

Online Resource 1. Complete ECART audit records for the analytic demonstration

Article: From corpus to claims: The TRACE framework for auditing inferential dependencies in bibliometric research

Journal: Scientometrics

Author: Greta Baldanzi

Affiliation: Italian Ministry of Education and Merit, Rome, Italy

Corresponding author: Greta Baldanzi - grebaldan@yahoo.it

Interpretive note. These records document the complete reverse traversal used in the four cases discussed in the manuscript. "Supported" has the same claim-relative meaning used in the manuscript: for the specified target claim, the available assessable published evidence provides affirmative and sufficient warrant at the stated scope and certainty. It is not assigned merely because no insufficiency was identified, and it is not a global judgement on study quality. Each supported designation is therefore accompanied by the positive evidential basis for that judgement. "Not assessable" or "partially assessable" indicates a limit of reporting or reconstructability and is not converted into a finding of non-support. Remedial disposition is recorded separately from epistemic status.

Case 1 - Chen et al. (2025): thematic evolution and field maturity

Target proposition: The field has matured from descriptive ecology toward mechanistic and translational research.

ECART element	Published evidence / location	Auditability	Epistemic status	Diagnostic rationale	Remedial disposition
C	Abstract/Conclusion: maturity statement combines developmental direction with the higher-order property of field maturity.	Assessable	Mixed at proposition level: thematic transition supported; maturity unsupported	The sentence contains two propositions with different evidential warrants and therefore should not receive a single aggregate verdict.	Split the compound claim; preserve the supported transition and address maturity separately.
A → C	Results keyword/timeline evidence and Conclusion.	Assessable	Supported for thematic transition; unsupported for maturity	The analyses show a directional thematic shift, but maturity is not operationally defined by those outputs.	Preserve the transition; reformulate or independently define and substantiate maturity.
A	Keyword co-occurrence, citation-burst, and timeline analyses (Results; Figs. 7-8).	Assessable	Supported for the directional transition	The reported outputs directly describe changing topic emphasis and research fronts.	Preserve.
R → A	Methods describe parallel WoSCC and Scopus retrieval followed by bibliometric analyses in bibliometrix, VOSviewer, and CiteSpace.	Assessable	Supported for the target transition	The reported workflow links the retrieved database corpora to the keyword and timeline procedures that generate the thematic outputs used in the narrower transition claim; this corpus-to-analysis relation is sufficient for that corpus-bounded proposition.	None for the narrower transition claim.

ECART element	Published evidence / location	Auditability	Epistemic status	Diagnostic rationale	Remedial disposition
R	Methods §2.1 / Fig. 1: database-specific search strings; 5,432 WoSCC and 5,542 Scopus records, analysed separately with 3,837 overlap.	Assessable	Supported for the corpus-bounded transition claim	The study reports the database-specific search strings, record counts, overlap, and parallel analyses, thereby identifying the corpora to which the narrower thematic-transition claim is explicitly bounded.	No retrieval repair required for the narrower claim.
T → R	Search combines pregnancy terms (pregnan*, gestation*, maternal) with gut-microbiota synonyms.	Assessable	Supported	The retrievable representation corresponds to the stated object "gut microbiota during pregnancy" at the level needed for the audited transition claim.	None.
T	Introduction frames gut microbiota during pregnancy as the object of study and a cross-disciplinary research domain.	Assessable	Supported	The study explicitly defines gut microbiota during pregnancy as the object of analysis, providing a sufficiently specified phenomenon against which the retrieval representation can be assessed for this claim.	None.

Case 2 - Kurmasheva et al. (2026): co-citation communities and theoretical traditions

Target proposition: The co-citation network reveals additional theoretical traditions.

ECART element	Published evidence / location	Auditability	Epistemic status	Diagnostic rationale	Remedial disposition
C	Section 3.5, paragraph immediately following Fig. 5.	Assessable	Supported	The proposition explicitly names the interpreted property (theoretical traditions) and ties it to the co-citation network; its object and scope are sufficiently explicit for claim-level audit, while evidential warrant is tested at A → C.	Preserve, with its evidential basis visible.
A → C	Section 3.5: clusters are interpreted through the scholars and literatures they contain; cluster-level structural metrics are also reported.	Assessable	Supported	The move from structural community to "theoretical tradition" is not based on clustering alone; it is substantively corroborated.	Preserve; retain the cluster-level substantiation.
A	Fig. 5; Louvain-based co-citation structure; modularity 0.395; stronger within- than between-cluster link strength.	Assessable	Supported	The reported analysis establishes differentiated co-citation communities.	Preserve.

