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Research Article

Scientific mapping of multimodal communication research in higher education: Thematic trends, intellectual structure, and future directions

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ABSTRACT

This study presents a systematic and scientific mapping of multimodal communication research conducted in higher education, examining the field's thematic trends, intellectual structure, and future directions through combined bibliometric and content-based analysis, drawing on 63 peer-reviewed journal articles retrieved from Web of Science and Scopus published between 2016 and 2026. The selection process followed preferred reporting items for systematic reviews and meta-analyses guidelines, with studies screened against two eligibility criteria: situatedness in higher education and multimodal communication as a primary analytical focus. Frequency analysis was applied to annual publication trends, research methods, author keywords, journal distribution, and abstract vocabulary, while thematic classification organized the corpus into six clusters. Findings indicate a marked acceleration in publication output from 2022 onwards, with the period 2022-2025 accounting for 66.7% of all studies. Quantitative approaches constitute the largest methodological category (30.2%), followed by conceptual and theoretical works (28.6%) and qualitative studies (22.2%). Six thematic clusters were identified: language teaching and multimodal resources (38.1%), multimodal literacy and competence (20.6%), technology-enhanced multimodal learning (14.3%), classroom interaction and multimodal communication (14.3%), institutional and organizational communication (6.3%), and theoretical and

methodological frameworks (6.3%). Abstract word analysis reveals a lexical shift from literacy- and theory-oriented vocabulary in the early period towards digital, interaction, and technology-centered terminology after 2021. Co-authorship analysis identifies a moderately collaborative field with an average of 2.78 authors per study. The future direction analysis revealed 34 research priorities under six thematic clusters, with theoretical/methodological development, multimodal assessment in higher education, and technology-enhanced learning being highlighted as the most prominent areas for future research. The findings collectively suggest that the field is transitioning from theoretical consolidation towards applied, empirically driven, and technology-informed inquiry, with institutional communication and artificial intelligence-mediated multimodal learning emerging as underexplored directions for future research.

Keywords: multimodal communication, higher education, systematic mapping review, bibliometric analysis, thematic trends

INTRODUCTION

The idea that communication is a multimodal process encompassing not only linguistic but also visual, auditory, gestural, and spatial layers of meaning is gaining increasing acceptance in educational research. According to Kress and van Leeuwen's (1996) pioneering social semiotics framework, meaning production stems not from a single channel but from the simultaneous use of multiple semiotic sources. This approach finds its place in a broad range of areas within the higher education context, spanning from classroom interaction to institutional communication, and from language teaching to assessment design. Multimodality is defined more as a field of practice than as a theory (Breuer & Archer, 2016). This approach offers a theoretical perspective that brings together the socially organized resources used by instructors and students to construct meaning. These resources include modes (e.g., visual, written, gestures, gaze, speech, and posture) and media (e.g., screens, books, and notes). In higher education, multimodality manifests itself in multimodal pedagogies (including the use of digital technologies), in students' multimodal texts, and in the increasing interdisciplinarity of both content and methods (e.g., film analysis in the discipline of history) (Argyriou & Tapsis, 2025). Breuer and Archer (2016) argue that multimodality is not merely a pedagogical preference but an academic necessity demanded by the digital age; this shifts the research field to an interdisciplinary ground encompassing educational technology, applied linguistics, communication sciences, and social semiotics.

With the proliferation of digital and artificial intelligence (AI)-supported learning environments, research in this field is rapidly expanding in both scope and scale. Argyriou and Tapsis (2025) demonstrate that multimodality has matured in terms of conceptual depth and methodological breadth within contemporary educational research. Distance learning platforms, augmented reality applications, AI-supported systems, and multi-layered digital text environments are transforming multimodal communication proficiency into a fundamental academic skill. Eka et al. (2024) emphasize that digital environments have fundamentally expanded the diversity and depth of multimodal communication and that this transformation has significantly impacted both student achievement and the learning experience.

Scholarship in this area can be organized according to several disciplinary orientations: some studies investigate meaning-making processes through the lens of social semiotics and discourse analysis (Bernad-Mecho, 2024; Coccetta, 2018; Gray, 2021); others focus on how multimodal resources are employed in classroom settings for language instruction and assessment purposes (Candarli, 2025; Uyar & Balaman, 2024); and still others explore multimodal interaction within technology-enhanced learning contexts (Liang & Hwang, 2023; Yu et al., 2025). How these studies relate to one another, how they build upon each other, or where they diverge has not yet been fully established. Liu et al. (2024), in their study analyzing international multimodal discourse studies from 1997 to 2023 using bibliometric methods, found that the field has demonstrated visible growth.

Gap in the Literature and Significance of the Study

Prior bibliometric and systematic review studies have addressed specific sub-fields of multimodal research. Chen (2020) mapped multimodal discourse analysis research from 2009 to 2019, a study later updated by Chen et al. (2025) to cover 2015-2024. Andries et al. (2023) documented stance-taking as a

multimodal phenomenon across 76 studies, demonstrating how head movement, gaze, gesture, and body posture contribute to epistemic and affective meaning-making. Li (2024) examined multimodal research in language education through bibliographic analysis, while Lu (2025) mapped multimodal linguistics and Christian et al. (2024) conducted a bibliometric review of multimodal literacy in English language teaching. Although these contributions are valuable, their scope is limited either to a specific disciplinary domain discourse analysis, language education, or linguistics, or to statistical citation networks alone (Mattei, 2024). A comprehensive mapping study that examines multimodal communication in higher education across an interdisciplinary range and with both bibliometric and thematic depth remains absent from the literature.

Systematic reviews in multimodal learning analytics (Alwahaby et al., 2021; Crescenzi Lanna, 2020; Khor et al., 2024; Mu et al., 2020; Ouhaichi et al., 2023; Sharma & Giannakos, 2020) largely concentrate on sensor data, eye-tracking, and physiological measures, placing pedagogical communication practices in the background. Other bibliometric studies on multimodal learning (Firmansyah et al., 2022; Joseph et al., 2023; Lopez et al., 2025) remain confined to learning modalities or instructional strategies and do not treat multimodal communication as a distinct research object. Guerrero-Sosa et al. (2025) offer a broad evaluation of multimodal analysis in education but adopt a technology-oriented perspective that does not systematically map pedagogical communication research. Meanwhile, Avalos Pérez et al. (2023) highlight how learning in higher education is being transformed through information and communication technologies, yet the implications of this transformation for multimodal practices remain insufficiently examined. Accordingly, a systematic mapping study that presents the bibliometric profile, thematic structure, methodological trends, and intellectual evolution of multimodal communication research in higher education within a unified framework has yet to appear in the literature.

Departing from this gap, the present study addresses multimodal communication research in higher education by drawing on two major databases such as Web of Science (WoS) and Scopus and combining thematic classification with frequency analysis to provide an integrative perspective on both the structure and temporal evolution of the field. The findings are expected to reflect the current state of multimodal communication research in higher education while also shedding light on the rapid growth in publications observed after 2021 and the influence of AI and generative technologies on learning environments and multimodal communication research.

THEORETICAL FRAMEWORK

Social Semiotic Theory and the Theoretical Foundations of Multimodality

The framing of multimodality as an academic research object draws primarily on social semiotic theory as developed by Kress and van Leeuwen (1996, 2001). This theory holds that meaning is not produced through language alone but through the simultaneous deployment of multiple semiotic resources, including image, sound, gesture, spatial arrangement, and writing. Kress (2010) demonstrates that the concept of modal affordance is central to understanding which meaning is communicated through which mode and why, particularly in multimodal text environments. From this perspective, an academic presentation, a lecture video, a digital story, or a university promotional material is not simply a linguistic message but the product of a layered semiotic system in which multiple resources contribute to the construction of meaning.

Steen et al. (2018) argue that multimodal communication research should be built on a data-driven and interdisciplinary infrastructure, proposing a methodological perspective on how social semiotic theory can be brought into dialogue with empirical inquiry. Regarding the application of social semiotic theory to discipline-specific meaning-making in higher education, Kapodistrias and Airey (2025) introduce the concept of purposeful transformation, which shows that meaning-making can occur not only through transduction across semiotic systems but also through intentional reconfiguration within a single semiotic system. This finding gives concrete form to, and extends, one of the foundational claims of social semiotic theory, namely that the modal affordance of semiotic resources is dynamic rather than fixed, applying it specifically to the higher education context. When considered through the tension between disciplinary affordance and pedagogical affordance formulated by Airey (2015), purposeful transformation appears to elevate both simultaneously rather than position them in opposition. This has direct implications for the theoretical

grounding of multimodal communication research in higher education: the question of which semiotic resources are transformed, how, and to what end in the design of instructional materials, academic presentations, and digital learning content remains one of the most generative questions in the field.

The study of Kapodistrias and Airey (2025) also demonstrates that social semiotic theory possesses considerable methodological flexibility across disciplines. Drawing on the concept of the critical constellation of semiotic resources introduced by Airey and Linder (2009, 2017), the researchers show that meaning-making processes in university education can be examined not only in terms of transitions across modalities but also in terms of purposeful manipulation within a single modality. This approach strongly supports the view that multimodal communication research in higher education should not remain confined to language teaching and literacy contexts but should also encompass discipline-specific semiotic systems such as mathematics, diagrams, and graphs. When studies such as Paxton et al. (2017), Schneider et al. (2017), and Gray (2021), all of which are part of the corpus examined in the present study, are considered in light of this perspective, multimodal communication research in higher education appears to be moving toward a more integrative approach to meaning-making, one that incorporates both inter-modal and intra-modal dimensions.

Multimodal Competence in Higher Education

The pedagogy of multiliteracies, introduced by the New London Group (1996), provides a theoretical foundation for the educational dimension of multimodal communication research. This framework argues that a monomodal conception of literacy is insufficient in contemporary digitalized communication environments, and that students need to develop visual, digital, critical, and multimodal literacy skills. In higher education, this perspective calls for broadening curricula to encompass multimodal production and reception, designing assessments that accommodate multimodal outputs, and developing the multimodal communication competencies of academic staff.

Fedorenko (2019) emphasizes the development of multimodal literacy in digital learning environments in higher education, while Bowen (2017) addresses visual literacy among undergraduate students within a multimodal communication framework. Bekturova et al. (2025) examine the multimodal literacy competencies of instructors in EMI contexts, shedding light on how multimodal competence is addressed at the institutional level. As Argyriou and Tapsis (2025) also note, this paradigm has contributed significantly to the parallel evolution of multimodal research and pedagogical transformation in higher education. In this respect, the pedagogy of multiliteracies offers not only a framework for instructional design but also a normative lens through which research agendas are shaped, competencies are measured, and pedagogical practices are selected for investigation. Roderick (2024) examines the representation of autism in university promotional videos through multimodal critical discourse analysis, while Wu and Cheong (2022) evaluate the visual identity of higher education institutions from a multimodal communication perspective. Zhang et al. (2020) analyze how multimodal discourse targeting international students is constructed across the websites of Australian and Chinese universities through a comparative approach.

The use of bibliometric methods in multimodal research has grown considerably. Chen (2020), Liu et al. (2024), and Lu (2025) have demonstrated the applicability and explanatory value of bibliometric mapping within discourse analysis and linguistics, while Firmansyah et al. (2022) and Joseph et al. (2023) have contributed methodologically through bibliometric reviews focused on multimodal learning. Building on this methodological foundation, the present study extends these contributions by incorporating a higher education perspective and a more recent timeframe (2016-2026), and by combining frequency analysis with content-based thematic classification to make the cumulative knowledge of the field more visible.

Research Questions

This study is guided by the following overarching research question:

"What is the intellectual structure, thematic landscape, and temporal trajectory of multimodal communication research in higher education between 2016 and 2026?"

In order to address this question systematically, the following sub-questions were formulated:

- What is the annual distribution of publications on multimodal communication in higher education across the review period (2016-2026)?

- What research methods have been predominantly employed in multimodal communication studies conducted in higher education contexts?
- In which journals is multimodal communication research in higher education most frequently published, and what does the distribution of publication venues indicate about the disciplinary positioning of the field?
- What are the most frequently occurring author keywords in the corpus, and what do they reveal about the conceptual vocabulary of the field?
- What are the most frequently occurring words in the abstracts of the included studies, and what do the temporal shifts in abstract vocabulary reveal about the evolving conceptual priorities of the field?
- What is the co-authorship structure of multimodal communication research in higher education, and what does the distribution of authorship patterns indicate about the collaborative nature of the field?
- What thematic clusters can be identified within the corpus, and how have these clusters evolved over time?
- What are the future directions in multimodal communication research in higher education?

