



## USING 3D PRINTING AND AI FOR MULTISENSORY COMMUNICATION IN IBERO-LATIN AMERICA: A SYSTEMATIC REVIEW

## USO DE LA IMPRESIÓN 3D Y LA IA PARA LA COMUNICACIÓN MULTISENSORIAL EN IBERO-LATINOAMÉRICA: UNA REVISIÓN SISTEMÁTICA

Marina Lisboa Empinotti  
Federal University of Santa Catarina, Brazil  
[marinaempinotti@gmail.com](mailto:marinaempinotti@gmail.com)  
<https://orcid.org/0000-0003-3697-9962>

Maria Jose Baldessar  
Federal University of Santa Catarina, Brazil  
[mbaldessar@gmail.com](mailto:mbaldessar@gmail.com)  
<https://orcid.org/0000-0001-8971-4576>

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### ABSTRACT

**Objective.** To produce a transparent and reproducible map of Ibero-Latin American research at the intersection of 3D printing, artificial intelligence (AI), and accessibility for blind and low-vision publics in communication contexts, while also determining whether a coherent body of work simultaneously integrating all three axes exists. **Design/Methodology/Approach.** A systematic literature review was conducted following PRISMA 2020 recommendations. Searches were performed in Scopus and Web of Science in November 2025, using affiliation criteria covering Latin America, Portugal, or Spain, English-language publications, and a substantive link to at least two of the three focal domains. Because the fully conjunctive query returned no records, the strategy was fragmented into six complementary searches. **Results/Discussion.** The evidence shows a fragmented but increasingly convergent field. Scopus concentrates studies on tactile representation, inclusive design, and emerging AI-assisted workflows, whereas Web of Science provides a broader technological ecosystem involving additive manufacturing, materials, and automation. Spain and Brazil recur as leading contributors, and publication activity is strongly concentrated between 2022 and 2025. **Conclusions.** No studies were identified that fully combine accessibility, 3D printing, and AI, revealing an

interdisciplinary gap and a need for shared metrics, repositories, and workflows. **Contribution/Originality/Value.** The review organizes a dispersed research landscape and identifies opportunities to integrate digital fabrication, AI, and multisensory communication through a socially grounded and inclusive approach.

**KEYWORDS:** 3D printing; artificial intelligence; accessibility; visual impairment; multisensory communication

## RESUMEN

**Objetivo.** Mapear de forma transparente y reproducible la investigación ibero-latinoamericana situada en la intersección entre impresión 3D, inteligencia artificial (IA) y accesibilidad para públicos ciegos y con baja visión en contextos de comunicación, verificando además si existe un cuerpo coherente de estudios que integre simultáneamente los tres ejes. **Diseño/Metodología/Enfoque.** Se realizó una revisión sistemática de la literatura siguiendo las recomendaciones PRISMA 2020. Las búsquedas se efectuaron en Scopus y Web of Science en noviembre de 2025, con criterios de afiliación en América Latina, Portugal o España, idioma inglés y vínculo sustantivo con al menos dos de los tres dominios focales. Ante la ausencia de resultados en la consulta conjunta, la estrategia se fragmentó en seis búsquedas complementarias. **Resultados/Discusión.** Los resultados muestran un campo fragmentado, aunque crecientemente convergente. Scopus concentra estudios sobre representación táctil, diseño inclusivo y flujos de trabajo asistidos por IA, mientras Web of Science revela un ecosistema tecnológico más amplio de manufactura aditiva, materiales y automatización. España y Brasil aparecen entre los principales polos de producción, con crecimiento marcado entre 2022 y 2025. **Conclusiones.** No se identificaron estudios que combinen de manera plena accesibilidad, impresión 3D e IA, lo que evidencia una brecha interdisciplinaria y la necesidad de métricas, repositorios y flujos de trabajo compartidos. **Aporte/Originalidad/Valor.** El estudio organiza un panorama aún disperso y señala oportunidades para integrar fabricación digital, IA y comunicación multisensorial desde una perspectiva socialmente situada e inclusiva.