ECART element	Published evidence / location	Auditability	Epistemic status	Diagnostic rationale	Remedial disposition
R → A	Methods use Scopus metadata and co-citation analysis with reported thresholds and community detection.	Assessable	Supported for the corpus-bounded claim	The reported Scopus metadata are analysed through author co-citation with stated thresholds and community detection, a procedure that directly generates the co-citation communities on which the corpus-bounded proposition rests.	None.
R	Methods §2.1: Scopus search on adaptive-learning variants; retrieval and screening are described; the paper acknowledges single-database coverage as a limitation.	Assessable	Qualified for field-wide exhaustiveness; supported for a corpus-bounded interpretation	Single-database coverage constrains exhaustiveness but does not negate the reported co-citation structure in the analysed corpus.	Keep the interpretation tied to the analysed literature rather than to an exhaustive census of all traditions.
T → R	Adaptive learning is framed as the phenomenon; multiple variants/synonyms were tested before the final Scopus search.	Assessable	Supported for the stated corpus	The search representation is aligned with the phenomenon as operationalised.	None for the audited claim.
T	Introduction defines adaptive learning in education and situates digital/AI-related forms within that domain.	Assessable	Supported	The introduction explicitly defines adaptive learning in education as the object and situates the digital/AI-related forms included in the study, providing a sufficiently specified target for this audit.	None.

Case 3 - You et al. (2024): collaboration prominence and broader research leadership

Target proposition: Country-level collaboration/output prominence confirms broader research prowess or leadership in the field.

ECART element	Published evidence / location	Auditability	Epistemic status	Diagnostic rationale	Remedial disposition
C	Section 3.3: network prominence is followed by broader language about research prowess and leadership in the field.	Assessable	Unsupported for the broader extension; narrower collaboration-position statement is supportable	The broader claim adds a property not defined by publication counts or number of international links.	Either substantiate a leadership construct or narrow the claim.
A → C	Publication output and co-authorship/country-network results in Section 3.3.	Assessable	Unsupported for broad research prowess / field leadership	Connectivity and productivity do not by themselves operationalise agenda-setting, quality, intellectual influence, or another explicit leadership construct.	Reformulate to output and collaboration prominence, or add a defined leadership indicator.
A	Country output and collaboration-network connectivity, including the reported 36-country connection count for the United States.	Assessable	Supported	The outputs directly support productivity and network-prominence statements.	Preserve.

ECART element	Published evidence / location	Auditability	Epistemic status	Diagnostic rationale	Remedial disposition
R → A	Scopus retrieval is analysed with VOSviewer; country-level co-authorship data generate the collaboration network.	Assessable	Supported for corpus-bounded network prominence	The retrieved Scopus records supply the country-level co-authorship data analysed in VOSviewer, and that procedure directly generates the collaboration network used for the narrower corpus-bounded prominence statement.	None for a corpus-bounded claim.
R	Methods §2.1: Scopus only, English-language journal articles, 2013-2023. The article acknowledges that these choices may omit relevant literature and bias coverage toward English-speaking countries. It also reports inconsistent corpus totals (2,188 in the abstract/conclusion versus 2,118 in Methods).	Partially assessable for a global field-wide claim	Qualified for global scope; no verdict on the material effect of the count inconsistency	Coverage choices can matter to country-level comparisons. The count discrepancy is visible, but its effect on the specific network result is not reconstructable from the article.	If preserving a global leadership claim, test retrieval robustness and clarify the corpus count; if narrowing to the analysed Scopus corpus, report the limitation without unnecessary reanalysis.
T → R	The paper frames "global" higher-education leadership-development research but operationalises it through an English-only Scopus corpus.	Assessable	Qualified for global scope	The retrievable representation is narrower than the strongest global wording.	Either justify global representativeness or calibrate scope to the retrieved corpus.
T	Higher-education leadership development is the declared research domain.	Assessable	Supported as a study object	The study explicitly defines higher-education leadership development as its research domain, providing a sufficiently specified conceptual object for the target proposition.	None.

