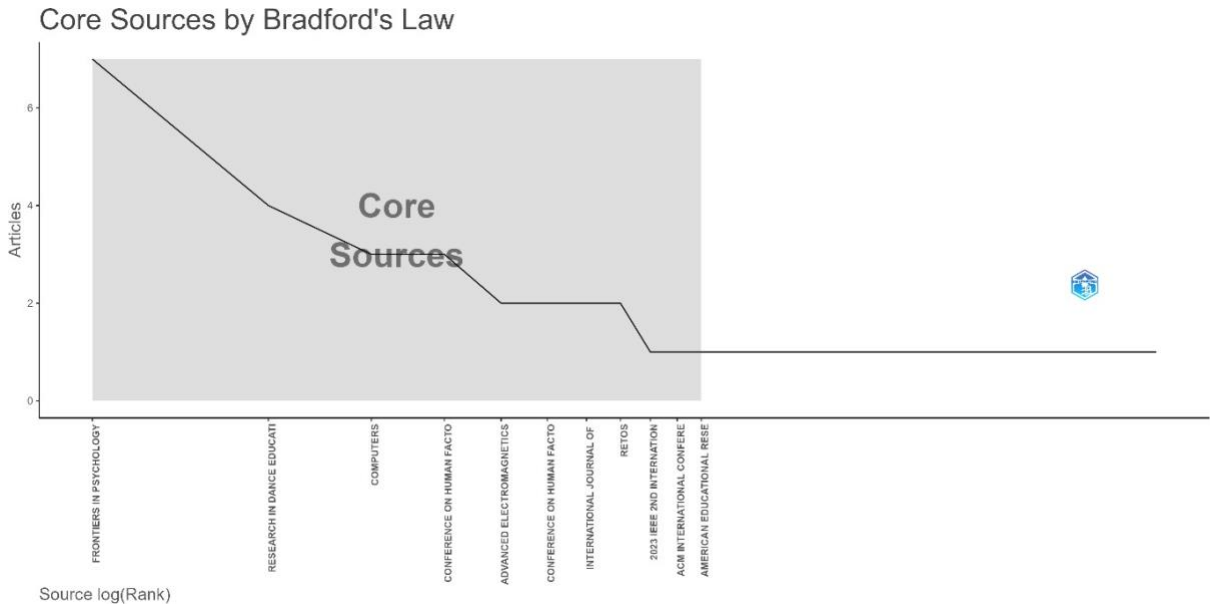


Figure 2. Core Publication Sources Based on Bradford's Law

Scholarly Contributors, Geographical Production, and International Collaboration

Author productivity shows a relatively dispersed pattern across the research domain. Kronsted C emerges as the most productive author with four documents, followed by Bergner Y, Cook J, Fdili Alaoui S, Ibrahim Z, Leonard AE, Wang Y, and Weber R, each with three publications (see Figure 3). Alaoui SF and Briedis M complete the top ten with two publications each. The narrow range of two to four publications among the leading authors indicates that scholarly production is distributed across multiple researchers rather than concentrated among a small number of highly prolific contributors.

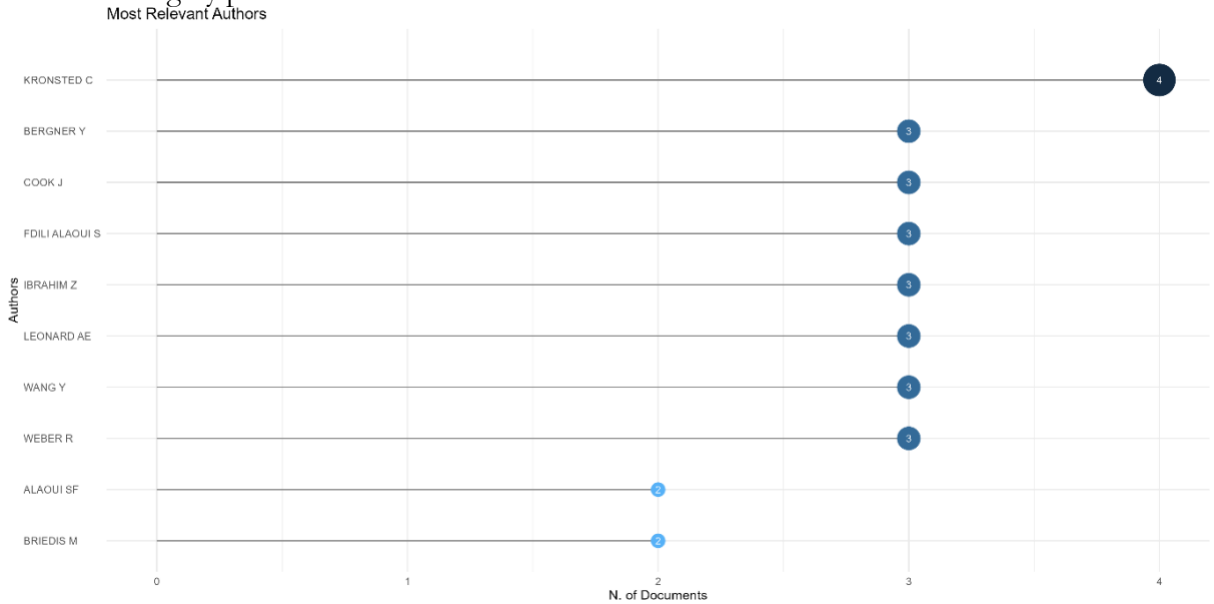


Figure 3. Most Relevant Authors by Number of Publications

Citation impact at the author level provides a complementary view of this distribution. Bergner Y and Kronsted C record the highest local H-index, each with a value of 3, followed by Alaoui SF, Champion D, Cook J, Dos Santos ADP, Fdili Alaoui S, Fiebrink R, Fisher VJ, and Geršak G, each with an H-index of 2 (see Figure 4). The narrow difference between the leading authors indicates that local citation influence is distributed among several contributors, consistent with the relatively dispersed pattern observed in author productivity.