**PALABRAS CLAVE:** impresión 3D; inteligencia artificial; accesibilidad; discapacidad visual; comunicación multisensorial

## INTRODUCTION

Systematic literature reviews are a cornerstone in communication and media research because they turn scattered studies into cumulative evidence. By specifying search strategies, screening rules, and data extraction steps, they make synthesis transparent and reproducible, which helps other researchers verify claims and practitioners apply the results. In areas that sit between subfields, such as accessibility, production workflows, and emerging technologies, systematic reviews also align vocabularies, expose gaps, and suggest shared agendas that single case studies cannot deliver on their own.

Guided by that value, we conducted a systematic review covering publications from 2005 to 2025 to examine how extrusion-based 3D printing (FFF/FDM), artificial intelligence (AI), and accessibility for blind and low-vision audiences have been studied in Ibero–Latin American contexts. Our initial goal was to see whether a coherent body of work exists at this crossroads.

The importance of this topic is evident in the global scale of vision loss. The World Health Organization reports about 43 million people who are blind worldwide and roughly 295 million with moderate to severe visual impairment. These conditions are associated with higher risks of unemployment, social isolation, anxiety, and depression, with obvious implications for participation in public culture and access to information (World Health Organization, 2019, 2023). For communication researchers and practitioners, these numbers are not peripheral; they define the audience realities that any visual-first narrative will exclude by design.

A second reason for focusing here is the role of assistive technologies and inclusive design in turning access from a late-stage fix into an early design requirement. Universal design argues that projects should anticipate human diversity from the outset, which reduces costly retrofits and improves usability for everyone (Burgstahler, 2015). Recent studies also show that accessibility challenges persist in visually dense representations such as diagrams and that AI-enabled tools are increasingly being explored to support disability inclusion, reinforcing the value of multisensory and carefully designed technology-mediated approaches (Zhao et al., 2024; Voultsiou & Moussiades, 2025). The empirical literature also reminds us that social context matters: stigma, situated use, and interaction norms can determine adoption even when the technology “works” on paper (Shinohara & Wobbrock, 2016). These perspectives connect directly to communication’s concerns with mediation, publics, and reception: an interface succeeds communicatively when it supports comprehension and action for users with different perceptual profiles.

The main objective of this study was to produce a transparent, reproducible map of Ibero–Latin American research at the crossroads of 3D printing, artificial intelligence (AI), and accessibility for blind and low-vision publics in communication contexts. We set out to synthesize the scope, distribution, and reported outcomes of work touching this intersection and to make that synthesis auditable by other researchers and usable by practitioners.

The very first goal, though, was to see whether a coherent body of work exists at the aforementioned crossroads. In the initial searches on both platforms, we formulated queries that combined all three axes simultaneously: accessibility (and related terms), 3D printing (and related terms), and artificial intelligence (and related terms). None of these joint searches returned results. This evidence gap motivated us to fragment the strategy into partial, pairwise queries and, from the retrieved sets, to build a comparative panorama of the landscape.

## METHODOLOGY

We carried out a systematic literature review following best-practice guidance for transparent evidence syntheses. The protocol specified databases, time frame, search strings, screening rules, data extraction, quality appraisal, and synthesis procedures, in line with PRISMA 2020 recommendations for planning and reporting (Page et al., 2021). The review focused on Ibero–Latin America (authors affiliated to institutions in Latin America, Portugal, or Spain) and covered publications from 2005 to 2025, in English. Eligible document types included peer-reviewed journal articles, conference papers, theses, and dissertations.

### *Information sources and search strategy*

Searches were run in Scopus and Web of Science (WoS) databases in November 2025. We first attempted a single, fully conjunctive query combining all focal themes (visual impairment, extrusion-based 3D printing, and AI) restricted to Ibero–Latin American affiliations. This initial strategy returned no records in either database within the time window. We then fragmented the search into overlapping strands and executed the following WoS and Scopus searches (Table 1).