METHOD

Research Design

This study employed a systematic mapping review design to examine the intellectual structure and thematic trends of multimodal communication research in higher education between 2016 and 2026. Systematic mapping reviews are a form of secondary research that synthesizes a body of literature through transparent and reproducible search, selection, and analysis procedures (Kitchenham & Charters, 2007). Unlike systematic reviews that aggregate findings on a specific intervention, mapping reviews are particularly suited to characterizing the scope and distribution of research in emerging or interdisciplinary fields, making them appropriate for the present purpose of identifying thematic clusters, methodological tendencies, and temporal trends in a dispersed body of literature (Grant & Booth, 2009).

Data Sources and Search Strategy

The systematic database search was conducted in March 2026 across two major bibliographic databases, WoS and Scopus, selected for their comprehensive indexing of peer-reviewed journals in education, applied linguistics, communication studies, and educational technology. Both databases were searched independently using a structured Boolean query combining the principal constructs of the study: *("multimodal communication" OR "multimodal literacy" OR "multimodal composing" OR "multimodality") AND ("higher education" OR "university" OR "tertiary education" OR "undergraduate" OR "postgraduate" OR "college")*

This search was executed on the title, abstract, and keyword section of the database. To restrict the search results according to the time frame, the search was filtered with the publication dates ranging from January 2016 to March 2026. The year 2016 was chosen as the beginning of the time frame because this is the time when digital multimodal communication practices were included in the research agenda of higher education institutions along with the emergence of smartphones, social media platforms, and digital multimodal composing tools in academic settings. The end year of the time frame is the year of the retrieval of the search results.

The filters were applied at the database level, restricting the results to journal articles only and to publications written in English. No restrictions were applied on the subject area or journal quartile of the publications because the field is interdisciplinary in nature. A total of 99 records were retrieved from the WoS database and 84 records from the Scopus database. Therefore, the total number of records retrieved was 183.

Inclusion and Exclusion Criteria

Studies were considered eligible for inclusion if they met all of the following criteria:

- Published as a peer-reviewed journal article between 2016 and 2026;

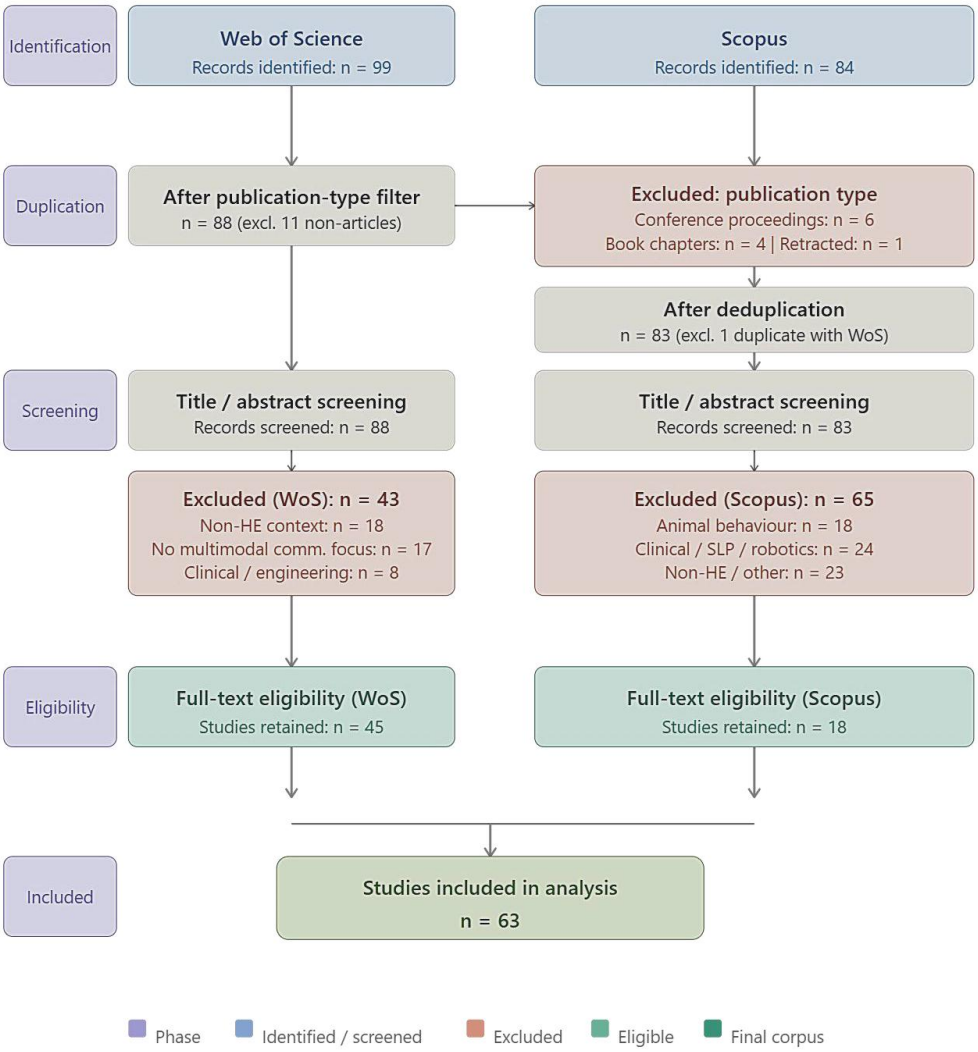

Figure 1. PRISMA flow diagram of the study selection process (created by the authors)

- Situated in a higher education or tertiary language learning context;
- Addressed multimodal communication as a primary analytical focus;
- Available in full text.
- Studies were excluded if they met any of the following conditions:
- Conference proceedings, book chapters, dissertations, reports, or retracted publications;
- Conducted exclusively in non-HE contexts (e.g., K-12 schooling, clinical, or veterinary settings);
- Focused on multimodal signal processing, engineering, or animal communication without educational relevance;
- Full text was inaccessible.

Study Selection Procedure

The study selection procedure followed the preferred reporting items for systematic reviews and meta-analyses (PRISMA) framework, as illustrated in **Figure 1**. In the first stage, 11 WoS records were excluded on the basis of publication type, comprising six conference proceedings, four book chapters, and one retracted publication, reducing the WoS pool to 88 records. Separately, one duplicate record was identified within the Scopus dataset and removed, reducing the Scopus pool from 84 to 83 unique records. Combined, the 88 WoS records and 83 Scopus records yielded a total of 171 records that proceeded to title and abstract screening. In the second stage, title and abstract screening was performed on the remaining 171 records. Out of the WoS records, 43 records were removed because 18 records were not related to the higher education field, 17

records did not have a substantial focus on multimodal communication, and eight records were not related to the field, focusing on other disciplines such as clinical medicine and engineering. Out of the Scopus records, 65 records were removed because 18 records were related to animal behavior, 24 records were related to clinical, speech language pathology, and robotics, and 23 records were not related to the HE field and were irrelevant. Finally, 45 records from WoS and 18 records from the Scopus database were found eligible and combined to create the final analytical corpus consisting of 63 records.

Data Extraction and Analysis

Bibliometric and thematic information was obtained from the 63 studies included in the systematic review. The following bibliometric information was recorded from each study: author, year of publication, journal name, method of research, and keywords used by the author. The data extraction process was facilitated through the use of a reference management tool called Zotero.

Two complementary analytical procedures were applied. First, a frequency analysis was conducted on the distribution of publications by year, research method, author keywords, and publication venue. Frequency analysis is a widely used approach in bibliometric research that counts the occurrence of recording units to reveal patterns of emphasis and concentration in a given literature (Köhler & Stemmler, 1997). To ensure the transparency and reproducibility of the scientific mapping procedures, the following technical specifications are reported for each visualization. All bibliometric network maps were generated using VOSviewer (version 1.6.20; van Eck & Waltman, 2010). The keyword co-occurrence network was constructed with “keywords” set as the unit of analysis and “full counting” as the counting method, using author keywords extracted directly from the bibliographic records without stemming. A minimum occurrence threshold of 2 was applied for a keyword to be included as a node, and only co-occurrence links with a strength above this threshold are displayed; node size represents keyword frequency, and edge thickness represents co-occurrence strength. The co-authorship network was constructed with “authors” as the unit of analysis and “full counting” as the counting method, with a maximum of 25 authors per document applied as a threshold for inclusion; node size represents the number of publications per author, and edge thickness represents the strength of co-authorship ties. The abstract word frequency analysis and word cloud were also generated using VOSviewer’s text-data mapping function, applied to the abstract fields of the 63 included records, following removal of stop words and methodological function words (e.g., “study,” “research,” and “article”); only content-bearing terms of four or more characters were retained, and no stemming or lemmatization was applied. Word size in the word cloud corresponds to raw frequency of occurrence across the 63 abstracts. Figures were usually produced in Python using the Matplotlib and Seaborn libraries, with the PRISMA flow diagram additionally structured using Graphviz.

Second, a content-based thematic classification was carried out through a systematic examination of titles, abstracts, and author keywords. Each study was coded into one of six thematic clusters according to the major analytical focus of the study. In cases where a study was coded to more than one possible theme, the final classification was according to the theme most emphasized in the title and abstract. The reliability of the thematic classification was tested by independent coding by two researchers, and inter-rater agreement was computed using the Miles and Huberman (1994) consensus formula: *Reliability = consensus/(consensus + disagreement)*.

The reliability coefficient obtained was 81%, which exceeds the 70% threshold recommended for qualitative coding reliability (Miles & Huberman, 1994). Discrepancies were resolved through discussion until consensus was reached.

The 20 meta-analyses, systematic reviews, and bibliometric mapping studies informing the supplementary future-directions synthesis were identified through a separate, non-systematic search of the same databases (WoS and Scopus) using the terms “multimodal” combined with “review,” “meta-analysis,” or “bibliometric,” without restriction to the higher education context, in order to capture forward-looking recommendations from adjacent subfields. Sources were selected on the basis of relevance and recency, with priority given to studies published between 2020 and 2025. Each source’s limitations, research-gap statements, and future-research recommendations were extracted and inductively grouped into thematic clusters. Because this synthesis was not conducted under the same systematic protocol as the primary 63-study corpus, its findings are presented as indicative rather than exhaustive.

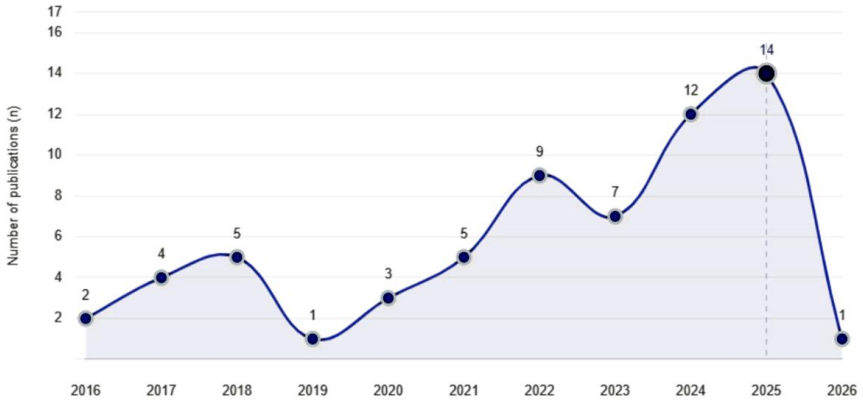

Figure 2. Annual distribution of studies by publication year (2016-2026) (created by the authors)

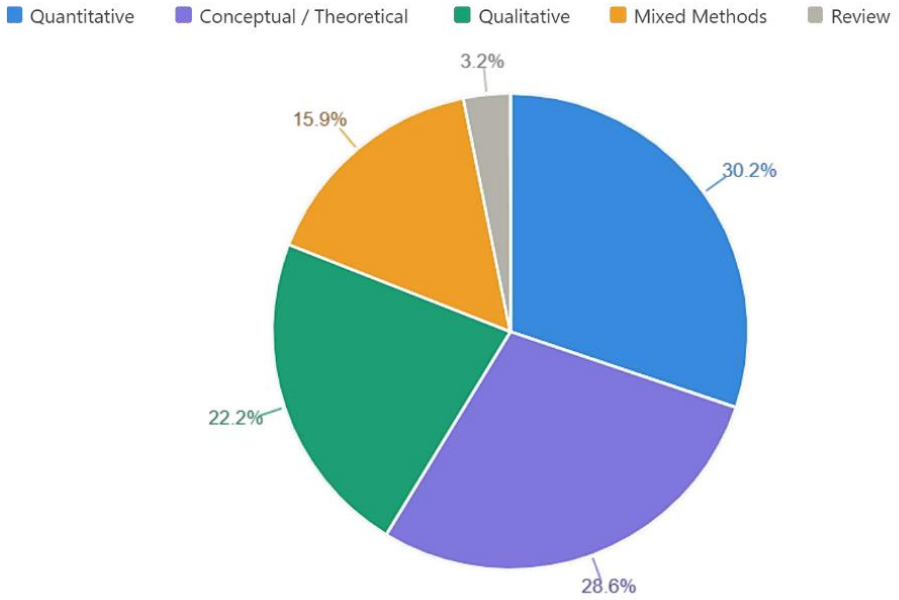

Figure 3. Distribution of studies by research method (n = 63) (created by the authors)

FINDINGS

Annual Distribution of Publications

The temporal pattern of the 63 studies included in the corpus is shown in **Figure 2**. The corpus covers a period from 2016 to 2026, although a single article was included in 2026 before the current search date in the form of an early access article. The number of publications was relatively scarce from 2016 to 2020, reaching a total of 15 publications (23.8%). After this period, the inflection point is observed in 2022, in which the number of publications increases significantly. Indeed, from 2022 to 2025, 42 publications (66.7%) were included in the corpus, of which 2025 was the most prolific year, including 14 publications (22.2%), and 2024 was the second most prolific year, including 12 publications (19.0%). The pattern of increasing publications follows the overall growth of digital and AI-mediated learning environments, which has revived research interest in the various aspects of teaching and communication in higher education from a multimodal point of view.