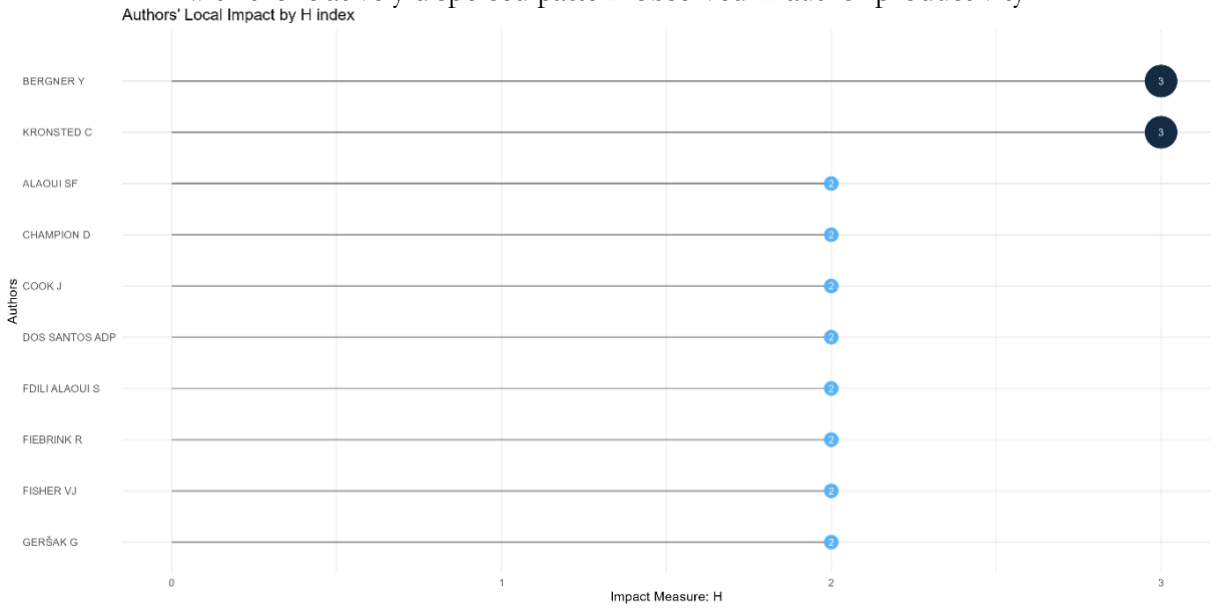


Figure 4. Authors' Local Impact Based on the H-Index

Country-level production reveals a broader geographical distribution with substantial differences in contribution volume. The United States records the highest scientific production with 77 contributions, followed by China with 47 and the United Kingdom with 33 (see Figure 5). Australia records 24 contributions, Malaysia 17, Spain 15, and Greece 14, while France, Indonesia, and Japan each record 12. Research activity therefore extends across North America, Europe, East Asia, Southeast Asia, and Oceania, although the volume of contributions remains uneven across countries.

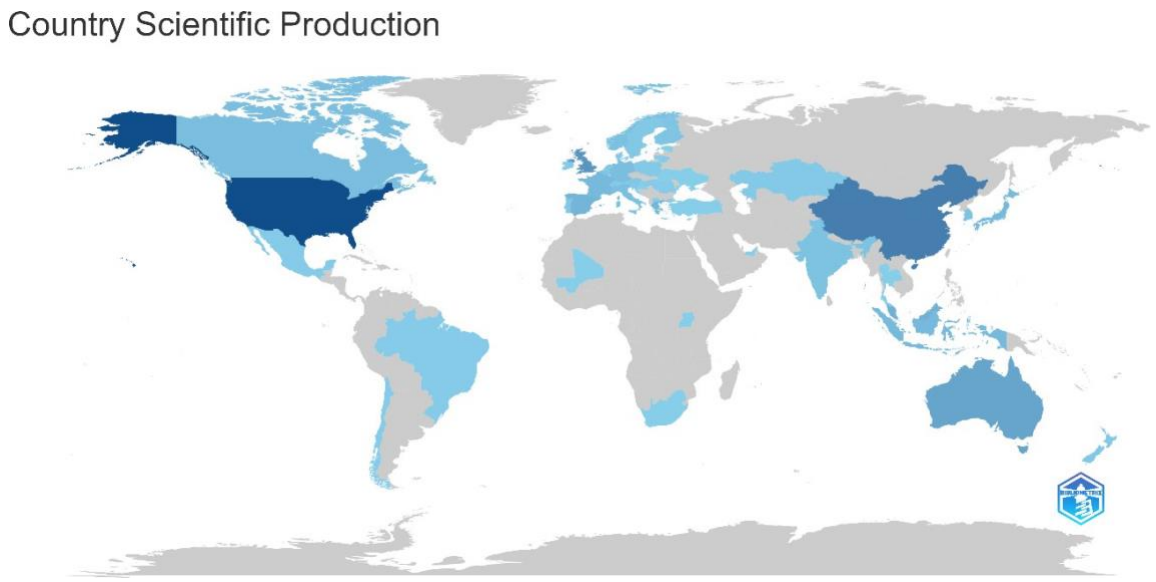


Figure 5. Country Scientific Production by Author Affiliation

Citation patterns across countries differ from their publication-production rankings. The United States records the highest citation count with 356 citations, followed by the United Kingdom with 142, Italy with 111, and China with 102 (see Figure 6). Macedonia records 73 citations, Spain 59, Germany 47, Australia 43, Cyprus 42, and Finland 37. The differences between

publication output and citation ranking show that scientific production and citation visibility are not distributed identically across countries.