**Table 1.**

#### *Search strings*

| Database | Search #   | String                                                                                                                                                                                                                                                                                                                                                                                                                         |
|----------|------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Scopus   | Search S#1 | TITLE-ABS-KEY ( ( "visual impairment" OR "blindness" OR "blind people" OR "visually impaired" ) AND ( "3D printing" OR "additive manufacturing" OR "Fused Filament Fabrication" OR "FFF" OR "extrusion-based 3D printing" ) AND ( "assistive technology" OR "assistive device" OR "inclusive design" ) ) AND ( AFFILCOUNTRY ( "Brazil" OR "Mexico" OR "Argentina" OR "Chile" OR "Colombia" OR "Peru" OR "Cuba" OR "Uruguay" OR |

| Database | Search #   | String                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|----------|------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          |            | "Venezuela" OR "Ecuador" OR "Guatemala" OR "Honduras" OR "El Salvador" OR "Nicaragua" OR "Costa Rica" OR "Panama" OR "Paraguay" OR "Portugal" OR "Spain" ) )                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Scopus   | Search S#2 | TITLE-ABS-KEY ( ( "visual impairment" OR "blindness" OR "blind people" OR "visually impaired" ) AND ( "3D printing" OR "additive manufacturing" OR "Fused Filament Fabrication" OR "FFF" OR "extrusion-based 3D printing" ) ) AND ( AFFILCOUNTRY ( "Brazil" OR "Mexico" OR "Argentina" OR "Chile" OR "Colombia" OR "Peru" OR "Cuba" OR "Uruguay" OR "Venezuela" OR "Ecuador" OR "Guatemala" OR "Honduras" OR "El Salvador" OR "Nicaragua" OR "Costa Rica" OR "Panama" OR "Paraguay" OR "Portugal" OR "Spain" ) )                                                                     |
| Scopus   | Search S#3 | TITLE-ABS-KEY ( ( "assistive technology" OR "assistive device" OR "inclusive design" ) AND ( "artificial intelligence" OR "machine learning" OR "computer vision" ) AND ( "3D printing" OR "additive manufacturing" OR "Fused Filament Fabrication" OR "FFF" OR "extrusion-based 3D printing" ) ) AND ( AFFILCOUNTRY ( "Brazil" OR "Mexico" OR "Argentina" OR "Chile" OR "Colombia" OR "Peru" OR "Cuba" OR "Uruguay" OR "Venezuela" OR "Ecuador" OR "Guatemala" OR "Honduras" OR "El Salvador" OR "Nicaragua" OR "Costa Rica" OR "Panama" OR "Paraguay" OR "Portugal" OR "Spain" ) ) |
| WoS      | Search W#1 | TS = (("3D printing" OR "additive manufacturing" OR "Fused Filament Fabrication" OR "FFF" OR "extrusion-based 3D printing") AND ( "visual impairment" OR "blindness" OR "blind people" OR "visually impaired" )) AND CU=( "Brazil" OR "Mexico" OR "Argentina" OR "Chile" OR "Colombia" OR "Peru" OR "Cuba" OR "Uruguay" OR "Venezuela" OR "Ecuador" OR "Guatemala" OR "Honduras" OR "El Salvador" OR "Nicaragua" OR "Costa Rica" OR "Panama" OR "Paraguay" OR "Portugal" OR "Spain")                                                                                                 |
| WoS      | Search W#2 | TS = (("3D printing" OR "additive manufacturing" OR "Fused Filament Fabrication" OR "FFF" OR "extrusion-based 3D printing") AND ( "artificial intelligence" OR "machine learning" OR "computer vision" )) AND CU=( "Brazil" OR "Mexico" OR "Argentina" OR "Chile" OR "Colombia" OR "Peru" OR "Cuba" OR "Uruguay" OR "Venezuela" OR "Ecuador" OR "Guatemala" OR "Honduras" OR "El Salvador" OR "Nicaragua" OR "Costa Rica" OR "Panama" OR "Paraguay" OR "Portugal" OR "Spain")                                                                                                        |
| WoS      | Search W#3 | TS = (("3D printing" OR "additive manufacturing" OR "Fused Filament Fabrication" OR "FFF" OR "extrusion-based 3D printing") AND( "assistive technology" OR "assistive device" OR "inclusive design")) AND CU=( "Brazil" OR "Mexico" OR "Argentina" OR "Chile" OR "Colombia" OR "Peru" OR "Cuba" OR "Uruguay" OR "Venezuela" OR "Ecuador" OR "Guatemala" OR "Honduras" OR "El Salvador" OR "Nicaragua" OR "Costa Rica" OR "Panama" OR "Paraguay" OR "Portugal" OR "Spain")                                                                                                            |

### ***Inclusion criteria***

- Affiliation of at least one author in the aforementioned Latin America countries, Portugal, or Spain;

- language in English;
- substantive link to at least two of the three focal domains: visual impairment/assistive or inclusive design; 3D printing/AM; artificial intelligence/AI;

**Deviation from protocol**

The only deviation was the move from a single conjunctive query (no returns) to a fragmented strategy. This change was fully reported and it reflects the current scarcity of triadic studies at the intersection of the subjects in Ibero–Latin America.

