

Shifting sands: analyzing trends in educational technology research published in *Educational Technology Quarterly* (2021-2023)

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Abstract

Educational technology is dynamic, with new developments and innovations continuously shaping research directions and priorities. The *Educational Technology Quarterly* (ETQ) offers valuable insights into evolving trends within this domain through its broad publication of studies across various educational contexts and technologies. This paper provides a bibliometric analysis of research articles published in ETQ from 2021-2023 to identify key themes and changes in focus over this period.

Keywords

educational technology, bibliometric analysis, research trends, digital competence, blended learning, cloud computing, COVID-19 impact, *Educational Technology Quarterly*

1. Introduction

Educational technology encompasses a broad range of topics related to using technological tools and innovations to facilitate and enhance teaching and learning. As new technologies emerge and pedagogical paradigms evolve, this domain's focal points and priorities are constantly shifting. Tracking and analyzing these trends is crucial for understanding the state of the field and where research efforts should be directed going forward.

The scholarly journal *Educational Technology Quarterly* (ETQ) offers a valuable window into contemporary developments and discussions within educational technology research [1]. Published by the *Academy of Cognitive and Natural Science* (ACNS) [2], ETQ has established itself as a prominent platform for disseminating high-quality studies. Its broad scope spans diverse technological contexts and educational levels, from pre-school to higher education and life-long learning. As such, the body of literature published in ETQ represents a rich dataset for investigating evolving priorities and themes over time within this dynamic field.

This paper undertakes a bibliometric analysis of ETQ articles published over a recent three-year period (2021-2023). Examining patterns and changes in the topics covered during this window aims to

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elucidate the current landscape and trajectories of educational technology research. ETQ was selected as the focal journal for several key reasons:

- Its longevity provides a sufficiently large dataset for longitudinal analysis over multiple years.
- As an established, peer-reviewed journal, ETQ content represents cutting-edge findings in the field.
- In the meantime, ETQ content is not indexed by the leading scientometric databases like Scopus and Web of Science.

Therefore, ETQ constitutes an ideal case study for systematically mapping educational technology research trends and developments through bibliometric techniques. The findings will shed light on the prevalent topics of inquiry today and how priorities are shifting over time.

2. Methodology

The dataset for this bibliometric study comprised 72 research articles published in the Educational Technology Quarterly (ETQ) from 2021-2023 [3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74]. Article metadata, including titles, abstracts, keywords, and publication dates, were retrieved using the journal's website in BibTeX format.

Full-text abstracts for each article were extracted from the BibTeX files. Abstract texts were pre-processed by converting all text to lowercase, removing stop words and punctuation, lemmatization, and stemming. This produced a corpus of cleaned abstract text ready for bibliometric analysis.

The VOSViewer software tool was used to conduct the abstract corpus's bibliometric analysis. Specifically, VOSViewer was used to extract author keywords and generate and visualize maps of co-occurring keywords in the text. Abstracts were input to VOSViewer to identify frequent terms and filter out terms that occurred fewer than ten times. This resulted in 2134 extracted terms, of which 29 met the minimum occurrence threshold 10.

Various bibliometric techniques were applied to analyze this set of frequent keywords:

- Keyword analysis to determine the frequency of topics
- Temporal analysis of publication dates and topics
- Network analysis of co-occurrences between keywords
- Geographic analysis of author locations

These techniques provided quantitative indicators and visual mappings to elucidate the salient themes and trends within the dataset.

3. Analysis and discussion

3.1. Keyword analysis

The co-occurrence network map generated in VOSViewer provided valuable visualizations of the relationships and clusters among frequent keywords in the ETQ dataset. As shown in figure 1, five distinct clusters emerged.

Cluster 1 centers on keywords such as “digital competence”, “information”, and “system”, indicating a focus on developing digital skills and utilizing technology systems.

Cluster 2 contains keywords like “blended learning”, “concept”, and “practice”, reflecting research on pedagogical models and educational concepts.

Cluster 3 includes keywords such as “cloud”, “environment”, and “model”, relating to technological infrastructure and frameworks.