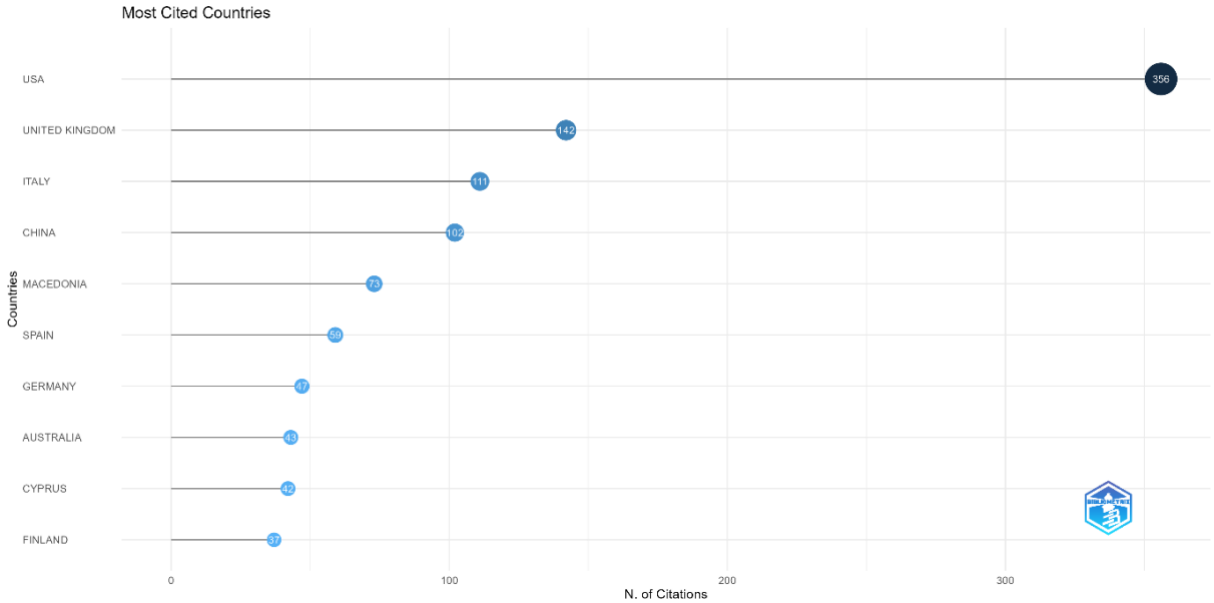


Figure 6. Most Cited Countries

International collaboration adds another dimension to the geographical structure of the field. The United States ranks first with 23 corresponding-author publications (12.2% of the total), comprising 19 Single Country Publications (SCP) and four Multiple Country Publications (MCP), followed by China with 21 publications (11.2%), including 19 SCP and two MCP (see Figure 7). Australia and the United Kingdom each contribute nine publications, although the United Kingdom records a higher proportion of international collaboration (33.3% MCP) than Australia (22.2%). Malaysia records eight publications with four SCP and four MCP, resulting in an MCP ratio of 50%, while Spain contributes seven publications with an MCP ratio of 42.9%. Korea contributes six publications, all classified as SCP. Norway presents a contrasting pattern, with all three publications classified as MCP. The country-level collaboration profiles therefore show that high publication volume does not necessarily correspond to a high proportion of international collaboration.

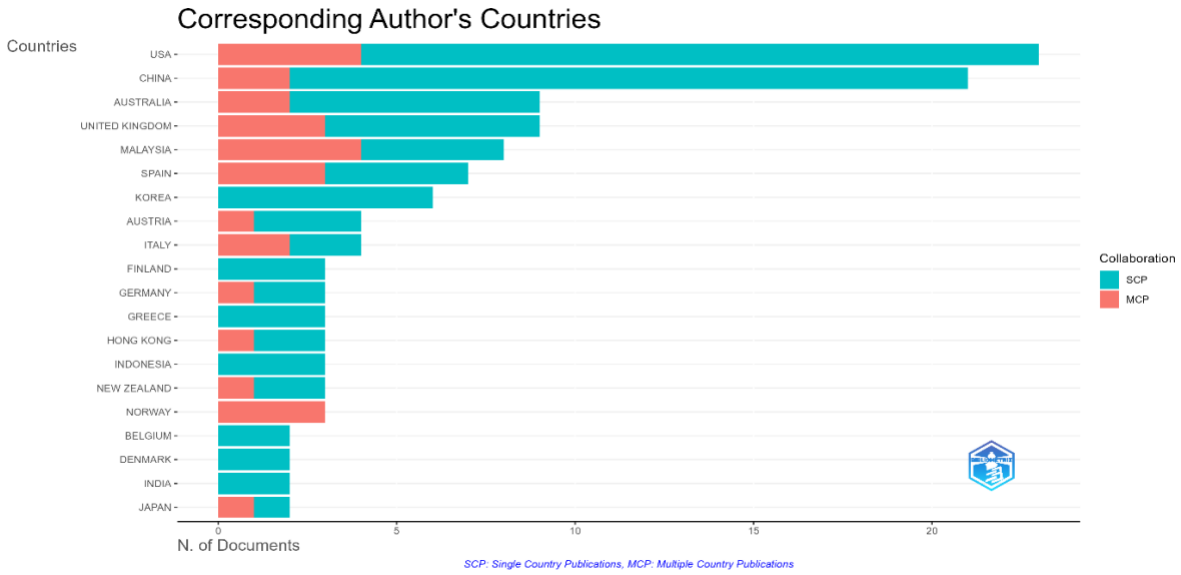


Figure 7. Corresponding Authors' Countries and International Collaboration Patterns

Citation Influence of Key Publications

Document-level citation analysis identifies the publications with the greatest global citation visibility within the dataset. Hou Y (2022), published in the Journal on Computing and Cultural Heritage, records 298 global citations, followed by Hanna JL (2008) in Educational Research with 122 citations and Riva G (2014) in Frontiers in Human Neuroscience with 97 (see Figure 8). Sra M (2018) records 74 citations, followed by Torrents C (2021) with 73 and Alaoui SF (2017) with 68. Liang A (2019) and Solomon F (2022) record 59 and 58 citations, respectively, while Wong JT (2023) and Jeon M (2019) complete the top ten with 54 and 53 citations. The substantial difference between the leading document and the remaining publications indicates an uneven distribution of global citations. The publication venues represented in the top ten span cultural heritage computing, education, neuroscience, human–computer interaction, creativity, sensors, learning sciences, and science education, showing that highly cited contributions originate from several disciplinary contexts.

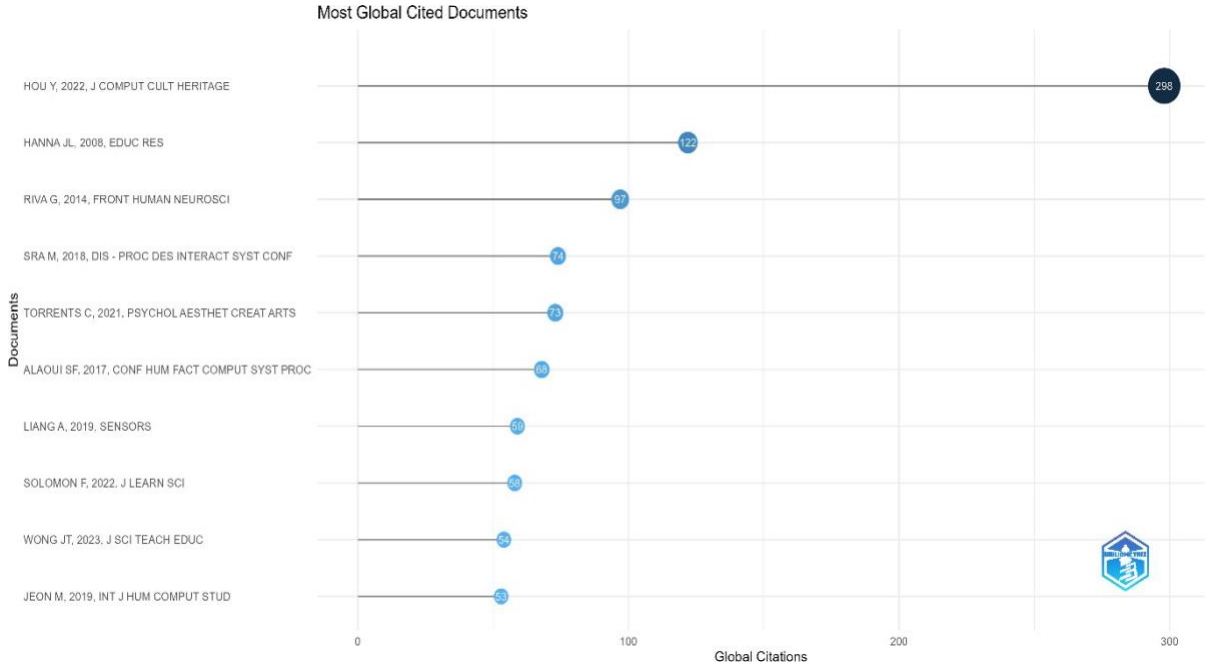


Figure 8. Most Globally Cited Documents

Conceptual and Thematic Structure of the Field

Authors' keyword frequencies provide an initial view of the conceptual structure of the literature. Embodied cognition is the most frequently occurring author keyword with 21 occurrences, followed by dance with 18 (see Figure 9). Virtual reality ranks third with 13 occurrences, followed by motion capture with 11. Dance education and embodiment each occur 10 times, while education and embodied interaction each appear nine times. Embodied learning records eight occurrences, and augmented reality appears six times. The distribution places embodiment-related concepts and digital technologies within the same keyword landscape, with embodied cognition occupying the most prominent position.