Distribution by Research Method

The methodological profile of the included studies is presented in **Figure 3**, based on content analysis of titles, abstracts, and keywords. Quantitative research is the most common method at 30.2% (n = 19), encompassing corpus-based, experimental, survey, and computer-based approaches, followed by conceptual and theoretical work at 28.6% (n = 18). Qualitative studies account for 22.2% (n = 14), mixed methods for

Table 1. Distribution of publications by journal

Journal	n	Percentage (%)
Language Assessment Quarterly	2	3.2
Computers & Education	2	3.2
Social Semiotics	2	3.2
System	2	3.2
English Teaching (South Korea)	2	3.2
Other journals (1 article each)	53	84.1
Total	63	100

Note. Only journals contributing two or more publications are listed individually & All remaining publications appeared in single-contribution journals

Table 2. Most frequently occurring author keywords

Keyword	n	Percentage (%)
Higher education	8	12.7
Multimodality	4	6.3
Assessment	3	4.8
Education	3	4.8
Multimodal literacy	2	3.2
Multimodal communication	2	3.2
Student engagement	2	3.2
Multimodal assessment	2	3.2
ESP	2	3.2
Intercultural communication	2	3.2
Other keywords (appearing once)	44	69.8
Total	63*	100

Note. *Total exceeds 63 as studies may include multiple keywords & Only keywords appearing in two or more studies are listed individually

15.9% (n = 10), and systematic reviews for 3.2% (n = 2). The high proportion of theoretical papers reflects the field's foundational priorities, while the growing share of quantitative and mixed methods suggests increasing methodological maturity.

Distribution by Journal

As shown in **Table 1**, the 63 publications were dispersed across 57 different journals, which suggests that the topic of multimodal communication in higher education has yet to be consolidated in a single publication venue and is, in fact, a cross-disciplinary concern for applied linguistics, educational technology, communication, and language assessment. Five journals published two papers each: *Language Assessment Quarterly, Computers and Education, Social Semiotics, System, English Teaching* (South Korea). The remaining 53 articles (84.1%) are spread across journals that each contributed a single study. The breadth of outlets — ranging from specialist language teaching journals to broad educational technology and social science venues — underscores the interdisciplinary reach of the field and reflects the embeddedness of contributing scholars in a variety of disciplinary communities.

Distribution by Author Keywords

Table 2 shows the most frequently occurring author keywords from the total of 63 studies. The keyword "higher education" is the most frequently occurring keyword in the results with a frequency of 8 or 12.7 percent. This is in line with the contextual anchoring of the corpus. "Multimodality" is the second most frequently occurring keyword with a frequency of 4 or 6.3 percent, while "assessment" is the third most frequently occurring keyword with a frequency of 3 or 4.8 percent. "Multimodal literacy," "multimodal communication," "multimodal assessment," "student engagement," "ESP," and "intercultural communication" occur twice in the keyword set. The majority of the keywords occur only once in the keyword set with a frequency of 44 or 69.8 percent. This shows that there is a lot of diversity in the terminology used in the field of multimodal communication. It is possible that the fragmentation of the keyword set is due to the interdisciplinary nature of the field of multimodal communication. The keyword co-occurrence networks are shown in **Figure 4** and **Figure 5**.

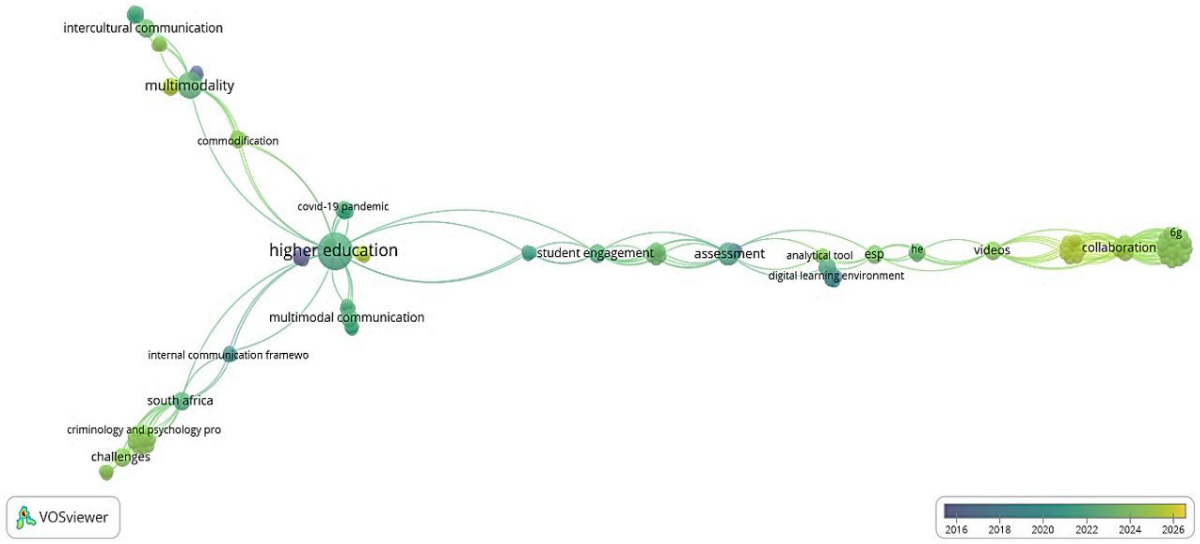

Figure 4. Author keyword co-occurrence network by years (created by the authors)

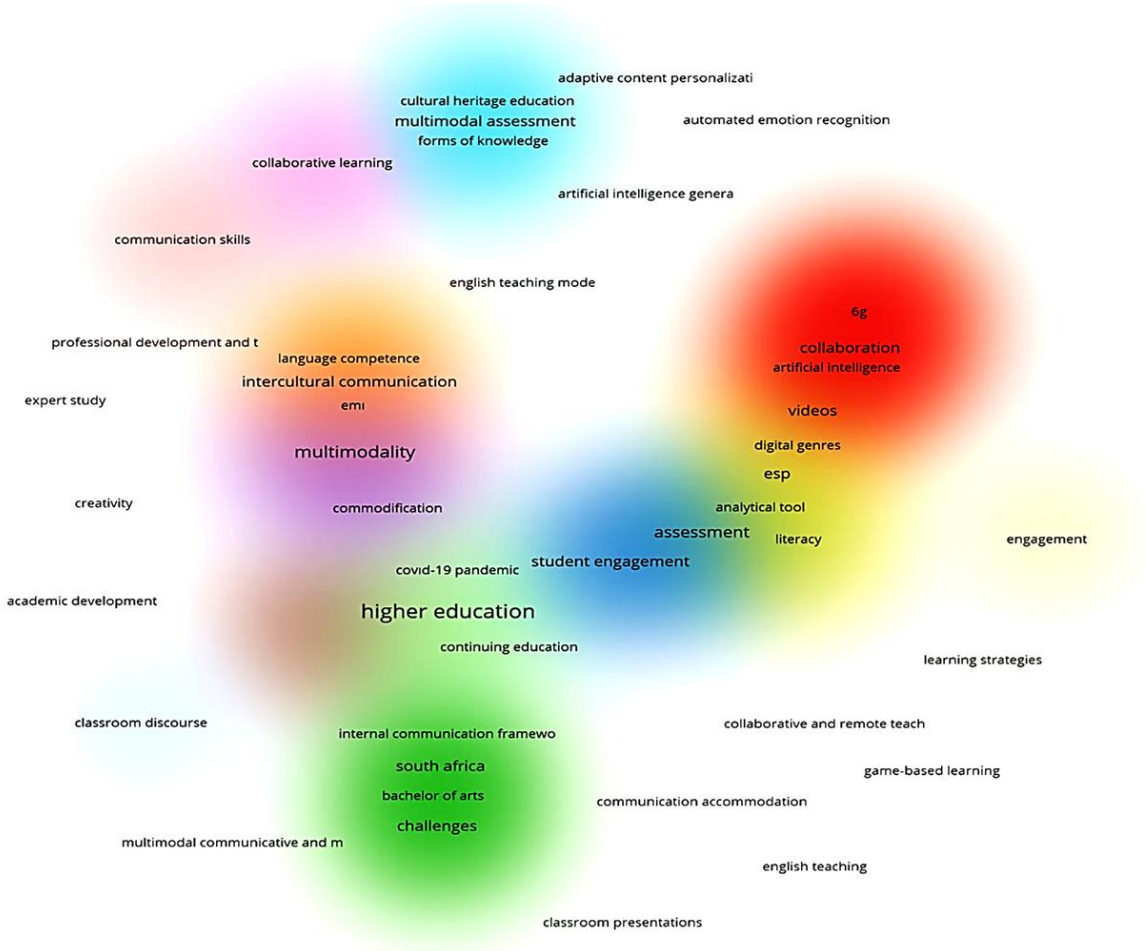

Figure 5. Author keyword co-occurrence network (created by the authors)

Abstract Word Analysis

To complement the author keyword analysis, a frequency analysis of the most commonly occurring substantive words across all 63 abstracts was conducted. Stop words and methodological function words were excluded, retaining only content-bearing terms of four or more characters. The results are presented in **Table 3**.

Table 3. Most frequently occurring words in study abstracts

Word	Total (f)	2021-2026 (f)	2016-2020 (f)
Multimodal	140	103	37
Learning	115	97	18
Communication	112	82	30
Students	101	83	18
Language	73	59	14
Education	72	55	17
Teaching	62	53	9
English	49	43	6
Higher	45	32	13
Digital	39	32	7
Social	36	35	1
Interaction	32	30	2
Visual	29	19	10
Assessment	26	18	8
Literacy	26	12	14
Online	25	22	3
Technology	25	22	3
Pedagogical	24	20	4
Challenges	24	19	5
Teachers	27	22	5

Note. f: Frequency of occurrence across all abstracts & Only words appearing 24 or more times in total are reported

As presented in **Table 3**, the term "multimodal" clearly dominates the corpus with a frequency of 140, which indicates the thematic consistency of the selected studies. "Learning" (115), "communication" (112), and "students" (101) appear as the following most frequent terms, which further confirms that the corpus is rooted in pedagogical rather than theoretical or technical considerations. The terms "language" (73), "education" (72), and "teaching" (62) clearly point to the instructional nature of the field. Of particular interest is the prominent position of "English" (49), which highlights the significance of English-medium contexts of language learning in multimodal communication studies. The terms "digital" (39), "interaction" (32), "visual" (29), "assessment" (26), "literacy" (26), "online" (25), and "technology" (25) clearly point to the intersection of digital pedagogy, semiotic theory, and language assessment in the field.