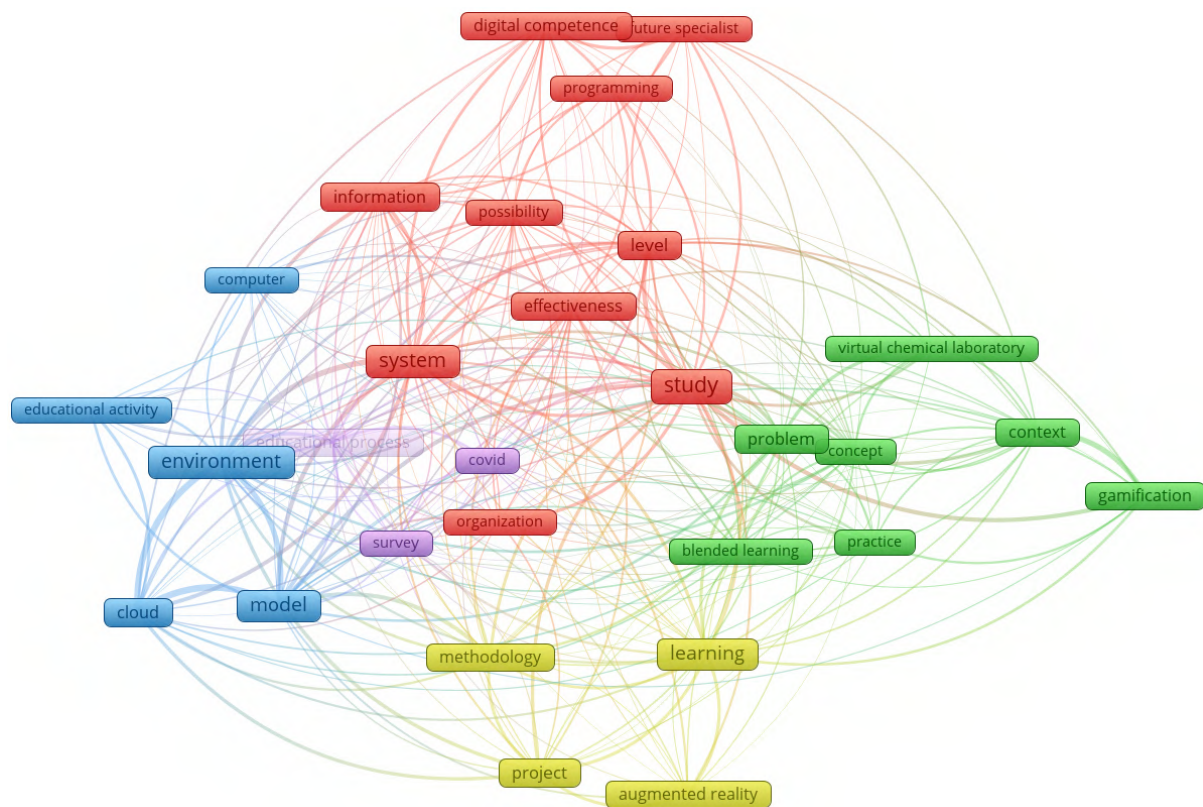


Figure 1: Co-occurrence network of keywords.

Cluster 4 contains keywords like “methodology”, “project”, and “study”, potentially pointing to research methods and processes.

Finally, cluster 5 contains keywords such as “covid”, “educational process”, and “survey”, signalling research undertaken in response to the COVID-19 pandemic.

Notably, the keywords “learning”, “level”, “problem”, and “effectiveness” occupy central positions spanning multiple clusters. This suggests they represent interdisciplinary topics connecting these research domains.

The scattered peripheral keywords “future specialist”, “programming”, and “virtual chemical laboratory” indicate more niche focus areas studied.

3.2. Temporal analysis

Mapping the keywords by their publication dates reveals several interesting temporal patterns and changes in research focus over time (figure 2).

Terms related to the COVID-19 pandemic, including “covid”, “survey”, and “educational process”, emerged abruptly in 2021 and remained frequent throughout the dataset, reflecting a surge in pandemic-driven research.

“Cloud” first gained traction in 2021, pointing to growing attention on cloud-based technologies and remote learning during the pandemic’s onset. This term has continued trending upward, signalling sustained focus in this area.

In contrast, keywords like “gamification” and “virtual chemical laboratory” only gained prominence in 2022 and 2023, respectively, indicating these were newer rising topics of inquiry.

Terms such as “model”, “practice”, and “organization” displayed peaks in 2021 before declining over 2022-2023. This suggests certain research priorities were more time-bound to the pandemic’s early stages.