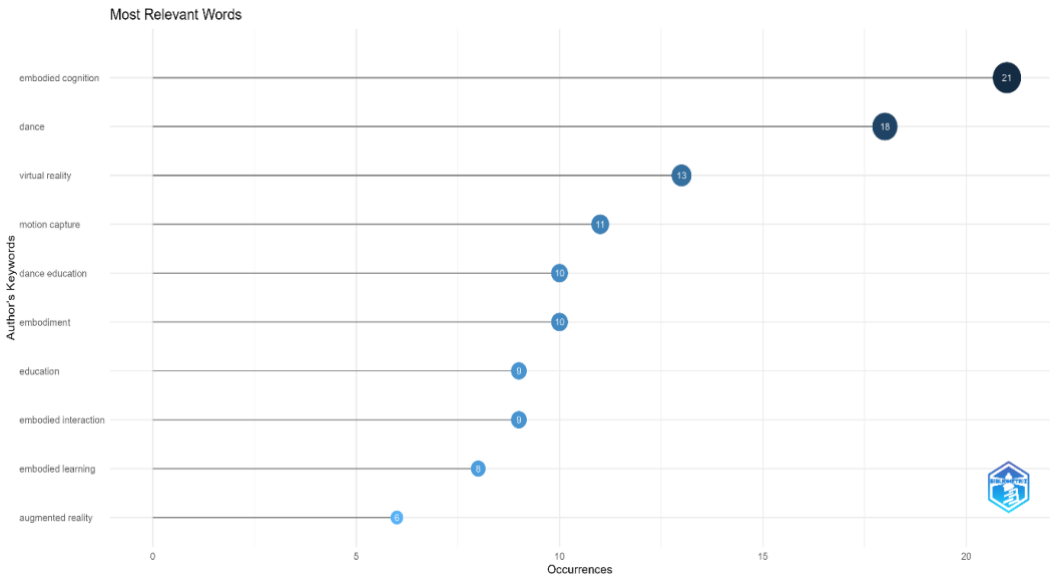


Figure 9. Most Relevant Authors' Keywords

The keyword co-occurrence network clarifies how major concepts are connected across the literature (see Figure 10). The largest technology-oriented cluster is organized around virtual reality and learning systems, with connections to dance education, education computing, immersive learning, animation, augmented reality, artificial intelligence, feedback, motor learning, and dance training. A second prominent cluster centers on human–computer interaction and human engineering, with links to embodied interaction, interactive computer graphics, user experience, design, arts computing, and embodied knowledge. Another cluster is structured around embodied cognition, education, human, learning, and cognition. Dance occupies a connecting position across technological, educational, and embodied concepts, while creativity, dance movement, and affordances appear within smaller and more peripheral areas of the network. The network structure therefore shows that technological, pedagogical, and embodiment-related concepts are connected across several conceptual clusters rather than appearing as isolated research topics.

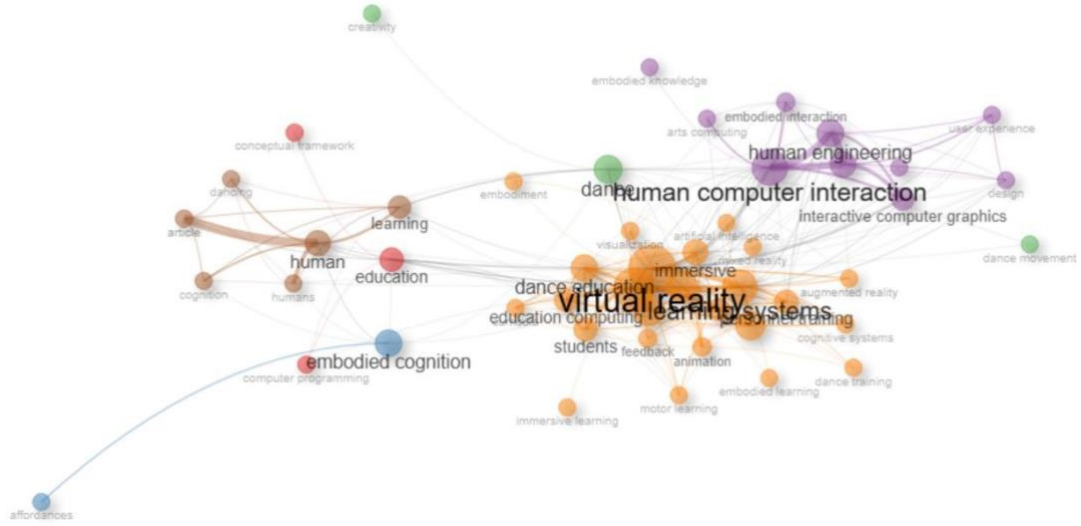


Figure 10. Keyword Co-Occurrence Network

Temporal Evolution and Emerging Research Frontiers

The thematic map extends the conceptual analysis by locating major topics according to their centrality and level of development (see Figure 11). Motor themes include dance, virtual reality, human–computer interaction, human engineering, and learning systems, indicating relatively developed and central areas within the research domain. Computer programming, computational thinking, computer applications, computational creativity, and intangible cultural heritage also

appear within this quadrant. Niche themes include learning environment, mental imagery, somatic learning, experimental groups, kinesthetic perception, and pilot studies, representing more specialized areas with comparatively lower connections to the broader field. Basic themes include embodied cognition, education, learning, affordances, improvisation, and pedagogy, reflecting topics with broad relevance but lower internal thematic development. Creativity, children, physical education, dance learning, cultural identity, artificial intelligence, active inference, and early childhood occupy the emerging or declining quadrant. Their position indicates relatively low centrality and density, although the thematic map alone does not determine whether individual topics are emerging or declining.