The results are illustrated in **Figure 6** (full abstract word cloud) and **Figure 7** (abstract word distribution by period).

A comparison between the two periods of the literature review reveals a qualitative change in the focus. In the period from 2016 to 2020, the most prominent general terms, aside from the already mentioned "multimodal" and "communication," were "literacy" (14), "international" (9), "visual" (10), and "tools" (11), which reveals the predominantly theoretical and literacy-focused character of the research, with a focus on international students. In the period from 2021 to 2026, the terms "learning" (97), "students" (83), "English" (43), "digital" (32), and "interaction" (30) increase significantly, which reveals the change in the focus from theory to practice.

Co-Authorship Analysis

Table 4 displays the co-authorship networks of the 63 included studies. There were 174 authors involved across a mean of 2.78 authors per study. Pictorially, the distribution indicates a topic in which single authorship, as well as collaboration, is prevalent, but studies with multiple authors are the most frequent. Single-authored studies comprise 19 publications (30.2%), reflecting the continued individual scholarly contribution, particularly in theoretical, conceptual, and discourse analysis studies. Two-authored collaborations represent the most common form of collaboration (n = 18, 28.6%), followed by three-authored teams (n = 10, 15.9%) and four-authored teams (n = 7, 11.1%). Works with five or more authors constitute 12.9% of the corpus (4 five-authored works, 1 six-authored work, 1 seven-authored work, 1 eleven-authored work, 1 thirteen-authored work), with the exceptions of eleven and thirteen-authored works corresponding to large-scale interdisciplinary or technology-focused projects.

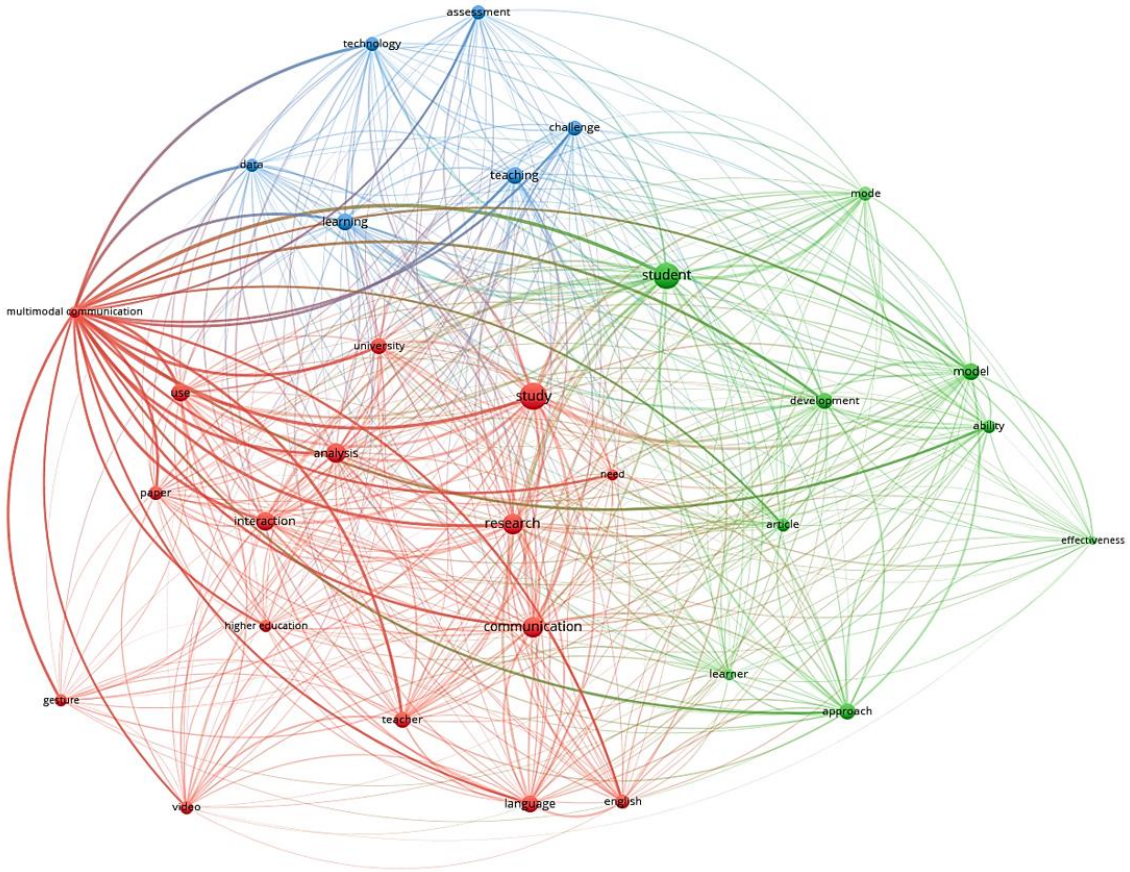

Figure 6. Word cloud of most frequently occurring terms in study abstracts (created by the authors)

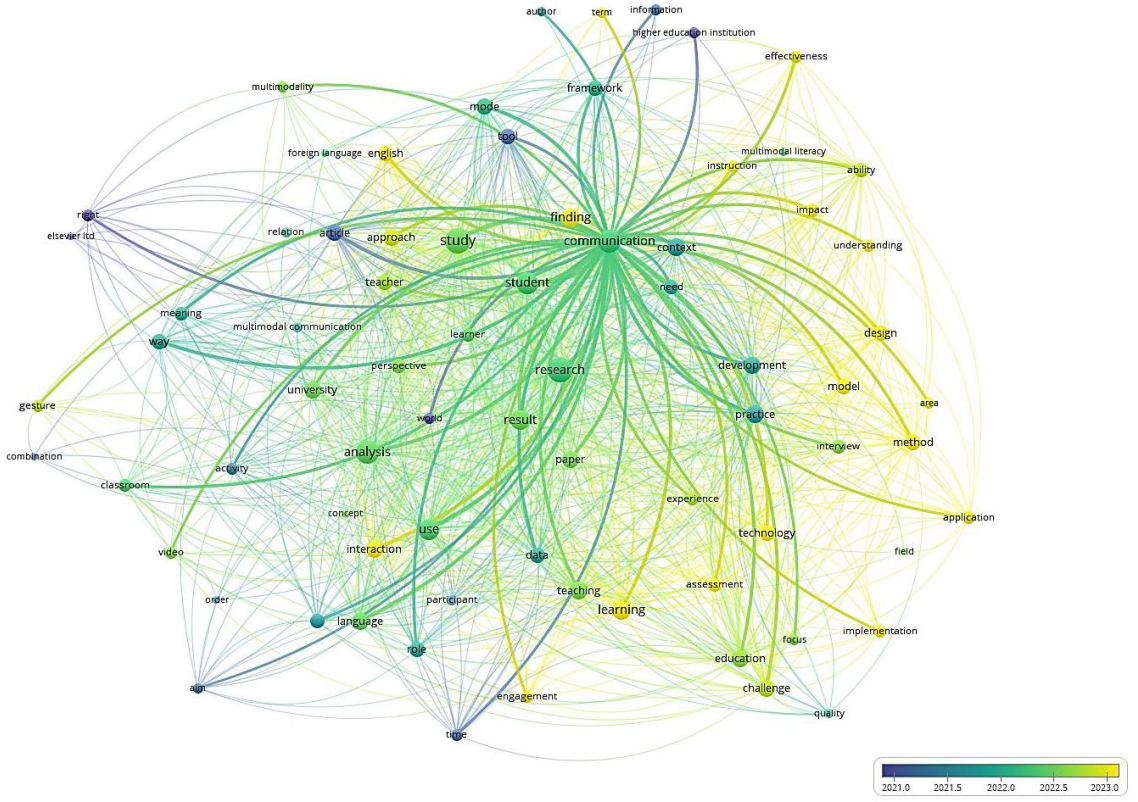

Figure 7. Comparative abstract word frequency by review period (2016-2020 vs. 2021-2026) (created by the authors)

Table 4. Co-authorship distribution of included studies

Number of authors	n	Percentage (%)	Total author appearances
1 author	19	30.2	19
2 authors	18	28.6	36
3 authors	10	15.9	30
4 authors	7	11.1	28
5 authors	5	7.9	25
6 authors	1	1.6	6
7 authors	1	1.6	7
11 authors	1	1.6	11
13 authors	1	1.6	13
Total	63	100	175

Note. n: Number of studies; Total author appearances: Number of authors × number of studies in each category; & Average authors per study = 2.78

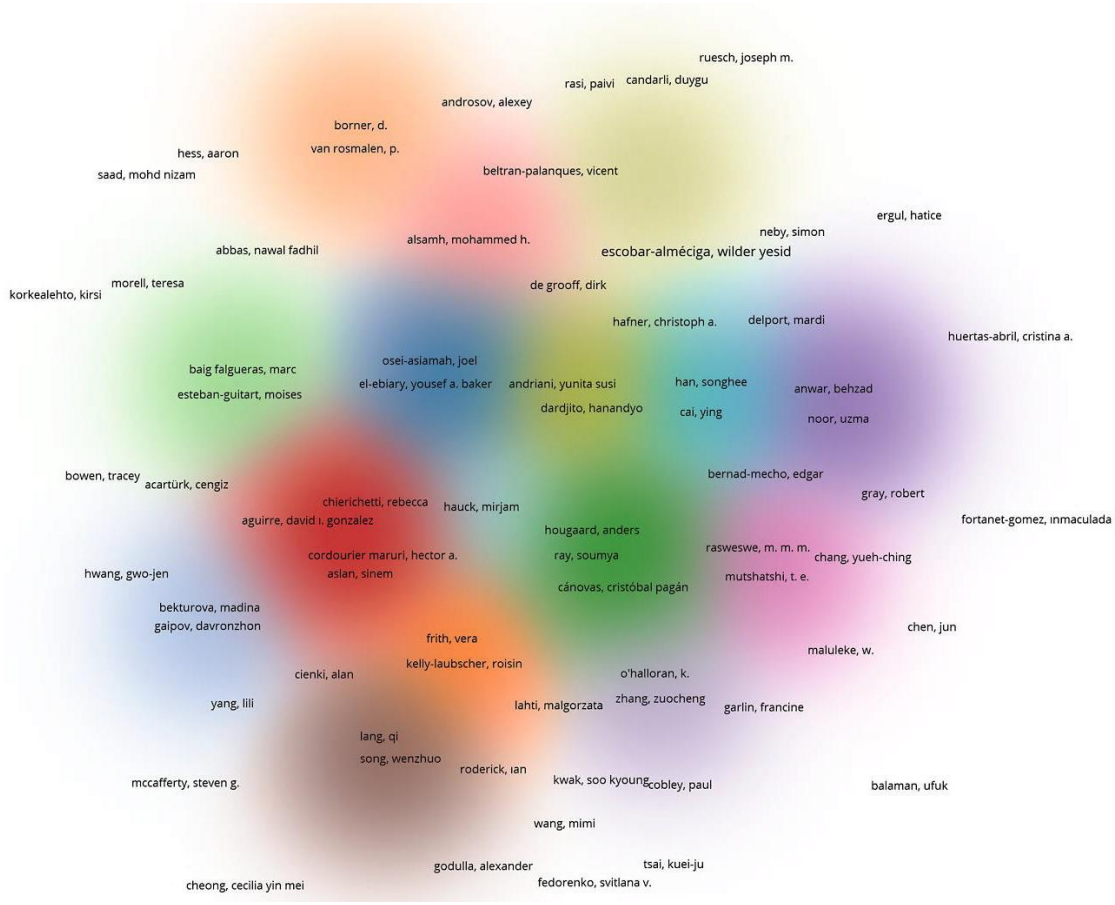

Figure 8. Co-authorship network of included studies (2016-2026) (created by the authors)

The dominance of two- and three-author configurations (44.5% of all studies combined) is consistent with patterns observed in applied linguistics and educational research more broadly, where collaborative pairs or small teams are the norm for empirical studies, while larger consortia tend to characterize technology-intensive or cross-institutional projects (Franceschet, 2011). The average of 2.78 authors per study indicates a moderately collaborative field, occupying a middle ground between the highly individualized scholarship typical of humanities disciplines and the large-team structures common in experimental or computational sciences.

Regarding repeated authorship, there is only one sole author (Escobar-Alméciga, W. Y.) that appears in two studies in the corpus, which indicates the interdisciplinary scattering of the discipline and the non-existence of a sole authorial network at the beginning of this domain. The other 173 authors studied only one article each. This high author diversity coupled with low author concentration is yet another piece of evidence that confirms the interdisciplinary and spatially dispersed nature of the multimodal communication research in higher education, namely, in the higher education context. **Figure 8** shows the co-authorship network of included studies (2016-2026).

