

Re-envisioning Bibliometric Analysis as a Tool for Transforming the Field

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1. Background

Our project **Mapping, Clarifying, and Communicating Key Ideas about Collaborative Learning to STEM Audiences** aims to map and synthesize literature on computer-supported collaborative learning (CSCL), identify topics relevant to K12 practitioners for translation from research to practice, and determine if new research is needed, while centering equity.

We chose to focus on CSCL because researchers (e.g., Jeong et al., 2019) have found CSCL has significant and meaningful effect sizes for the impact on science learning ($g=.67$), as well as computer science ($g=.50$) and math learning ($g=.33$), yet the research knowledge on CSCL has not impacted the instructional practice (Wise et al., 2019).

Our project unfolds in three phases (Figure 1). In Phase 1, we map the existing literature. In Phase 2, we will use the Delphi method to bring together an expert panel of collaborative learning researchers and K12 education practitioners to evaluate the literature map and distill topics valuable for translation from research into practice. In Phase 3, we will use what we learn in the first two project stages to create new materials that will be used to translate key research findings for collaborative learning into practice. In this poster, we focused on Phase 1, the literature mapping phase, and asked the following research questions:

RQ1: What does the map of the CSCL literature look like? and

RQ2: What does the map reveal about DEI in this field?

Figure 1. MC2 Project Phases



2. Methods: Bibliometric literature analysis

- Quantitative method to analyze bibliographic datasets and identify topic clusters and links between them, impactful authors, publications, and reveal author networks (Block & Fisch, 2020).
- Database and corpus: Web of Science / 16,470 pubs
- Open-access tool for analysis: BiblioMaps
- Bibliographic coupling method based on the number of shared references between two publications
- No shared references => two publications are not linked
- All references the same => maximum strength of the connection between the two publications

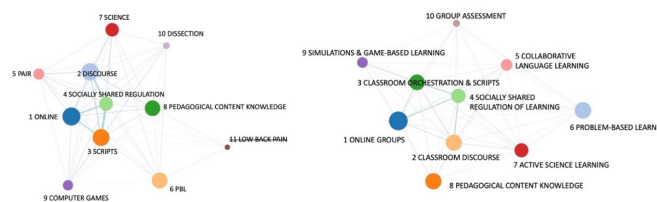
2. Methods: Literature map evaluation and curation process

Our goal was to identify key research topics relevant for K12 practice, so we worked to evaluate and refine the initial software-generated CSCL literature map (Figure 2, on the left). We determined the top 10% most relevant publications of our search was most appropriate (Figure 1, on the right). We then:

- independently reviewed publications in each node and excluded irrelevant nodes (i.e., low-back pain) and updated node names
- compared the map topics to those in the recent “International handbook of computer-supported collaborative learning” (Cress et al., 2021)
- Included two topics from the Handbook, “Diversity, equity, and inclusion” and “Argumentation” in the project.

To ensure the map’s trustworthiness, we engaged in peer-debriefing sessions with researchers not involved in this project to review the map and our curating decisions.

Figure 2. The initial map (left) and the final map (right) of CSCL literature (top 10% most relevant publications)



3. Results

RQ1: We found the initial whole corpus, software-generated literature map gathered 13,433 publications into 21 topics and 151 subtopics. The map of top 10% most relevant works included 1428 publications, 11 topics, 40 subtopics.

The five most prominent nodes: online groups (219 articles), problem-based learning (169 articles), pedagogical-content knowledge (162), classroom discourse (158 articles), and classroom orchestration and scripts (151 articles). This map shows emergence of new categories, such as group assessment, with 26 publications.

RQ2: We found a relatively small sub-node of 27 publications focused on equity, with the majority of publications originating from the U.S. The fact that DEI was not included at the node level in the map means that it did not share enough citations with the publications in other nodes.

4. Discussion

Our bibliometric analysis led us to concur with Gomez et al. (2021) that despite deep concerns with DEI within the CSCL scholarship, the existing literature does not reflect a widespread, global effort to address DEI as a focal point of CSCL studies. We also raise the following three additional caveats concerning DEI that researchers using bibliometric methods should be aware of:

- differences in institutional levels of access to bibliographic databases (BDs),
- biases and lack of algorithmic transparency in the BDs and software tools themselves, and
- accessibility to the research literature behind paywalls.

Considering these caveats, we posit that the first step towards transformative use of bibliometric analysis is the acknowledgement that software-generated literature maps reflect inequities, biases, and issues of power that are already present and evident in the structure of scholarly fields and in the software tools used to create them. One way researchers using bibliometric methods can begin to center DEI in their work is to reflect on what is not there and on what literature is yet to be written in addition to what the present structure of the field is like.

5. References

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6. Acknowledgements:

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