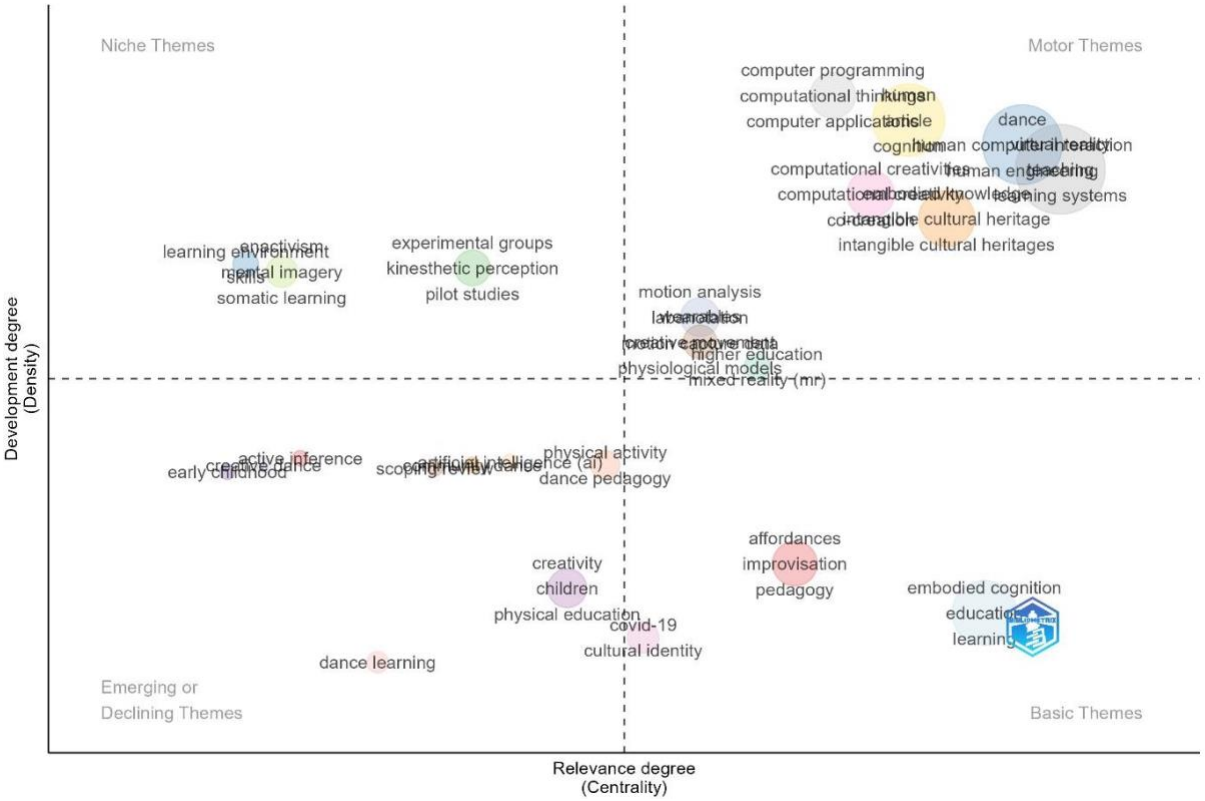


Figure 11. Thematic Map of the Research Domain

Trend-topic analysis adds a temporal perspective to the thematic structure by tracing changes in topic visibility across publication years (see Figure 12). Dance education represents an earlier and relatively persistent topic, extending from 2018 to approximately 2025, while education and embodied learning become more visible from 2020 onward. Dance, virtual reality, embodied cognition, learning systems, and embodied knowledge gain visibility during 2021–2022. Virtual reality and embodied cognition become particularly prominent around 2023–2024. Human–computer interaction, teaching, engineering education, interactive computer graphics, and human engineering appear among the more recent topics during 2025–2026. The temporal distribution shows an expansion from educational and embodied-learning topics toward a broader research landscape that increasingly incorporates immersive technologies, interactive systems, and technology-mediated learning environments.

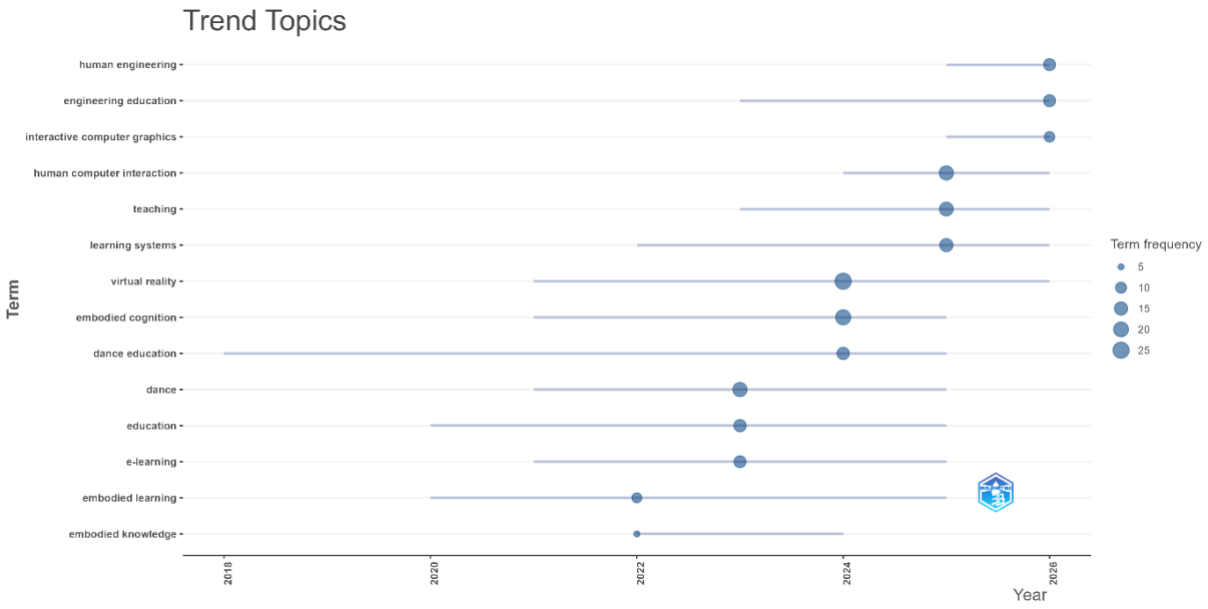


Figure 12. Trend Topics in Embodied Pedagogy, Technology, and Dance Education

The results show that research on embodied pedagogy, technology, and dance education is growing and becoming increasingly interdisciplinary. Publications are distributed across dance education, psychology, computing, human–computer interaction, and technology-enhanced learning, while research production is geographically diverse but uneven. The United States and China show particularly strong research activity, whereas authorship is relatively dispersed across the field. At the conceptual level, embodied cognition is the most prominent author keyword, while virtual reality, motion capture, augmented reality, human–computer interaction, and learning systems are increasingly visible in the keyword and thematic structures. The temporal analysis shows a similar pattern. Dance education represents an earlier and persistent topic, whereas virtual reality and embodied cognition became more prominent around 2023–2024, followed by HCI, interactive computer graphics, and related technological topics in 2025–2026. These patterns suggest that the field is developing through increasing connections between embodied and technological research rather than through two separate lines of inquiry.