Table 5. Distribution of studies by thematic cluster and category

Theme	Category	n	P (%)
Language teaching & multimodal resources		24	38.1
	ESP/EFL/ELT multimodal practices	16	25.4
	Digital storytelling & composing	4	6.3
	Video and multimodal resources	3	4.8
	Assessment in language learning	1	1.6
Multimodal literacy & competence		13	20.6
	EMI and multilingual contexts	8	12.7
	Multimodal literacy development	4	6.3
	Assessment of multimodal literacy	1	1.6
Technology-enhanced multimodal learning		9	14.3
	Online and blended learning	6	9.5
	AI and generative technologies	2	3.2
	VR, metaverse, and immersive environments	1	1.6
Classroom interaction & multimodal communication		9	14.3
	Gesture, gaze and nonverbal communication	5	7.9
	Teacher-student interaction	3	4.8
	Peer interaction and collaboration	1	1.6
Institutional & organizational communication		4	6.3
	Intercultural communication in HE	2	3.2
	University identity & promotional communication	1	1.6
	Academic and professional communication	1	1.6
Theoretical & methodological frameworks		4	6.3
	Social semiotic and multimodal theory	2	3.2
	Discourse analysis approaches	2	3.2
Total		63	100

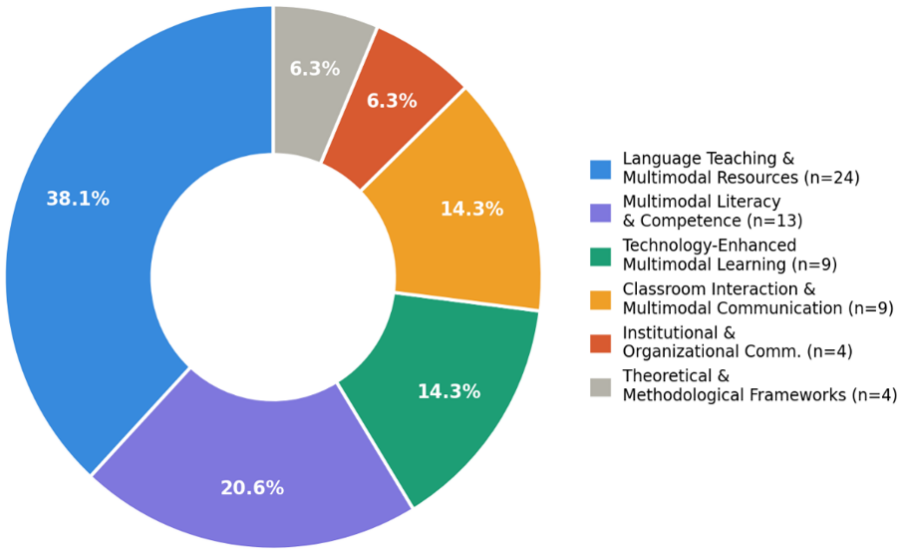

Figure 9. Proportional distribution of studies by thematic cluster (n = 63) (created by the authors)

Thematic Distribution of Studies

Table 5 presents the distribution of the 63 studies across six thematic clusters and their constituent categories, derived from systematic content analysis of titles, abstracts, and author keywords. The field is organized around three dominant clusters—language teaching and multimodal resources (n = 24, 38.1%), multimodal literacy and competence (n = 13, 20.6%), and technology-enhanced multimodal learning (n = 9, 14.3%)—alongside three smaller but theoretically significant clusters addressing classroom interaction (n = 9, 14.3%), institutional and organizational communication (n = 4, 6.3%), and theoretical and methodological frameworks (n = 4, 6.3%).

The proportional distribution of themes is illustrated in **Figure 9**, and the temporal evolution of thematic clusters is presented in **Figure 10**.

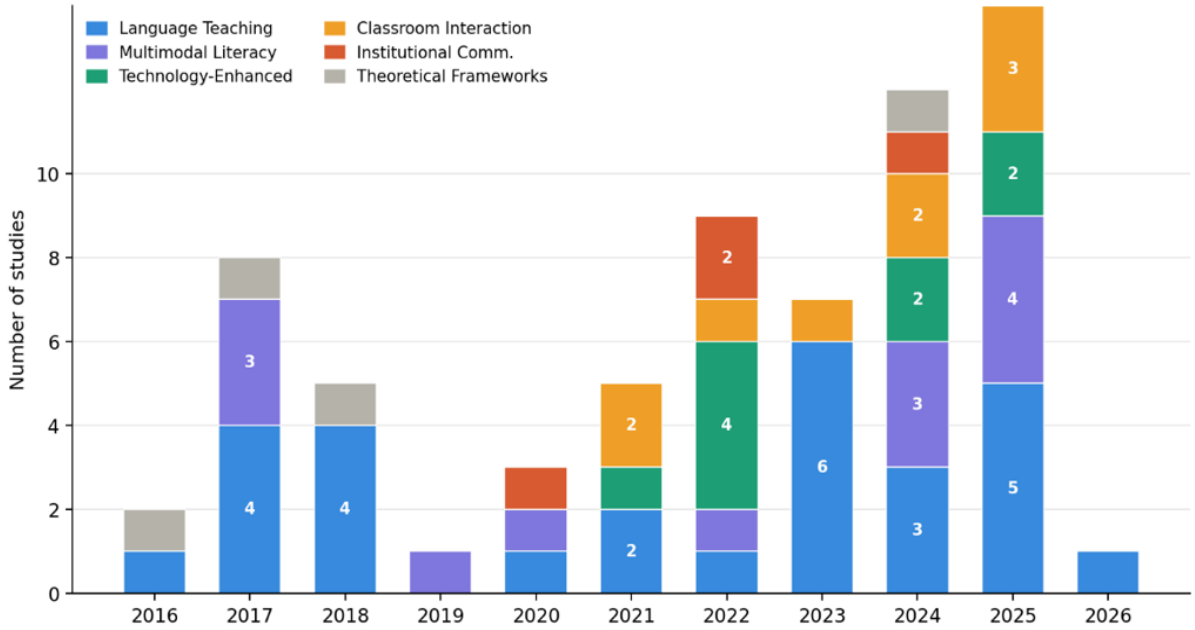

Figure 10. Annual distribution of studies by thematic cluster (2016-2026) (numbers inside bars indicate study counts per theme per year & only values ≥ 2 are labelled) (created by the authors)

The thematic analysis revealed six clusters. The largest cluster (n = 24, 38.1%) focuses on language teaching and multimodal resources, predominantly in ESP, EFL, and ELT contexts (n = 16, 25.4%), where gestures, digital tools, video content, and material artefacts are integrated into instruction and assessment. Digital storytelling (n = 4), video-based resources (n = 3), and corpus-based assessment (n = 1) constitute notable sub-themes. This cluster maintained the most consistent presence throughout the review period, peaking in 2023 (n = 6) and remaining prominent in 2025 (n = 5).

The second cluster (n = 13, 20.6%) addresses multimodal literacy and competence, with the majority of studies (n = 8, 12.7%) examining communicative demands in EMI and multilingual contexts across non-Anglophone settings such as Kazakhstan, Finland, and Taiwan. Four studies focus on the pedagogical development of multimodal literacy, and one examines rubric-based visual literacy assessment frameworks. Technology-enhanced multimodal learning comprises nine studies (14.3%), with online and blended learning environments as the dominant category (n = 6). AI and generative technologies (n = 2) and immersive Metaverse environments (n = 1) represent emerging sub-themes. Studies in this cluster increased markedly from 2021 onwards, consistent with the digitalization accelerated by the COVID-19 pandemic. Classroom interaction and multimodal communication also accounts for nine studies (14.3%), with gesture, gaze, and nonverbal communication as the most examined category (n = 5), followed by teacher-student interaction (n = 3) and peer interaction (n = 1).

The two smallest clusters (n = 4, 6.3% each) address institutional and organizational communication and theoretical and methodological frameworks, respectively. The former includes studies on intercultural communication, university promotional discourse, and science communication, pointing to a structurally underexplored dimension of the field. The latter, concentrated in the 2016-2018 period, comprises foundational contributions to social semiotic theory, research infrastructure, and discourse analysis that provided the conceptual scaffolding for subsequent empirical work.

Regarding temporal trends, language teaching and multimodal resources maintained a consistent presence throughout the review period, while technology-enhanced multimodal learning and classroom interaction studies grew steadily from 2021 onwards. Theoretical and methodological frameworks were concentrated in the early period, reflecting their field-formation function. Taken together, these patterns indicate a field transitioning from theoretical consolidation towards applied, empirically oriented, and technology-informed inquiry.

Table 6. Synthesis of future research directions in multimodal communication in higher education

Theme (f)	Future direction	Source
AI and computational approaches (5)	Automated multimodal analysis via AI and computer vision	Guerrero-Sosa et al. (2025)
	AI-assisted multimodal discourse analysis tools	Chen et al. (2025)
	Real-time multimodal feedback in HE classrooms	Guerrero-Sosa et al. (2025)
	Computational methods in multimodal discourse analysis	Liu et al. (2024)
	Sensor fusion and physiological data in MLA	Mu et al. (2020)
Multimodal assessment & literacy in HE (6)	Assessment frameworks for multimodal academic work	Breuer and Archer (2016)
	Multimodal literacy assessment in L2 contexts	Christian et al. (2024)
	Digital multimodal composing in EFL/ESL education	Christian et al. (2024)
	Multimodal genre analysis in academic writing	Li (2024)
	Corpus-based multimodal studies in language education	Li (2024)
	Multimodal vocabulary development in digital environments	Lopez et al. (2025)
Immersive & technology-enhanced learning (6)	VR/AR environments for multimodal language learning	Eka et al. (2024)
	Cognitive and affective dimensions of multimodal immersion	Eka et al. (2024)
	ICT-mediated multimodal practices in diverse HE settings	Avalos Pérez et al. (2023)
	Student agency in technology-enhanced environments	Avalos Pérez et al. (2023)
	Personalized multimodal learning pathways in HE	Khor et al. (2024)
	Multimodal engagement indicators in online HE	Ouhaichi et al. (2023)
Ethics, equity & institutional dimensions (5)	Ethical frameworks for MLA data collection and use	Alwahaby et al. (2021)
	Equity and inclusion in multimodal research design	Alwahaby et al. (2021)
	Privacy-preserving multimodal learning analytics	Khor et al. (2024)
	Institutional policies for multimodal communication in HE	Breuer and Archer (2016)
	Multimodal communication in crisis and health contexts	Liu et al. (2024)
Theoretical & methodological advancement (7)	Emerging paradigms beyond social semiotics	Liu et al. (2024) & Lu (2025)
	Critical reframing beyond Western multimodal paradigms	Argyriou and Tapsis (2025)
	Conceptual clarification: multimodal learning vs. communication	Firmansyah et al. (2022)
	Standardization of multimodal data collection protocols	Guerrero-Sosa et al. (2025)
	Interdisciplinary integration of multimodal research	Argyriou and Tapsis (2025)
	Theoretical integration of multimodal data and learning science	Sharma and Giannakos (2020)
	Network analysis of multimodal intellectual communities	Firmansyah et al. (2022)
Teacher development (5)	Teacher professional development for multimodal pedagogy	Breuer and Archer, 2016)
	Teacher training for multimodal literacy instruction	Christian et al. (2024)
	Pedagogical shifts in AI-augmented multimodal learning	Argyriou and Tapsis (2025)
	Teacher-facing MLA dashboards and interpretability	Ouhaichi et al. (2023)
	Transfer of multimodal skills across academic contexts	Eka et al. (2024)

Note. Total = 34; f: Frequency of future direction items per theme; Sources listed indicate the studies from which each direction was derived; MLA: Multimodal learning analytics; HE: Higher education; VR: Virtual reality; AR: Augmented reality; EFL: English as a foreign language; ESL: English as a second language; & L2: Second language

Analysis of Future Trends

In this section, we present an analysis of the future intellectual structure and potential directions of multimodal communication research in higher education, as identified through a targeted synthesis of the broader multimodal research literature. To this end, 20 key sources comprising meta-analyses, systematic reviews, and bibliometric mapping studies were systematically examined with respect to their stated limitations, research gaps, and forward-looking recommendations. The resulting directions were organized into six thematic clusters in accordance with the principle of thematic integration and are presented in **Table 6**.