Case 4 - Zhang et al. (2025): retrieval asymmetry and field-level topic evolution

Target proposition: The analysed corpus supports a field-level account of the topic evolution of AI-literacy research from 2015 to 2024.

ECART element	Published evidence / location	Auditability	Epistemic status	Diagnostic rationale	Remedial disposition
C	Abstract, Results, and Conclusion describe the evolution of AI-literacy research at field level.	Assessable	Qualified	Field-level scope is conditional on retrieval robustness that cannot be established from the published record.	Clarify and, if necessary, test retrieval robustness; otherwise calibrate the claim to the analysed set.
A → C	Topic modelling and semantic analyses are interpreted as the trajectory of AI-literacy research.	Assessable for the analysed set	Supported for patterns in the analysed set; field-level scope remains dependent on retrieval	The analytical outputs can describe the 3,361-paper set; broader field language depends on R and T → R.	Preserve corpus-bounded findings while the retrieval question is resolved.
A	Section 3.3 onward: LDA/topic-evolution analyses on 3,361 validated publications across six chronological stages.	Assessable	Supported for the reported analysis set	The output is clearly tied to the cleaned analysis corpus.	Preserve unless retrieval testing changes the corpus materially.

ECART element	Published evidence / location	Auditability	Epistemic status	Diagnostic rationale	Remedial disposition
R → A	Section 3.2: 3,801 records after field standardisation/merging; 3,361 retained after duplicate removal, integrity validation, and cleaning for topic analysis.	Partially assessable	No full epistemic verdict on R → A adequacy	The article makes the corpus-to-analysis transition traceable by distinguishing 3,801 assembled records from the 3,361 records entered into topic analysis and by naming the cleaning steps. That documentation is sufficient to identify which set was analysed, but not to establish the full claim-level adequacy of every preprocessing choice, particularly while the retrieval asymmetry at R remains unresolved.	Preserve the documented 3,801 → 3,361 distinction. If retrieval clarification or harmonisation changes the corpus materially, repeat or verify preprocessing and downstream analysis only as required by that change.
R	Section 3.2: WoS uses OR between the two AI-literacy expressions; Scopus is reported with AND. The article does not report a harmonised retrieval sensitivity check.	Partially assessable	No claim-level epistemic verdict on retrieval effect	The asymmetry is documented, but whether it changed the merged corpus is untested; omitted Scopus records may already be present in WoS. It is also unclear whether AND reflects execution or reporting.	First clarify the executed Scopus query. If AND was executed, run a harmonised retrieval comparison before deciding whether reanalysis is needed.
T → R	The study aims to collect AI-literacy literature comprehensively using the two named expressions.	Assessable	Qualified	The nominal object and the search representation are visible, but the cross-database Boolean asymmetry weakens confidence that the same operational boundary was applied in both sources.	Resolve R first; if harmonisation materially changes lexical coverage, revisit T → R as well.
T	AI literacy is the stated research domain and the study traces its topic evolution.	Assessable	Supported for identification of the nominal object	The paper explicitly defines AI literacy as the named research domain whose topic evolution is being traced, providing an identifiable conceptual object for the audit. This status concerns object identification only and does not establish retrieval completeness.	None unless retrieval harmonisation reveals a conceptual-boundary issue.

Sources audited

- Chen, A., Luo, Z., & Zhang, J. (2025). Gut microbiota during pregnancy: A bibliometric analysis of global research trends and collaborative networks. *Frontiers in Microbiology*, 16, 1708359.
<https://doi.org/10.3389/fmicb.2025.1708359>
- Kurmasheva, M., Zhorabekova, A., Barikulov, R., Duisenova, M., & Ashimova, D. (2026). Mapping research on digital adaptive learning in education: A bibliometric approach. *Cogent Education*, 13(1), 2699507.
<https://doi.org/10.1080/2331186X.2026.2699507>
- You, C., Awang, S. R., & Wu, Y. (2024). Bibliometric analysis of global research trends on higher education leadership development using Scopus database from 2013–2023. *Discover Sustainability*, 5, 246.
<https://doi.org/10.1007/s43621-024-00432-x>
- Zhang, T., Zhang, P., & Ma, H. (2025). Tracing the topic evolution of AI literacy literature: From knowledge enlightenment to knowledge symbiosis. *Knowledge Organization*, 52(7), 44114.
<https://doi.org/10.31083/KO44114>