The position of embodied cognition in this structure is particularly important. Although technological topics are becoming more prominent, embodied cognition remains central to the conceptual organization of the literature. This may indicate that the increasing use of technology has not displaced the bodily foundations of dance learning. Rather, technology appears to change some of the conditions through which movement is observed, represented, practiced, and reflected upon. Previous studies support this interpretation. Digital video and other technology-supported environments have been used to extend movement observation and self-reflection beyond immediate studio interaction (Cisneros et al., 2019; Huddy, 2017). Berg (2023) be also showed that embodied knowledge can be communicated through kinesthetic dialogue even when direct tactile intervention is limited. Thus, the relationship identified in the blibliometric network appears to correspond with earlier studies showing that digital mediation and embodied learning can coexist within dance pedagogy.

Virtual reality, motion capture, and interactive learning systems form another important part of this relationship. These technologies are located among the more visible technological themes in the present analysis, and previous research provides some explanation for this position. Motion-capture and virtual systems can make movement trajectories, timing, body positioning, and performance errors visible to learners (Chan et al., 2011; Kyan et al., 2015). Gamified virtual environments have also been used to support movement learning and comparison with expert movement patterns (Senecal et al., 2020), while extended-reality systems can provide interactive and personalized feedback during dance training (W. Xu et al., 2023). Immersive environments may additionally allow dancers to experience movement from viewpoints and spatial configurations that are difficult to reproduce in conventional studio settings (Lottridge et al., 2022; Thomas, 2022). The increasing bibliometric visibility of these technologies may therefore be related to their capacity to make particular aspects of movement observable, repeatable, and open to computational feedback.

However, their increasing visibility should not be interpreted as evidence that technologically mediated learning is necessarily more effective than conventional embodied learning. Bibliometric indicators describe scholarly attention and structural relationships, not pedagogical effectiveness. Previous research also identifies limitations that are less visible when technological systems are considered mainly in terms of performance and feedback. Virtual environments cannot fully reproduce muscular resistance, physical touch, breathing, proprioception, and other felt dimensions of movement (Thomas, 2022; Zhu, 2025). Similarly, movement represented as trajectories or numerical information may provide useful technical feedback while giving less attention to the bodily sensations through which movement is experienced. Technology may therefore improve the visibility of movement without necessarily representing the full experience of moving. This distinction is important when interpreting the growing position of technological themes in the present results.

The thematic structure provides further evidence of this problem. Virtual reality, HCI, learning systems, interactive systems, and other technology-related topics occupy relatively central or developed positions, whereas somatic learning and kinesthetic perception appear as more specialized themes, and creativity and cultural identity have relatively low centrality and density. These positions do not necessarily mean that creativity, somatic experience, kinesthetic perception, or cultural identity are becoming less important. One possible explanation is that movement characteristics that can be captured, visualized, or quantified are more easily incorporated into computational research than affective, aesthetic, relational, and culturally situated aspects of dance. Earlier studies raise similar concerns. Digital systems have difficulty reproducing tactile and proprioceptive qualities of dance practice (Hapidzin et al., 2026; Zhu Yi, n.d.), while algorithmic approaches may direct greater attention toward measurable accuracy than toward emotional expression and aesthetic intention (Han, 2025; Liu, 2025). In this respect, the present thematic imbalance may point to a gap between what digital technologies can readily measure and what dance education considers meaningful embodied knowledge.

A ssimilar issue can be observed in the relational and cultural dimensions of dance learning. Dance knowledge is often transmitted through physical co-presence, observation, interpersonal response, cultural memory, and situated practice. These dimensions are not easily reproduced through standardized digital representations. Hapidzin et al. (2026) and Liu and Shi (2025), for example, raise concerns about the capacity of digital environments to preserve embodied and culturally situated forms

of dance knowledge. Berg (2020) further showed that technology in dance education may introduce forms of surveillance that influence how bodies are observed and evaluated. These findings suggest that the technological development of dance education should not be examined only through questions of access, feedback, or movement accuracy. It also raises questions about which forms of bodily knowledge are represented, which movement standards are encoded in technological systems, and which cultural or relational dimensions remain outside their measurement.

From this perspective, the relationship identified across the bibliometric results can be described as digitally mediated embodiment. In this study, the term refers to conditions in which bodily experience remains central to learning while digital technologies participate in the observation, representation, interpretation, communication, or reflection of movement. The concept does not imply that digital technology strengthens embodiment in all circumstances. Different technologies appear to mediate different aspects of bodily experience. Video may extend opportunities for observation and reflection; motion capture can provide detailed representations of movement; virtual reality can reorganize spatial experience; and AI-based systems may provide new forms of movement analysis and feedback. At the same time, these technologies may give less attention to tactile experience, proprioception, aesthetic interpretation, interpersonal interaction, or cultural context. Digitally mediated embodiment is therefore proposed here as a way of describing this relationship rather than as an empirically validated theory. The bibliometric evidence suggests its presence at the level of the research field, but empirical studies are required to determine how it operates in actual teaching and learning settings.

These findings have implications for the use of technology in dance education. The results do not support the assumption that greater technological sophistication necessarily produces better embodied learning. Instead, the usefulness of a technology is likely to depend on the pedagogical purpose for which it is used. Motion capture and video-based systems may be useful when the objective is movement observation, technical feedback, or reflective analysis, whereas immersive environments may be more appropriate for spatial exploration and simulated performance environments. Technologies may be less adequate when learning depends strongly on physical touch, subtle proprioceptive information, interpersonal responsiveness, or culturally situated interpretation. The same consideration applies to emerging AI applications. Systems capable of identifying movement patterns or technical errors may complement pedagogical judgment, but movement quality in dance cannot always be reduced to computationally recognizable characteristics. Technology may therefore be more appropriately understood as part of the learning environment rather than as a replacement for the embodied and pedagogical relationships on which dance education depends.

Several questions remain open for future research. First, the comparatively peripheral position of creativity, somatic learning, kinesthetic perception, and cultural identity requires closer examination to determine whether it represents limited research attention or limitations in how these topics are captured through bibliometric and computational vocabularies. Second, comparative empirical studies are needed to examine whether VR, motion capture, AI-assisted feedback, and conventional studio instruction differ in their effects on technical performance, kinesthetic awareness, creativity, presence, and learner agency. Qualitative and phenomenological studies may also help reveal aspects of embodied experience that are difficult to identify through technological performance measures. Cross-cultural research is particularly relevant for examining whether digital systems adequately represent traditional,

indigenous, and other culturally situated forms of dance knowledge. Finally, the concept of digitally mediated embodiment requires empirical examination across different dance genres, educational levels, learner populations, and technological environments. Such studies would help determine whether the relationship observed in the present bibliometric structure represents a broader transformation in dance pedagogy or is specific to particular technologies and research contexts.