The largest cluster, theoretical and methodological advancement (f = 7), calls for paradigmatic renewal beyond social semiotics, greater cross-cultural inclusivity, and the standardization of research protocols. Multimodal assessment and literacy in higher education and immersive and technology-enhanced learning each yield six directions, pointing to persistent gaps in assessment framework design and the underexplored potential of VR/AR and personalized digital learning environments. AI and computational approaches (f = 5) identifies automated analysis, real-time feedback, and sensor-based data as priority areas, while ethics, equity and institutional dimensions (f = 5) foregrounds the need for ethical frameworks, privacy-preserving analytics, and institutional policy development. Finally, teacher development (f = 5) emphasizes the urgency of preparing educators for AI-augmented and multimodal teaching environments. Taken together, the synthesis

indicates that the field's most pressing intellectual needs lie at the intersection of theoretical renewal, technological integration, and equitable, institutionally responsive research design.

DISCUSSION

The findings of this systematic mapping and bibliometric review provide insights into the intellectual structure and developmental trajectory of multimodal communication research in higher education between 2016 and 2026.

The findings from the study show a significant increase in the number of publications from 2022 onwards, with the 2022-2025 period constituting 66.7% of the entire sample. This reflects the digital transformation of higher education, triggered and accelerated by the COVID-19 pandemic (Avalos Pérez et al., 2023). The proliferation of synchronous online platforms, AI-powered learning tools, and immersive digital environments has significantly expanded communicative contexts utilizing multimodal resources and intensified scholarly interest in how meaning is constructed and negotiated through multiple semiotic channels in academic settings.

From the perspective of the methodological profile of the compilation, the dominance of quantitative approaches (30.2%), along with a significant share of conceptual and theoretical studies (28.6%), indicates that the field is simultaneously collecting empirical data and undergoing ongoing theoretical development. This dual character aligns with Argyriou and Tapsis' (2025) conclusion that multimodality in contemporary education is undergoing both a pedagogical and paradigmatic reframing. The low number of mixed methods studies (15.9%) and the limited number of systematic reviews (3.2%) suggest that integrative research designs are not being used sufficiently. The summary keyword analysis reinforces these observations. The shift in discourse from terminology centered on literacy and theory before 2021 to vocabulary emphasizing digital tools, interaction, and technology after 2021 points to a genuine reorientation in research priorities. In the keyword distribution, higher education (n = 8, 12.7%) confirms the contextual focus of the text set; The prominence of the concepts of multimodality (n = 4, 6.3%) and evaluation (n = 3, 4.8%) indicates that the field is shaped along both the axes of semiotic theory and pedagogical evaluation.

From a thematic distribution perspective, language teaching and multimodal resources (38.1%) and multimodal literacy and competence (20.6%) together constitute approximately 58.7% of all studies (nearly three-fifths), confirming that language learning and teaching contexts remain the primary research setting. This finding is consistent with the broader mapping studies of Liu et al. (2024) and Chen et al. (2025), who identify applied linguistics and language education as the dominant disciplinary field of multimodal research. The importance of ESP, EFL, and EMI contexts reflects the different communicative pressures placed on multilingual students and instructors in international higher education settings. These findings have been addressed from complementary perspectives by Bernad-Mecho (2024), Bekturova et al. (2025), and Candarli (2025).

The distribution of 63 studies in 57 different journals clearly reveals that multimodal communication research in higher education has not yet found an established disciplinary home. Only a small number of publications, including Language Assessment Quarterly, Computers & Education, Social Semiotics, System, and English Teaching (South Korea), publish regularly, showcasing a wide range of publications encompassing applied linguistics and language assessment journals, as well as educational technology and social sciences publications. Chen et al.'s (2025) bibliometric review of multimodal discourse analysis documented a similar distribution pattern, interpreting it as a natural reflection of the field's interdisciplinary character. This indicates that researchers belong to multiple disciplinary communities and that multimodal communication research develops in simultaneous dialogue with numerous academic traditions.

The results revealed a total of 174 unique contributors, with studies averaging 2.78 authors each. The continued presence of single-authored works (30.2%) suggests that individual scholarly effort remains a vital form of contribution, especially within theoretical, conceptual, and discourse analysis studies. At the same time, the predominance of multi-authored studies (69.8%) and two- and three-authored structures (44.5%) is indicative of the importance of small team collaborations in empirical research. This finding is consistent with Franceschet's (2011) observations on applied linguistics and educational research, confirming that small

teams are the norm in this field, while large groups are characteristic of technology-intensive or inter-institutional projects.

One of the most important future directions for multimodal communication research appears to be the integration of AI and computational methods into analytical processes. Guerrero-Sosa et al. (2025) identify the development of automated multimodal analysis systems and real-time feedback mechanisms as a priority research agenda. Similarly, Chen et al. (2025) point to the development of AI-powered multimodal discourse analysis tools, while Liu et al. (2024) emphasize the adaptation of computational methods to discourse analysis applications as a critical area for future studies. Regarding how multimodal literacy should be assessed in higher education and what theoretical and practical frameworks should support this assessment, Breuer and Archer (2016) highlight the development of reliable measurement tools as a fundamental unmet need. Christian et al. (2024) emphasize the design of multimodal literacy assessment, particularly in second language studies, and the integration of digital multimodal composition into EFL/ESL education. Li (2024) notes that more research is needed on multimodal genre analysis in academic writing pedagogy, while Li (2024) and Lopez et al. (2025) call for research on multimodal strategies for vocabulary development in digital environments.

Equally important is how digital transformation shapes multimodal communication practices in higher education. Eka et al. (2024) identify the cognitive and emotional dimensions of multimodal interaction in virtual and augmented reality environments in English language teaching as critical for future research. Avalos Pérez et al. (2023) examine various ICT-mediated teaching methods in higher education contexts, while Khor et al. (2024) focus on the design of personalized multimodal learning experiences, and Ouhaichi et al. (2023) highlight the importance of developing indicators of multimodal interaction in online higher education as one of the leading findings of systematic mapping studies. This trend points to a significantly underrepresented area in the current literature and presents a significant opportunity to investigate how multimodal communication evolves in AI-assisted learning environments.

Ethical and inclusivity dimensions of multimodal research are also prominent. Alwahaby et al. (2021) argue that ethical frameworks and the principles of equity and inclusivity should be incorporated into the design of multimodal learning analytics studies. Khor et al. (2024) suggest the development of confidential multimodal analytics approaches, while Liu et al. (2024) include the examination of multimodal communication in critical contexts such as crisis and healthcare among the identified research gaps. Breuer and Archer (2016) state that higher education institutions should develop policies that support multimodal communication. The fact that only a small portion of the studies in the current review address the ethical dimension supports the view that this is a priority area requiring attention in future research. Regarding the theoretical context, Liu et al. (2024) and Lu (2025) advocate for the development of new theoretical models that go beyond Kress and van Leeuwen's social semiotics paradigm. Firmansyah et al. (2022) identify resolving the conceptual ambiguity between multimodal learning and multimodal communication as a key priority, while Guerrero-Sosa et al. (2025) demand the standardization of multimodal data collection protocols. Breuer and Archer (2016) state that multimodal pedagogy training for academic staff has gained significant importance in the higher education policy agenda, while Christian et al. (2024) propose the redesign of teacher training programs for multimodal literacy instruction. Argyriou and Tapsis (2025) emphasize the urgent need for research on pedagogical changes in AI-assisted multimodal learning environments, while Ouhaichi et al. (2023) called for the development of multimodal analytical dashboards for teachers and the addressing of interpretability challenges.

These patterns should also be read critically in light of the study's own design choices. The pronounced dominance of English-language teaching and applied-linguistics contexts within the corpus is unlikely to reflect the full scope of multimodal communication research in higher education; rather, it partly reflects the fact that WoS and Scopus privilege English-language, Anglophone-indexed journals, and that the search terms themselves ("multimodal communication," "multimodal literacy") are more established in applied linguistics than in other disciplinary vocabularies. Fields such as engineering education, medical education, or arts and design may employ multimodal practices under different terminology (e.g., "visual communication" and "design-based learning") and would therefore be underrepresented or invisible in the present sampling frame. Consequently, the thematic dominance observed here should be interpreted as a property of the indexed, English-language literature captured by the search strategy, rather than as a comprehensive picture of

multimodal communication practice across all of higher education. This has direct implications for the generalizability of the study's conclusions, particularly regarding underexplored areas such as institutional communication, which may be less a genuine research gap than an artifact of database and language coverage.

The findings hold several important implications for researchers, practitioners, and institutional policymakers interested in multimodal communication in higher education. Sixty-three studies published in 57 different journals, most with one or two researchers, demonstrate that the field has yet to establish a coherent institutional disciplinary base. This reflects the lack of productive interdisciplinary reach of multimodal communication research, while the limited dialogue between findings published in different journals poses significant obstacles to cumulative knowledge production. For practitioners and curriculum designers, the findings show that multimodal communication competence is gaining a structural dimension in higher education and playing an increasingly decisive role in many contexts, particularly in language-intensive programs. For policymakers, the fact that institutional and organizational communication constitutes only 6.3% of the literature points to a gap in research on how universities position themselves as multimodal communication institutions.

Several limitations of this study should be acknowledged. The corpus was restricted to peer-reviewed journal articles published in English and indexed in WoS and Scopus, a decision that ensured methodological consistency but excluded book chapters, edited volumes, conference proceedings, and non-English-language publications that may offer valuable insights from specific regional or linguistic contexts. Relying on a fixed set of keyword combinations also carries the risk that studies addressing multimodal communication through alternative conceptual vocabularies, such as semiotic resources, design-based learning, or mediated discourse, were not captured by the search strategy. In addition, variables such as country of origin, sample characteristics, and the specific communication medium examined were beyond the scope of the present analysis and remain promising avenues for future research.

CONCLUSION AND RECOMMENDATIONS

This study aimed to reveal the intellectual structure, thematic outlook, and developmental trajectory of multimodal communication research in higher education between 2016 and 2026 using a systematic mapping method. Combining bibliometric and content-based thematic methods, this review analyzed 63 peer-reviewed articles; identified six thematic clusters; documented a significant increase in publications after 2022; characterized the methodological profile of the field; and observed a discursive shift in abstract word analysis. The findings demonstrate that multimodal communication research in higher education is a dynamic, interdisciplinary, and rapidly evolving field, and confirm its central role in language teaching and literacy development, as well as on the expanding frontier of technology-supported learning. In a higher education environment reshaped by digital transformation, AI, and global mobility, the question of how meaning is produced, negotiated, and evaluated through multiple semiotic modes is expected to gain even more decisive importance in terms of theoretical depth and practical significance. This review provides a systematic framework that researchers, educators, and organizational leaders can use to determine the direction they should take to overcome this challenge.

In light of the current findings, several suggestions can be offered for future research. First, the intersection of AI and multimodal communication in higher education constitutes a priority research agenda that deserves studies with robust theoretical foundations and empirical depth. Although initial steps have been taken, systematic research on how AI-mediated environments reshape multimodal interaction is still insufficient. Furthermore, to understand the breadth of multimodal applications in institutional contexts and the depth of individual learning processes, it is necessary to incorporate mixed methods and longitudinal research designs that go beyond the current cross-sectional, single-context study model. Expanding databases and including research in different languages will offer a broader perspective. Finally, analyses can also be conducted in the context of variables such as cross-country distribution, sample groups, and the type of communication tools used.

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analysis, methodology, software, visualization, writing – review & editing; **AAE:** data curation, investigation, resources, validation, writing – review & editing; **OKK:** investigation, visualization, writing – review & editing; **EGS:** funding acquisition, project administration, supervision, writing – review & editing. All authors approved the final version of the article.

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AI statement: No generative artificial intelligence (AI) or AI-assisted technologies were used in the conception, design, analysis, interpretation, writing, or editing of this manuscript.

Declaration of interest: The authors declared no competing interest.

Data availability: Data generated or analyzed during this study are available from the authors on request.

REFERENCES

*Research included in the analysis.