**RESULTS AND DISCUSSION**

**Scopus searches**

The three queries partially overlapped by design, since they interrogated adjacent conceptual spaces around 3D printing, visual impairment and assistive/inclusive design, and—more recently—AI-assisted pipelines. Three records retrieved by S#1 reappeared in S#2 when broader institutional tags and topical descriptors were included.

For analytical integrity, we consolidated items using unique identifiers (title/DOI/EID) and interpreted overlaps as single works. Although they count on both searches, they are not considered when ranking top affiliations or top subjects. This de-duplication step is nontrivial: the presence of repeated items indicates a relatively compact and dense literature, where closely related search strings tend to surface the same contributions rather than three large, disjoint bodies of work.

A clear temporal pattern emerged. S#1 spans a very early phase (2012–2017) followed by a recent uptick (2024–2025). The earlier segment is anchored in feasibility and legibility questions for non-visual access: whether additive manufacturing can reliably produce tactile maps, raised-relief diagrams, and simple educational artifacts; what layer heights and surface encodings support accurate recognition; and how users interpret simplified geometries under task constraints. Evaluations are typically small-N, focused on recognition rates, decision time, and user preference, reflecting a first wave of low-cost fabrication for accessibility beyond specialized embossing or industrial molding.

In contrast, S#2 and particularly S#3 (2024–2025) demonstrate a transition from work centered on printability to research aimed at system integration and scaling. Conference venues are more prominent in S#3, which is consistent with rapid prototyping cycles that precede journal consolidation. Table 2 shows all searches’ top results before we advance to further discussion.

**Table 2.**

*Scopus searches results*

| Search #<br>and total<br>findings | Top Years                                                                 | Top<br>Countries                        | Top Affiliations                                                                                                                                                                 | Top<br>Document<br>Types                |
|-----------------------------------|---------------------------------------------------------------------------|-----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|
| S#1<br>7 records                  | 2024 (2);<br>2025 (1);<br>2017 (1);<br>2016 (1);<br>2015 (1);<br>2012 (1) | Brazil (3);<br>Spain (3);<br>Mexico (1) | Universidad Jaume I, Castellon de la Plana (3);<br>Universidade Federal de Uberlândia (1);<br>Tecnológico de Monterrey (1); SENAI CETIQT (1); Universidade Federal do Paraná (1) | Conference<br>paper (4);<br>Article (3) |

| Search #<br>and total<br>findings | Top Years             | Top<br>Countries                                        | Top Affiliations                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Top<br>Document<br>Types                               |
|-----------------------------------|-----------------------|---------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|
| S#2<br>10 records                 | 2024 (6);<br>2025 (4) | Spain (5);<br>Mexico (2);<br>Brazil (1);<br>Peru (1)    | Universidad Jaume I, Castellon de la Plana (2);<br>Tecnológico de Monterrey, Monterrey (2);<br>Universidad de Sevilla (1); Universidad de<br>Alcalá (1); Universidad de Santiago de<br>Compostela (1);<br>Universidade Federal de Uberlândia (1);<br>Universidad ESAN (1); Universidad<br>Complutense de Madrid (1)                                                                                                                                                                | Article (8);<br>Review (1);<br>Conference<br>paper (1) |
| S#3<br>10 records                 | 2025 (10)             | Brazil (6);<br>Mexico (1);<br>Peru (1);<br>Portugal (1) | Universidade Federal de São Paulo (1);<br>Universidade Federal do ABC (1); Universidade<br>Federal de Uberlândia (1); Universidad<br>Iberoamericana Puebla (1); Pontificia<br>Universidad Catolica del Peru (1); Instituto<br>Politécnico de Tomar (1); Universidade<br>Estadual Paulista Júlio de Mesquita Filho (1);<br>University Center of Distrito Federal (1);<br>Faculdade de Ciências e Tecnologia da<br>Universidade Nova de Lisboa (1); Universidade<br>de São Paulo (1) | Conference<br>paper (6);<br>Article (4)                |

Geography and affiliations show a stable Ibero-Latin backbone. Spain and Brazil recur as leading contributors, with Mexico, Peru, and Portugal present in specific niches. Affiliation lines feature Spanish universities and Brazilian federal universities and technology centers, alongside archaeology and design units connected to museums and heritage.