CONCLUSION

This study mapped the intellectual, geographical, and thematic development of research at the intersection of embodied pedagogy, digital technology, and dance education through a bibliometric analysis of 188 Scopus-indexed publications. The findings reveal a rapidly expanding and increasingly interdisciplinary research domain in which embodied cognition remains an important conceptual foundation, while virtual reality, human–computer interaction, learning systems, motion capture, and other digital technologies have become increasingly prominent. Rather than indicating a shift from embodied toward technology-centred learning, the findings suggest a reconfiguration of embodiment within digitally mediated environments, in which technology increasingly participates in how bodily movement is experienced, represented, observed, interpreted, and reflected upon. Based on this convergence, this study proposes digitally mediated embodiment as a bibliometrically informed conceptual lens for understanding the emerging relationship between embodiment and technology in dance education. This perspective positions digital technology not as a replacement for bodily learning, but as part of the learning environment through which embodied knowledge may be mediated, extended, and reconfigured, while preserving the kinesthetic, affective, aesthetic, relational, and cultural dimensions fundamental to dance education.

Future research should empirically examine and refine digitally mediated embodiment across different dance genres, educational levels, cultural contexts, and technological environments. Particular attention should be given to how virtual reality, motion capture, interactive systems, and emerging artificial intelligence applications influence kinesthetic awareness, creativity, presence, feedback, learner agency, and teacher–learner interaction, as well as whether these technologies preserve or constrain the experiential and culturally situated dimensions of dance.

Future studies could also extend the present bibliometric analysis by incorporating additional databases, multilingual publications, systematic or qualitative evidence synthesis, and empirical research to determine whether the intellectual and thematic patterns identified in the Scopus corpus remain consistent across broader scholarly contexts. Such investigations would provide the evidence required to test, refine, or challenge the proposed concept of digitally mediated embodiment and contribute to the development of technology-enhanced dance education that remains fundamentally grounded in embodied learning.not

REFERENCES

Aartun, I., & Standal, Ø. F. (2026). Exploring the embodied experiences of social relationships in physical education. *Curriculum Studies in Health and Physical Education*, *17*(1), 32–49. https://doi.org/10.1080/25742981.2024.2376154

Andreadou, E., & Kazanidis, I. (2025). Unlocking the Potential of Immersive Technologies in K-12 Physical Education: A Systematic Literature Review. In *Research on E-Learning and ICT in*

Education: Technological, Pedagogical and Instructional Perspectives (pp. 249–268). Springer Nature. https://doi.org/10.1007/978-3-031-99961-1_15

Aria, M., & Cuccurullo, C. (2017). bibliometrix: An R-tool for comprehensive science mapping analysis. *Journal of Informetrics*, *11*(4), 959–975. https://doi.org/https://doi.org/10.1016/j.joi.2017.08.007

Berg, T. (2020). Manifestations of surveillance in private sector dance education: the implicit challenges of integrating technology. *Research in Dance Education*, *21*(2), 135–152. https://doi.org/10.1080/14647893.2020.1798393

Berg, T. (2023). Kinesthetic Dialogue: The "Hands-off" Transmission of Embodied Knowledge through Silent Dance Pedagogy. *Journal of Dance Education*, *23*(4), 287–
298. https://doi.org/10.1080/15290824.2021.1941976

Brown, C., Knight, L., Battersby, C., & Roche, J. (2023). Intra-and Intergenerational Dance Performing Citizenship. *International Journal of Education and the Arts*, *24*(3). https://doi.org/10.26209/ijea24n3

Chan, J. C. P., Leung, H., Tang, J. K. T., & Komura, T. (2011). A Virtual Reality Dance Training System Using Motion Capture Technology. *IEEE Transactions on Learning Technologies*, *4*(2), 187–195. https://doi.org/10.1109/TLT.2010.27

Chettaoui, N., Atia, A., & Bouhlel, M. S. (2022). Exploring the Impact of Interaction Modality on Students' Learning Performance. *Journal of Educational Computing Research*, *60*(1), 4–27. https://doi.org/10.1177/07356331211027297

Cisneros, R. E., Stamp, K., Whatley, S., & Wood, K. (2019). WhoLoDancE: digital tools and the dance learning environment. *Research in Dance Education*, *20*(1), 54–72. https://doi.org/10.1080/14647893.2019.1566305

DiGiammarino, O., da Silviera Gorman, R., Peisachovich, E., & Appel, L. (2026). Pas de Trois: A Literature Review and Project Audit of Virtual Reality Technology in Dance Pedagogy and Performance. *Journal of Dance Education*, *26*(3), 233–242. https://doi.org/10.1080/15290824.2025.2500031

Dolinina, K. L. (2020). "Who Is Your Guru?" Traditional Knowledge Transmission and Changing Institutional Setting in Kathak Dance Education. *Lietuvos Muzikologija*, *21*, 180–191. https://www.scopus.com/inward/record.uri?eid=2-s2.0-85126578799&partnerID=40&md5=e7a25f3bf2fdbb02f3cc13f9f131aa1c

Donthu, N., Kumar, S., Mukherjee, D., Pandey, N., & Lim, W. M. (2021). How to conduct a bibliometric analysis: An overview and guidelines. *Journal of Business Research*, *133*, 285–296. https://doi.org/10.1016/j.jbusres.2021.04.070

Echague, E. T., Cruz, R. I. D., & Santiago, A. L. P. (2025). Movement Beyond Sound: Reintegrating Teaching Dance for Understanding (TDfU) for Deaf Learners. In *Emerging Pedagogical Practices in Physical and Sports Education* (pp. 305–332). IGI Global. https://doi.org/10.4018/979-8-3373-2160-8.ch012

Giguere, M. (2025). Impact of the Group on Dance Learning and Creation: A Cognitive and Social Perspective Literature Review. *Journal of Dance Education*, *25*(4), 367–378. https://doi.org/10.1080/15290824.2024.2394962

Goletti, C., & Milovanovic, D. (2022). COVID-19 Pandemic and Online Dance Education: Issues, Opportunities, and New Pedagogies. *Dance Education in Practice*, *8*(4), 20–28. https://doi.org/10.1080/23734833.2022.2114250

Han, A. (2025). Beyond spectacle: Kandinsky's aesthetics and Co-creative necessity in digital dance. *Cogent Arts & Humanities*, *12*(1), 2600520.