*Abbas, N. F., Awad, Z. E., & Mohaisen, A. K. (2025). YouTube as a learning tool among EFL learners: A systematic review. *Arab World English Journal, SI*, 96-110. https://doi.org/10.24093/awej/call11.6

*Acartürk, C., Coskun, M., & Emil, S. (2021). Multimodal communication in instructional settings: An investigation of the functional roles of gestures and arrows. *Revista Signos, 54*(107), 867-892. https://doi.org/10.4067/S0718-09342021000300867

Airey, J. (2015). Social semiotics in higher education: Examples from teaching and learning in undergraduate physics. *DiVA Portal*. http://urn.kb.se/resolve?urn=urn:nbn:se:uu:diva-266049

Airey, J., & Linder, C. (2009). A disciplinary discourse perspective on university science learning: Achieving fluency in a critical constellation of modes. *Journal of Research in Science Teaching, 46*(1), 27-49. https://doi.org/10.1002/tea.20265

Airey, J., & Linder, C. (2017). Social semiotics in university physics education. In D. Treagust, R. Duit, & H. Fischer (Eds.), *Multiple representations in physics education* (pp. 95-122). Springer. https://doi.org/10.1007/978-3-319-58914-5_5

*Alsamh, M. H., Hawbani, A., Kumar, S., & Alsamhi, S. H. (2024). Multisensory metaverse-6G: A new paradigm of commerce and education. *IEEE Access, 12*, 75657-75677. https://doi.org/10.1109/ACCESS.2024.3392838

Alwahaby, H., Cukurova, M., Papamitsiou, Z., & Giannakos, M. (2021). The evidence of impact and ethical considerations of multimodal learning analytics: A systematic literature review. In M. Giannakos, D. Spikol, D. Di Mitri, K. Sharma, X. Ochoa, & R. Hammad (Eds.), *The multimodal learning analytics handbook* (pp. 289-325). Springer. https://doi.org/10.1007/978-3-031-08076-0_12

Andries, F., Meissl, K., De Vries, C., Feyaerts, K., Oben, B., Sambre, P., Vermeerbergen, M., & Brône, G. (2023). Multimodal stance-taking in interaction—A systematic literature review. *Frontiers in Communication, 8*. https://doi.org/10.3389/fcomm.2023.1187977

Argyriou, M., & Tapsis, N. (2025). Reframing multimodality in contemporary education: A critical review of research patterns and pedagogical shifts. *European Journal of Open Education and E-Learning Studies, 10*(3), 16-33. https://doi.org/10.46827/ejoe.v10i3.6106

*Aslan, S., Durham, L. M., Alyuz, N., Chierichetti, R., Denman, P. A., Okur, E., Aguirre, D. I. G., Esquivel, J. C. Z., Cordourier Maruri, H. A., Sharma, S., Raffa, G., Mayer, R. E., & Nachman, L. (2024). What is the impact of a multi-modal pedagogical conversational AI system on parents' concerns about technology use by young children? *British Journal of Educational Technology, 55*(4), 1625-1650. https://doi.org/10.1111/bjet.13399

Avalos Pérez, M. Á., Zabala-Haro, A., Marcelo, P., Humanante, T., Morales Rodas, L. Y., & Galimberti, J. V. (2023). Modalities of teaching learning through information and communication technologies in higher education. *Journal of Namibian Studies, 33*, 2953-2968. https://doi.org/10.59670/jns.v33i.918

*Baig Falgueras, M., Boned Ribas, P., Gonzalez-Ceballos, I., & Esteban-Guitart, M. (2023). Artefactos identitarios multimodales 2.0 como mecanismo de personalización del aprendizaje en educación superior. Un estudio cualitativo [Multimodal identity artifacts 2.0 as a mechanism for personalizing learning in higher education. A qualitative study]. *RIED: Revista Iberoamericana de Educación a Distancia, 26*(2), 27-44. https://doi.org/10.5944/ried.26.2.36227

*Bekturova, M., Gaipov, D., Dyankova, G. H., & Tulepova, S. (2025). Examining multimodal literacy skills among EMI teachers in Kazakhstan. Inter*national Journal of Cognitive Research in Science, Engineering and Education, 13*(1), 217-222. https://doi.org/10.23947/2334-8496-2025-13-1-217-222

*Beltrán-Palanques, V. (2024). Assessing video game narratives: Implications for the assessment of multimodal literacy in ESP. *Assessing Writing, 60*, Article 100809. https://doi.org/10.1016/j.asw.2024.100809

*Bernad-Mechó, E. (2024). Building successful communication in EMI contexts: A multimodal approach to organizational metadiscourse in intercultural lectures. *Chinese Journal of Applied Linguistics, 47*(2), 259-280. https://doi.org/10.1515/CJAL-2024-0206

*Bowen, T. (2017). Assessing visual literacy: A case study of developing a rubric for identifying and applying criteria to undergraduate student learning. *Teaching in Higher Education, 22*(6), 705-719. https://doi.org/10.1080/13562517.2017.1289507

Breuer, E., & Archer, A. (2016). *Multimodality in higher education*. Brill/Sense Publishers. https://doi.org/10.1163/9789004312067

*Cai, Y., Pan, Z., Han, S., Shao, P., & Liu, M. (2022). The impact of multimodal communication on learners' experience in a synchronous online environment: A mixed-methods study. *Online Learning, 26*(4), 118-145. https://doi.org/10.24059/olj.v26i4.3448

*Candarli, D. (2025). A corpus-based multimodal analysis of written assignments in the target language use domain: Implications for L2 multimodal writing task design and assessment. *Language Assessment Quarterly, 22*(4-5), 582-608. https://doi.org/10.1080/15434303.2025.2596375

*Cervera, F., Schmidt, T., & Schwadron, H. (2021). Towards planetary performance pedagogy: Digital companions in multipolar classrooms. *Theatre, Dance and Performance Training, 12*(1), 20-39. https://doi.org/10.1080/19443927.2020.1829694

*Chang, Y. (2022). Mobilizing multi-semiotics in intercultural communication: Asian international students' experience of using English as a multilingua franca in a Taiwanese university. *Taiwan Journal of TESOL, 19*(1), 59-86. https://doi.org/10.30397/TJTESOL.202204_19(1).0003

Chen, C.-L. (2020). Visualizing the knowledge domain of multimodal discourse analysis (2009-2019): A bibliometric review. *Forum for Linguistic Studies, 2*(1), 57-70. https://doi.org/10.18063/fls.v2i1.1205

Chen, L., Abdullah, M. A. R., Abdullah, S. N. S., Hussin, S., & Rahman, R. A. (2025). A bibliometric survey on multimodal discourse analysis (2015-2024): Looking behind to look ahead. *English Language and Literature Studies, 15*(3), 99-113. https://doi.org/10.5539/ells.v15n3p99

Christian, I., Rohmah, Z., & Jalaluddin, I. (2024). Exploring studies on multimodal literacy in English learning: A bibliometric analysis. *JEELS: Journal of English Education and Linguistics Studies, 11*(2), 821-848. https://doi.org/10.30762/jeels.v11i2.3681

*Cienki, A. (2016). Cognitive linguistics, gesture studies, and multimodal communication. *Cognitive Linguistics, 27*(4), 603-618. https://doi.org/10.1515/cog-2016-0063

*Coccetta, F. (2018). Developing university students' multimodal communicative competence: Field research into multimodal text studies in English. *System, 77*, 19-27. https://doi.org/10.1016/j.system.2018.01.004

Crescenzi Lanna, L. (2020). Multimodal learning analytics research with young children: A systematic review. *British Journal of Educational Technology, 51*(5), 1485-1504. https://doi.org/10.1111/bjet.12959

*Delport, M. (2020). Lost in communication in higher education. *Communicatio: South African Journal for Communication Theory and Research, 46*(3), 106-126. https://doi.org/10.1080/02500167.2020.1826552

*Derboven, J., Geerts, D., & De Grooff, D. (2017). Appropriating virtual learning environments: A study of teacher tactics. *Journal of Visual Languages and Computing, 40*, 20-35. https://doi.org/10.1016/j.jvlc.2017.01.002

*Durst-Andersen, P., & Cobley, P. (2018). The communicative wheel: Symptom, signal, and model in multimodal communication. *Semiotica, 2018*(225), 77-102. https://doi.org/10.1515/sem-2016-0228

Eka, W., Rahmanu, D., & Molnár, G. (2024). Multimodal immersion in English language learning in higher education: A systematic review. *Heliyon, 10*, Article e38357. https://doi.org/10.1016/j.heliyon.2024.e38357

*Escobar-Alméciga, W. Y. (2025). Ethnography of multimodal communication: An English-mediated university classroom interaction analysis. *Profile: Issues in Teachers' Professional Development, 27*(2), 85-104. https://doi.org/10.15446/profile.v27n2.115294

*Escobar-Alméciga, W. Y., & Brutt-Griffler, J. (2022). Multimodal communication in an early childhood bilingual education setting: A social semiotic interaction analysis. *Íkala, Revista de Lenguaje y Cultura, 27*(1), 84-104. https://doi.org/10.17533/udea.ikala.v27n1a05

*Fedorenko, S. V. (2019). Experience of developing students' multimodal literacy in the digital learning environment of higher education institutions. *Information Technologies and Learning Tools, 69*(1), 12-20. https://doi.org/10.33407/itlt.v69i1.2405

Firmansyah, M. B., Andriyani, A. D., & Asih, R. (2022). *Bibliometric analysis of multimodality based on multimodal learning*. SSRN. https://doi.org/10.2139/ssrn.4298216

Franceschet, M. (2011). Collaboration in computer science: A network science approach. *Journal of the American Society for Information Science and Technology, 62*(10), 1992-2012. https://doi.org/10.1002/asi.21614

*Girón-García, C., & Fortanet-Gómez, I. (2023). Science dissemination videos as multimodal supporting resources for ESP teaching in higher education. *English for Specific Purposes, 70*, 164-176. https://doi.org/10.1016/j.esp.2022.12.005

Grant, M. J., & Booth, A. (2009). A typology of reviews: An analysis of 14 review types and associated methodologies. *Health Information & Libraries Journal, 26*(2), 91-108. https://doi.org/10.1111/j.1471-1842.2009.00848.x

*Gray, R. (2021). Multimodality in the classroom presentation genre: Findings from a study of Turkish psychology undergraduate talks. *System, 99*, Article 102522. https://doi.org/10.1016/j.system.2021.102522

*Gregson, M. (2025). The importance of the teacher-researcher-artist in curriculum design, development and assessment in vocational education in England. *Education Sciences, 16*(1), Article 24. https://doi.org/10.3390/educsci16010024

Guerrero-Sosa, J. D., Romero, F. P., Menéndez-Domínguez, V., Serrano-Guerrero, J., Montoro-Montarroso, A., & Olivas, J. (2025). A comprehensive review of multimodal analysis in education. *Applied Sciences, 15*(11), Article 5896. https://doi.org/10.3390/app15115896

*Hafner, C. A. (2020). Digital multimodal composing: How to address multimodal communication forms in ELT. *English Teaching, 75*(3), 133-146. https://doi.org/10.15858/engtea.75.3.202009.133

*Hauck, M., Salomao, A. C. B., Satar, M., & Primo, G. (2025). Internationalisation at home through critical virtual exchange. *AILA Review, 38*(2), 262-293. https://doi.org/10.1075/aila.24044.hau

*Huertas-Abril, C. A., & Muszyńska, B. (2022). The role of eTwinning tools in social and curriculum integration using multimodal communication. *Teaching English with Technology, 22*(3-4), 63-84.

*Ingerpuu-Rümmel, E. (2018). Translation as meaning constructor for new words in the multimodal communication of foreign language classrooms. *Estonian Papers in Applied Linguistics, 14*, 59-76. https://doi.org/10.5128/ERYa14.04

Joseph, J., Thomas, B., Jose, J., & Pathak, N. (2023). Decoding the growth of multimodal learning: A bibliometric exploration of its impact and influence. *International Journal of Intelligent Decision Technologies, 18*(1), 151-167. https://doi.org/10.3233/IDT-230727

*Joseph, S., Thompson, R., Soobramoney, S., & Wing, J. W. (2022). Emergency remote teaching and learning during COVID-19 pandemic: Efficacy of a four-stage model. *Tuning Journal for Higher Education, 9*(2), 529-561. https://doi.org/10.18543/tjhe.2134

Kapodistrias, A., & Airey, J. (2025). Multimodality and disciplinary learning: The case of purposeful transformation in the sciences. *Frontiers in Communication, 10*. https://doi.org/10.3389/fcomm.2025.1562515

Khor, E., Tan, L., & Chan, S. H. L. (2024). Systematic review on the application of multimodal learning analytics to personalize students' learning. *AsTEN Journal of Teacher Education*. https://doi.org/10.56278/asten.vi.2750

Kitchenham, B., & Charters, S. (2007). *Guidelines for performing systematic literature reviews in software engineering*. Keele University and Durham University.