Three thematic clusters recur across the consolidated corpus. The first is tactile representation and spatial literacy: maps, raised-relief diagrams, braille/embossed legends, and the use of surface textures as a stable semantic code. The second is discipline-specific learning objects: manipulatives for STEM and heritage that translate abstract structures into graspable forms, often co-designed with instructors and learners and evaluated against curricular outcomes. The third is pipeline/toolchain work, increasingly with AI: automated or semi-automated conversion from 2D/3D sources to printable relief; parameter presets for tactile clarity. These workflow contributions are key for moving from isolated prototypes to repeatable practice. The consolidated evidence portrays a field in transition: early feasibility work established that low-cost FFF can produce legible tactile artifacts; the most recent wave is integrating domain specificity, user-centered evaluation, and AI-assisted authoring to scale production and improve consistency.

### ***Web of Science searches***

The Web of Science yielded a substantially larger number of records compared with other databases. This outcome is expected for two main reasons. First, WoS indexes a broader range of interdisciplinary and cross-domain journals. Second, the database includes a significant volume of conference proceedings, which are particularly relevant in fields driven by rapid prototyping, technological innovation, and emerging methodologies. As a result, WoS captures early-stage research, methodological developments, and application-oriented studies that may not yet appear in strictly journal-focused databases.

This higher retrieval volume allows for a broader and more comprehensive bibliometric assessment, improving the robustness of trend identification and enabling the construction of a more faithful and representative panorama of the scientific landscape. The diversity of document types, institutional affiliations, and disciplinary categories detected in WoS ultimately strengthens the analytical depth of this review and supports more reliable interpretations of the field's evolution.

**Table 3.**

*Web of Science searches results*

| <b>Search #<br/>and total<br/>findings</b> | <b>Top Years</b>                                               | <b>Top<br/>Countries</b>                                                 | <b>Top 5 Affiliations</b>                                                                                                                                                                  | <b>Top<br/>Document<br/>Types</b>                                            |
|--------------------------------------------|----------------------------------------------------------------|--------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|
| W#1<br>28 records                          | 2024 (7);<br>2023 (4);<br>2022 (3);<br>2021 (2);<br>2020 (2);  | Brazil (6);<br>Spain (16);<br>Mexico (3);<br>Ecuador (1);<br>Peru (1)    | Universitat Jaume I (5); Universitat Politècnica de Valencia (5); Universitat Politècnica de Catalunya (4); Tecnológico de Monterrey (3)                                                   | Conference paper (10);<br>Article (14);<br>Review (3);<br>Editorial (1)      |
| W#2<br>251 records                         | 2025 (78);<br>2023 (42)<br>2024 (41)<br>2022 (35)<br>2021 (26) | Spain (98);<br>Brazil (55);<br>Portugal (42)<br>Mexico (28);<br>Peru (1) | Universidade do Porto (15);<br>Universidad de Santiago de Compostela (10);<br>Universidade de São Paulo (11);<br>Tecnológico de Monterrey (9);<br>Universitat Politècnica de Catalunya (7) | Article (163);<br>Review (53);<br>Conference paper (32)<br>Early Access (14) |
| W#3<br>29 records                          | 2025 (5)<br>2018 (5)<br>2024 (4)<br>2020 (4)<br>2021 (3)       | Brazil (15);<br>Portugal (5)<br>Spain (4);<br>Mexico (3);<br>Peru (1)    | Universidade de São Paulo (5); Universidade Federal do Paraná (3); Universidade Tecnológica Federal do Paraná (3);<br>Universidade de Lisboa (2)                                           | Conference paper (15);<br>Article (12);<br>Review (2);<br>Early Access (1)   |

Across the three iterative searches conducted in the WoS, a total of 308 records were retrieved, distributed as 28, 251 and 29 documents, respectively. The second search returned far more records than the first and third. This can be explained by both conceptual and technical factors. Conceptually, the second strategy was deliberately designed to focus on core, high-volume keywords related to engineering, materials science and additive manufacturing, avoiding overly restrictive terms tied to specific application niches.