https://doi.org/10.1080/23311983.2025.2600520

Hapidzin, R. I., Masunah, J., Nugraheni, T., & Sunaryo, A. (2026). Revisiting McCutchen's Teaching Dance as Art in Education: Bridging Embodied Learning and Digital Archives. *Journal of General Education and Humanities*, *5*(4 SE-Articles), 4891–4908. https://doi.org/10.58421/gehu.v5i4.1395

Hsia, L.-H., Huang, I., & Hwang, G.-J. (2016). Effects of different online peer-feedback approaches on students' performance skills, motivation and self-efficacy in a dance course. *Computers & Education*, *96*, 55–71. https://doi.org/https://doi.org/10.1016/j.compedu.2016.02.004

Huddy, A. (2017). Digital technology in the tertiary dance technique studio: expanding student engagement through collaborative and co-creative experiences. *Research in Dance Education*, *18*(2), 174–189. https://doi.org/10.1080/14647893.2017.1330327

Jung, J., Park, H., & Choi, E. (2026). Exploring core practices for dance educators: towards a practice-based pedagogy in Korean dance education. *Physical Education and Sport Pedagogy*. https://doi.org/10.1080/17408989.2026.2626904

Kim, Y. (2025). Exploring educational methods for Korean dance literacy. *Research in Dance Education*. https://doi.org/10.1080/14647893.2025.2479488

Kyan, M., Sun, G., Li, H., Zhong, L., Muneesawang, P., Dong, N., Elder, B., & Guan, L. (2015). An Approach to Ballet Dance Training through MS Kinect and Visualization in a CAVE Virtual Reality Environment. *ACM Trans. Intell. Syst. Technol.*, *6*(2). https://doi.org/10.1145/2735951

Li, G., Zhang, S., & He, Z. (2026). Immersive technologies in dance education: a systematic review. *Virtual Reality*. https://doi.org/10.1007/s10055-026-01482-4

Li, J., & Ahmad, M. A. (2025). Evolution and trends in online dance instruction: a comprehensive literature analysis. *Frontiers in Education*, *Volume 10-2025*. https://www.frontiersin.org/journals/education/articles/10.3389/feduc.2025.1523766

Li, Z. (Michael). (2024). Shifts in Pedagogy and Autonomy in Virtual Dance Teaching and Learning. *Journal of Dance Education*, *24*(4), 308–316. https://doi.org/10.1080/15290824.2023.2170383

Lindberg, L., Marin, A., & Silverman, Z. (2023). Improvisational Dance as Enactive Cognition: What Do Novice Dancers Teach Us about Embodied Cognition in Dance? *Journal of Dance Education*, *23*(4), 329–340. https://doi.org/10.1080/15290824.2021.1957480

Liu, L. (2025). Body and Subject under the Technological Gaze : A Subjectification - Centered Critique of AI - Assisted Dance Education. *Journal of Education and Educational Research*, 32–38.

Liu, L., & Shi, K. (2025). Integration of Digital Media in Dance Education: New Media as Catalysts for Educational Innovation. *Global Review of Humanities, Arts, and Society*, *1*(5), 1–8. https://doi.org/10.63802/grhas.V1.I5.119

Longley, A., & Buck, R. (2019). A Gap in the place where a teacher should be. In *Innovations in Narrative and Metaphor: Methodologies and Practices* (pp. 253–266). Springer Singapore. https://doi.org/10.1007/978-981-13-6114-2_16

Lottridge, D., Weber, R., McLean, E.-R., Williams, H., Cook, J., & Bai, H. (2022). Exploring the Design Space for Immersive Embodiment in Dance. *2022 IEEE Conference on Virtual Reality and 3D User Interfaces (VR)*, 93–102. https://doi.org/10.1109/VR51125.2022.00027

Parrish, M. (2016). Toward transformation: Digital tools for online dance pedagogy. *Arts Education Policy Review*, *117*(3), 168–182. https://doi.org/10.1080/10632913.2016.1187974

Radin, S. T. (2025). Dance Impressions: The Power of Practice and Pedagogy on Adolescent Identity Formation. *Journal of Adolescent Research*.

https://doi.org/10.1177/07435584251377480

Senecal, S., Nijdam, N. A., Aristidou, A., & Magnenat-Thalmann, N. (2020). Salsa dance learning evaluation and motion analysis in gamified virtual reality environment. *Multimedia Tools and Applications*, *79*(33), 24621–24643. https://doi.org/10.1007/s11042-020-09192-y

Shi, Y., & Yao, K. (2026). Empowering Traditional Dance Heritage and Dissemination Through a Double-Loop Knowledge Management View. *International Journal of Knowledge Management*, *22*(1). https://doi.org/10.4018/IJKM.413111

Svalina, V., Svalina, F., & Čop, A. (2026). Movement, Rhythm, and Dance in The Early Primary Years: Theoretical Synthesis and Curricular-Methodical Implications. *Metodicki Ogledi*, *32*(2), 203–226.

https://doi.org/10.21464/mo.32.62.9

Thomas, L. M. (2022). Employing a Dance-Somatic Methodological Approach to VR to Investigate the Sensorial Body across Physical-Virtual Terrains. In *Multimodal Technologies and Interaction* (Vol. 6, Issue 4, p. 25). https://doi.org/10.3390/mti6040025

Weber, R. (2019). Somatic Movement Dance Education: A Feminist, Cognitive, Phenomenological Perspective on Creativity in Dance. In *Social Indicators Research Series* (Vol. 73, pp. 307–324). Springer Nature. https://doi.org/10.1007/978-3-319-95699-2_18

Xu, L.-J., Wu, J., Zhu, J.-D., & Chen, L. (2025). Effects of AI-assisted dance skills teaching, evaluation and visual feedback on dance students' learning performance, motivation and self-efficacy. *International Journal of Human-Computer Studies*, *195*, 103410. https://doi.org/https://doi.org/10.1016/j.ijhcs.2024.103410

Xu, S., Rahim, N., & Wan Yahaya, W. A. J. (2025). The Impact of Hybrid Learning Integrating Mobile Interaction and AI Timely Feedback on Students' Dance Performance, Perceived Motivation, and Engagement. *An-Najah University Journal for Research - B (Humanities)*, *39*(10), 877–892. https://doi.org/10.35552/0247.39.10.2452

Xu, W., Xing, Q.-W., Zhu, J.-D., Liu, X., & Jin, P.-N. (2023). Effectiveness of an extended-reality interactive learning system in a dance training course. *Education and Information Technologies*, *28*(12), 16637–16667. https://doi.org/10.1007/s10639-023-11883-6

Zhu Yi. (n.d.). The Paradox and Promise of Virtual Reality in Dance Movement Learning: Meta-Analysis. *Journal of Integrated Arts Education*, *1*(1 SE-Articles), 1–13. https://doi.org/10.64797/jiae.v1i1.9515