*Kjeldsen, J., & Hess, A. (2021). Experiencing multimodal rhetoric and argumentation in political advertisements: A study of how people respond to the rhetoric of multimodal communication. *Visual Communication, 20*(3), 327-352. https://doi.org/10.1177/14703572211013399

*Koç, T., & Ergül, H. (2024). The use of material resources in vocabulary explanations: A conversation analytic inquiry. *Text & Talk, 44*(2), 223-248. https://doi.org/10.1515/text-2021-0118

*Korkealehto, K., & Leier, V. (2021). Facebook for engagement: Telecollaboration between Finland and New Zealand in German language learning. *International Journal of Computer-Assisted Language Learning and Teaching, 11*(1), 1-20. https://doi.org/10.4018/IJCALLT.2021010101

Köhler, T., & Stemmler, M. (1997). Normative versus ipsative configural frequency analysis in personality research—Their use discussed in a reanalysis of data on situation-bound anxiety. *European Journal of Personality, 11*(1), 69-79. https://doi.org/10.1002/(SICI)1099-0984(199703)11:1<69::AID-PER277>3.0.CO;2-G

Kress, G. (2010). *Multimodality: A social semiotic approach to contemporary communication*. Routledge.

Kress, G., & van Leeuwen, T. (1996). *Reading images: The grammar of visual design*. Routledge.

Kress, G., & van Leeuwen, T. (2001). *Multimodal discourse: The modes and media of contemporary communication*. Arnold.

*Kwak, S. K. (2023). Learner initiative through multimodal communication resources in the English classroom. *English Teaching, 78*(3), 25-54. https://doi.org/10.15858/engtea.78.3.202309.25

*Lang, Q., Wang, M., Yin, M., Liang, S., & Song, W. (2025). Transforming education with generative AI (GAI): Key insights and future prospects. *IEEE Transactions on Learning Technologies, 18*, 230-242. https://doi.org/10.1109/TLT.2025.3537618

*Lehtonen, D., Joutsenlahti, J., & Perkkilä, P. (2023). Multimodal communication and peer interaction during equation-solving sessions with and without tangible technologies. *Multimodal Technologies and Interaction, 7*(1), Article 6. https://doi.org/10.3390/mti7010006

Li, Y. (2024). Advancing language education through multimodality: Insights from a bibliographic analysis. *Forum for Linguistic Studies, 6*(3), 447-466. https://doi.org/10.30564/fls.v6i3.6691

*Liang, J.-C., & Hwang, G.-J. (2023). A robot-based digital storytelling approach to enhancing EFL learners' multimodal storytelling ability and narrative engagement. *Computers & Education, 201*, Article 104827. https://doi.org/10.1016/j.compedu.2023.104827

Liu, H., Liu, L., & Li, H. (2024). Multimodal discourse studies in the international academic community (1997-2023): A bibliometric analysis. *SAGE Open, 14*(4). https://doi.org/10.1177/21582440241305454

Lopez, C. M. S., Mangulad, M. P., & Santos, J. M. (2025). The use of multimodal strategies to develop vocabulary and reading comprehension: A bibliometric analysis. *International Journal of Multidisciplinary Applied Business and Education Research, 6*(8), 4068-4083. https://doi.org/10.11594/ijmaber.06.08.27

Lu, Y. (2025). Mapping multimodal linguistics research: A CiteSpace bibliometric analysis. *Forum for Linguistic Studies, 7*(8), 88-106. https://doi.org/10.30564/fls.v7i8.10243

*Maluleke, W. (2024). Usage of blackboard learn for teaching and learning in the historically disadvantaged institution: Challenges and prospects. *South African Journal of Higher Education, 38*(5), 39-62. https://doi.org/10.20853/38-5-6409

*Manamela, L. E., Sumbane, G. O., Mutshatshi, T. E., Ngoatle, C., & Rasweswe, M. M. M. (2024). Multimodal teaching and learning challenges: Perspectives of undergraduate learner nurses at a higher education institution in South Africa. *African Journal of Health Professions Education, 16*(3), Article e1299. https://doi.org/10.7196/AJHPE.2024.v16i3.1299

Mattei, E. (2024). Approaching tourism communication with empirical multimodality: Exploratory analysis of Instagram and website photography through data-driven labeling. *Frontiers in Communication, 9*. https://doi.org/10.3389/fcomm.2024.1355406

*McCafferty, S. G., & Rosborough, A. (2023). Contingency and multimodal communication in the learning environment: A second language read-aloud lesson. *Language and Sociocultural Theory, 9*(2), 175-201. https://doi.org/10.1558/LST.20987

Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis: An expanded sourcebook*. SAGE.

*Morell, T., & Pastor Cesteros, S. (2018). Multimodal communication in academic oral presentations by L2 Spanish students. *Journal of Spanish Language Teaching, 5*(2), 125-138. https://doi.org/10.1080/23247797.2018.1538334

Mu, S., Cui, M., & Huang, X. (2020). Multimodal data fusion in learning analytics: A systematic review. *Sensors, 20*(23), Article 6856. https://doi.org/10.3390/s20236856

New London Group. (1996). A pedagogy of multiliteracies: Designing social futures. *Harvard Educational Review, 66*(1), 60-92. https://doi.org/10.17763/haer.66.1.17370n67v22j160u

*Ou, W. A., & Gu, M. M. (2022). Competence beyond language: Translanguaging and spatial repertoire in teacher-student interaction in a music classroom in an international Chinese university. *International Journal of Bilingual Education and Bilingualism, 25*(8), 2741-2758. https://doi.org/10.1080/13670050.2021.1949261

Ouhaichi, H., Spikol, D., & Vogel, B. (2023). Research trends in multimodal learning analytics: A systematic mapping study. *Computers and Education: Artificial Intelligence, 4*, Article 100136. https://doi.org/10.1016/j.caeai.2023.100136

*Paxton, M., Frith, V., Kelly-Laubscher, R., Muna, N., & van der Merwe, M. (2017). Supporting the teaching of the visual literacies in the earth and life sciences in higher education. *Higher Education Research & Development, 36*(6), 1264-1279. https://doi.org/10.1080/07294360.2017.1300139

*Planer, R., Wolf, C., & Godulla, A. (2022). Digital storytelling beyond flagship projects: Exploring multimedia work routines in higher education practical training. *Journalism Practice, 16*(6), 1247-1264. https://doi.org/10.1080/17512786.2020.1832140

*Ramesh, K., Thomas, C. A., Osei-Asiamah, J., Pagidipati, B., Muniyandy, E., Reddy, B. V. S., & El-Ebiary, Y. A. B. (2025). Cognitive load optimization in digital (ESL) learning: A hybrid BERT and FNN approach for adaptive content personalization. *International Journal of Advanced Computer Science and Applications, 16*(4), 564-576. https://doi.org/10.14569/IJACSA.2025.0160457

*Rasi, P., & Poikela, S. (2016). A review of video triggers and video production in higher education and continuing education PBL settings. *Interdisciplinary Journal of Problem-Based Learning, 10*(1). https://doi.org/10.7771/1541-5015.1609

*Roderick, I. (2024). Misrepresenting autism in university promotional videos advocating robot therapy: A multimodal critical discourse analysis. *Social Semiotics, 34*(5), 826-845. https://doi.org/10.1080/10350330.2023.2207477

*Ruesch, J. M., & Sarvary, M. A. (2025). Instructors as communication strategists: Using multimodal communication to implement a new course policy on assignment extension due dates. *Frontiers in Education, 10*. https://doi.org/10.3389/feduc.2025.1558758

*Sataoen, H. L., Lövgren, D., & Neby, S. (2024). Metaphors of communication professionals in higher education: Between the trivial and significant. *JCOM: Journal of Science Communication, 23*(5). https://doi.org/10.22323/2.23050206

*Schneider, J., Börner, D., van Rosmalen, P., & Specht, M. (2017). Presentation trainer: What experts and computers can tell about your nonverbal communication. *Journal of Computer Assisted Learning, 33*(2), 164-177. https://doi.org/10.1111/jcal.12175

Sharma, K., & Giannakos, M. (2020). Multimodal data capabilities for learning: What can multimodal data tell us about learning? *British Journal of Educational Technology, 51*(5), 1450-1484. https://doi.org/10.1111/bjet.12993

*Shirahata, M., Lahti, M., & Siitonen, M. (2025). Language ideologies in a Finnish university student union's Facebook communication practices. *Social Semiotics, 35*(1), 114-132. https://doi.org/10.1080/10350330.2023.2267462

*Spanjaard, D., Garlin, F., & Mohammed, H. (2023). Tell me a story! Blending digital storytelling into marketing higher education for student engagement. *Journal of Marketing Education, 45*(2), 167-182. https://doi.org/10.1177/02734753221090419

*Steen, F. F., Hougaard, A., Joo, J., Olza, I., Cánovas, C. P., Pleshakova, A., Ray, S., Uhrig, P., Valenzuela, J., Woźny, J., & Turner, M. (2018). Toward an infrastructure for data-driven multimodal communication research. *Linguistics Vanguard, 4*(1). https://doi.org/10.1515/lingvan-2017-0041

*Sumekto, D. R., Dardjito, H., Sukur, S. G., Andriani, Y. S., Olam, R. M., & Sulistyorini, D. A. (2024). Paralinguistic features in students' storytelling within multimodal communications. *LLT Journal: A Journal on Language and Language Teaching, 27*(2), 997-1018. https://doi.org/10.24071/llt.v27i2.8701

*Tsai, K.-J. (2025). Concept mapping for enhancing multimodal communication in an EFL classroom. *SAGE Open, 15*(3). https://doi.org/10.1177/21582440251368978

*Uyar, G., & Balaman, U. (2024). The role of gazing behaviors in navigating paired role-play interactional competence assessment tasks. *Language Assessment Quarterly, 21*(3), 266-286. https://doi.org/10.1080/15434303.2024.2375651

van Eck, N. J., & Waltman, L. (2010). Software survey: VOSviewer, a computer program for bibliometric mapping. *Scientometrics, 84*(2), 523-538. https://doi.org/10.1007/s11192-009-0146-3

*Wang, M. (2022). The cultivation of students' multiple practical ability under the multimodal blended teaching mode. *International Journal of Emerging Technologies in Learning, 17*(12), 106-120. https://doi.org/10.3991/ijet.v17i12.32087

*Wu, Y. Q., & Cheong, C. Y. M. (2022). Academic visual identity of higher education institutions: A multimodal communication through pictorial representations. *GEMA Online Journal of Language Studies, 22*(2), 236-260. https://doi.org/10.17576/gema-2022-2202-13

*Xu, Y., & Chen, J. (2025). From multimodal making to meaning: Transmedia storytelling and interdisciplinary assessment in higher education. *Innovations in Education and Teaching International*. https://doi.org/10.1080/14703297.2025.2582597

*Yang, L., & Zhang, Y. (2024). Application of psychological effects in intelligent digital English teaching based on multimodal low resource language information processing from a psychological perspective. *ACM Transactions on Asian and Low-Resource Language Information Processing, 23*(6), Article 85. https://doi.org/10.1145/3599726

*Yao, W., & Saad, M. N. (2026). A model for enhancing screenwriting creativity for media students through a creative system and guided mental imagery strategy. *Asian Education and Development Studies, 15*(1), 151-171. https://doi.org/10.1108/AEDS-02-2025-0061

*Younas, M., Ismayil, I., El-Dakhs, D. A. S., Anwar, B., & Noor, U. (2025). Evaluating the effectiveness of digital scenario-based English teaching at the university level using the artificial intelligence generated content. *Frontiers in Education, 10*. https://doi.org/10.3389/feduc.2025.1670892

*Yu, S., Androsov, A., & Yan, H. (2025). Exploring the prospects of multimodal large language models for automated emotion recognition in education: Insights from Gemini. *Computers & Education, 232*, Article 105307. https://doi.org/10.1016/j.compedu.2025.105307

*Zhang, Z., Tan, S., Wignell, P., & O'Halloran, K. (2020). Addressing international students on Australian and Chinese university webpages: A comparative study. *Discourse, Context & Media, 36*, Article 100403. https://doi.org/10.1016/j.dcm.2020.100403