Technically, this broader query structure aligns more closely with how WoS indexes journals and conference proceedings in Engineering Manufacturing, Materials Science and Automation, which are among the densest and most widely covered categories in the database. As a result, the second search taps into a much larger portion of the WoS corpus than the more focused first and third searches, which emphasize narrower biomedical and rehabilitation-oriented topics.

This asymmetry in retrieval volume has important methodological implications. The large dataset from the second search (251 records) enables more robust identification of global trends, the construction of statistically meaningful distributions by year, country, affiliation and document type, and the mapping of dominant citation topics around “Nanofibers, Scaffolds & Fabrication”, “Design & Manufacturing” and “Additive Manufacturing”. At the same time, the smaller but more thematically focused sets obtained in the first and third searches provide fine-grained insight into emerging subfields, such as multisensory integration,

rehabilitation and assistive technologies. Together, these three levels make it possible to combine a broad, high-level panorama with deep dives into specific niches, yielding a more faithful and nuanced representation of the research landscape than any single search would allow.

## CONCLUSIONS

Across the six searches conducted in Scopus and Web of Science, the evidence reveals a fragmented but increasingly convergent landscape at the crossroads of 3D printing, AI, and accessibility in Ibero–Latin America. Each database surfaced partially overlapping but distinct portions of the field: Scopus retrieved a compact corpus centered on tactile representation, inclusive design, and emerging AI-assisted workflows, whereas WoS provided a broader technological backdrop dominated by engineering, materials science, and fabrication research. When combined, these strands outline both the macrostructure and the microdynamics of a field that is only beginning to integrate multimodal access and digital fabrication into communication practices.

Scopus contributes depth on assistive and educational applications, particularly in Spain, Brazil, and Mexico, where research teams work on tactile maps, raised-relief diagrams, and manipulatives for STEM and heritage learning. These contributions tend to emphasize user studies, interpretation accuracy, and the development of tactile vocabularies tailored to educational or cultural contexts. AI-assisted pipelines appear mainly in recent years, suggesting a shift toward automation, reproducibility, and scaling of tactile media production.

WoS, in contrast, captures the surrounding technological ecosystem, including large volumes of work on additive manufacturing, materials development, design for fabrication, and algorithmic optimization. Although much of this literature does not address accessibility directly, it demonstrates the technological workflows, and conceptual tools that future accessible media systems may draw upon. The inclusion of conference proceedings also highlights areas of AM that rarely appear in Scopus. To support future analyses, Table 4 consolidates results from all six searches.

**Table 4.**

*Overall top searches results*

| Dimension                            | Scopus S#1                                   | Scopus S#2                                                | Scopus S#3                               | WoS W#1                                   | WoS W#2                                    | WoS W#3                           |
|--------------------------------------|----------------------------------------------|-----------------------------------------------------------|------------------------------------------|-------------------------------------------|--------------------------------------------|-----------------------------------|
| Number of records                    | 7                                            | 10                                                        | 10                                       | 28                                        | 251                                        | 29                                |
| Top years                            | 2012–2025<br>(clustered in<br>2024–2025)     | 2024–2025                                                 | 2025                                     | 2024                                      | 2022–2025                                  | 2018 & 2025                       |
| Leading countries (Ibero–LatAm only) | Brazil,<br>Spain,<br>Mexico                  | Spain,<br>Mexico                                          | Brazil,<br>Portugal                      | Spain, Brazil                             | Spain,<br>Brazil,<br>Portugal,<br>Mexico   | Brazil,<br>Portugal,<br>Spain     |
| Top affiliations (Ibero–LatAm)       | Univ. Jaume I; UFU; Tecnológico de Monterrey | Univ. Jaume I; Tecnológico de Monterrey; Univ. de Sevilla | USP; UFABC; UFU; UNESP; UNIFESP; FCT-UNL | Univ. Jaume I; UPV; UPC; Tec de Monterrey | Univ. do Porto; Tec de Monterrey; USP; USC | USP; UFPR; UTFPR; Univ. de Lisboa |

| Dimension      | Scopus S#1               | Scopus S#2      | Scopus S#3               | WoS W#1                | WoS W#2                        | WoS W#3                      |
|----------------|--------------------------|-----------------|--------------------------|------------------------|--------------------------------|------------------------------|
| Document types | Mostly conference papers | Mostly articles | Mostly conference papers | Articles & conferences | Articles, reviews, conferences | Conference papers & articles |

Taken together, the six searches reveal that the field is both recent and accelerating, with a marked concentration of publications from 2022 to 2025. The thematic clustering identifies a move from early feasibility studies toward multimodal integration, automated pipelines, and domain-specific learning objects, although fully triadic studies combining accessibility, 3D printing, and AI remain absent.

This systematic review demonstrates both the promise and the immaturity of Ibero–Latin American research at the intersection of accessibility, 3D printing, and AI. The most striking finding is the absence of publications that combine all three axes simultaneously, despite growing interest in each pairwise connection. Without integrated studies, the field struggles to develop or share evaluation metrics. As a result, innovations in tactile modeling, AI-assisted pipelines, and accessible workflows often advance in parallel rather than informing one another.

At the same time, we understand the fragmentation strategy proved methodologically fruitful. By separating the search into complementary strands, we were able to identify what components of the ecosystem are already mature and which remain underdeveloped. Although artificial intelligence and 3D printing have become well-established research areas, the picture changes the moment accessibility is added to the search.

Across all six searches, it becomes clear that studies in AI and 3D printing grow quickly and occupy a large space in both databases, while publications that focus on accessibility users are still far fewer and appear in a more fragmented way. This contrast shows that the technologies themselves are evolving rapidly, but their use to support inclusion has not advanced at the same pace. It also suggests that real integration between these three worlds has not yet happened and that there is room for meaningful interdisciplinary work capable of bringing accessibility, 3D printing and AI together in a more intentional and socially grounded way.

The implications for communication research are twofold. Substantively, the field should embrace blindness and low vision not as edge cases but as central publics whose perceptual demands reveal design assumptions that often go unexamined. When the visual channel becomes secondary rather than primary, communicative intent is redistributed across touch, motion, and sound, prompting narrative forms that are more inclusive and more expressive.

Future research will need to address the gaps identified here by forming interdisciplinary collaborations, adopting open-source toolchains, and developing shared repositories of tactile and sonic assets. As the ecosystem consolidates, the integration of 3D printing and AI into accessible communication practices has the potential not only to broaden participation but also to enrich the communicative repertoire available to all audiences.

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## BIBLIOGRAPHIC REFERENCES

- Burgstahler, S. (2015). *Universal design in higher education: From principles to practice* (2nd ed.). Harvard Education Press.
- Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J. M., Akl, E. A., Brennan, S. E., Chou, R., Glanville, J., Grimshaw, J. M., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E. W., Mayo-Wilson, E., McDonald, S., ... Moher, D. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. *BMJ*, 372, n71. <https://doi.org/10.1136/bmj.n71>
- Shinohara, K., & Wobbrock, J. O. (2016). Self-conscious or self-confident? A diary study conceptualizing the social accessibility of assistive technology. *ACM Transactions on Accessible Computing*, 8(2), 1–31. <https://doi.org/10.1145/2827857>
- Voultsiou, E., & Moussiades, L. (2025). A systematic review of AI, VR, and LLM applications in special education: Opportunities, challenges, and future directions. *Education and Information Technologies*, 30, 19141–19181. <https://doi.org/10.1007/s10639-025-13550-4>
- World Health Organization. (2019). *World report on vision*. World Health Organization. <https://www.who.int/publications/i/item/world-report-on-vision>
- World Health Organization. (2023). *Blindness and vision impairment*. World Health Organization. <https://www.who.int/news-room/fact-sheets/detail/blindness-and-visual-impairment>
- Zhao, Y., Nacenta, M. A., Sukhai, M. A., & Somanath, S. (2024). *TADA: Making node-link diagrams accessible to blind and low-vision people*. Proceedings of the 2024 CHI Conference on Human Factors in Computing Systems, Article 45, 1–20. <https://doi.org/10.1145/3613904.3642222>