By 2023, keywords like “methodology”, “problem”, and “programming” overtook some earlier topics

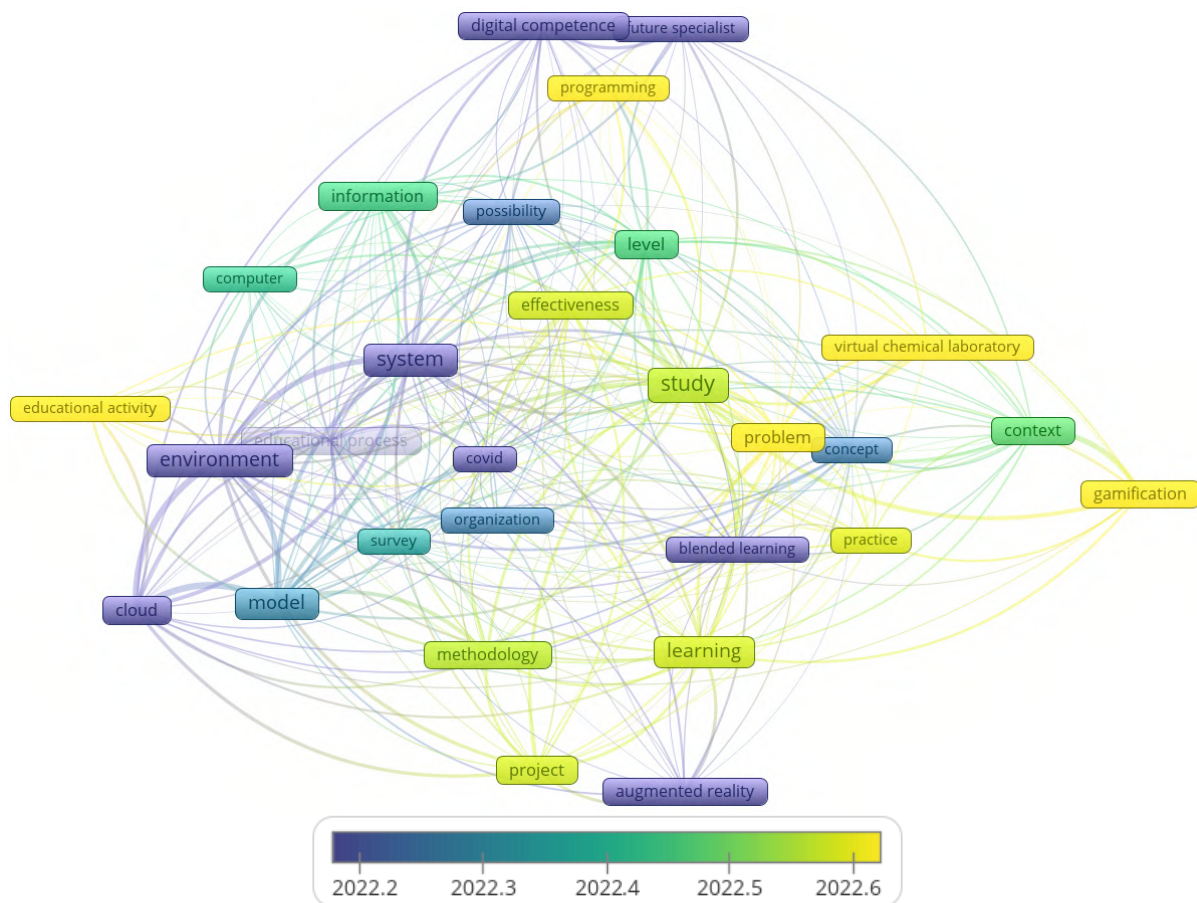


Figure 2: Overlay visualization.

in frequency, indicating a return to more foundational educational technology research as the acute pandemic period receded.

Notably, “digital competence” first rose substantially in 2022, and its upward trajectory continued through 2023, pointing to rapidly growing, sustained interest in developing digital skills and literacy.

The temporal mapping provides insights into how research priorities shifted in response to emerging issues like the pandemic versus more persistent, steadily rising topics like digital competence development. The predominance of recent average publication years (2022 onward) for most keywords signals the currency of these research foci within the last two years.

3.3. Network analysis

The co-occurrence network (figure 1) reveals several noteworthy patterns in the connections between keywords that provide further insights into the relationships between research topics.

There is a strong linkage between the keywords “learning” and “level”, indicating close interrelation between research investigating learning processes and outcomes.

Similarly, “cloud” and “environment” are strongly connected, highlighting a joint focus on cloud-based technologies and online environments.

“Model” forms connections across multiple clusters, suggesting it is an interdisciplinary topic spanning conceptual frameworks, technologies, and research methods.

Meanwhile, peripheral keywords like “future specialist” and “virtual chemical laboratory” have fewer connections, pointing to their more siloed domain-specific nature.

“Digital competence” bridges the clusters related to technologies and conceptual models, showing it links these domains.

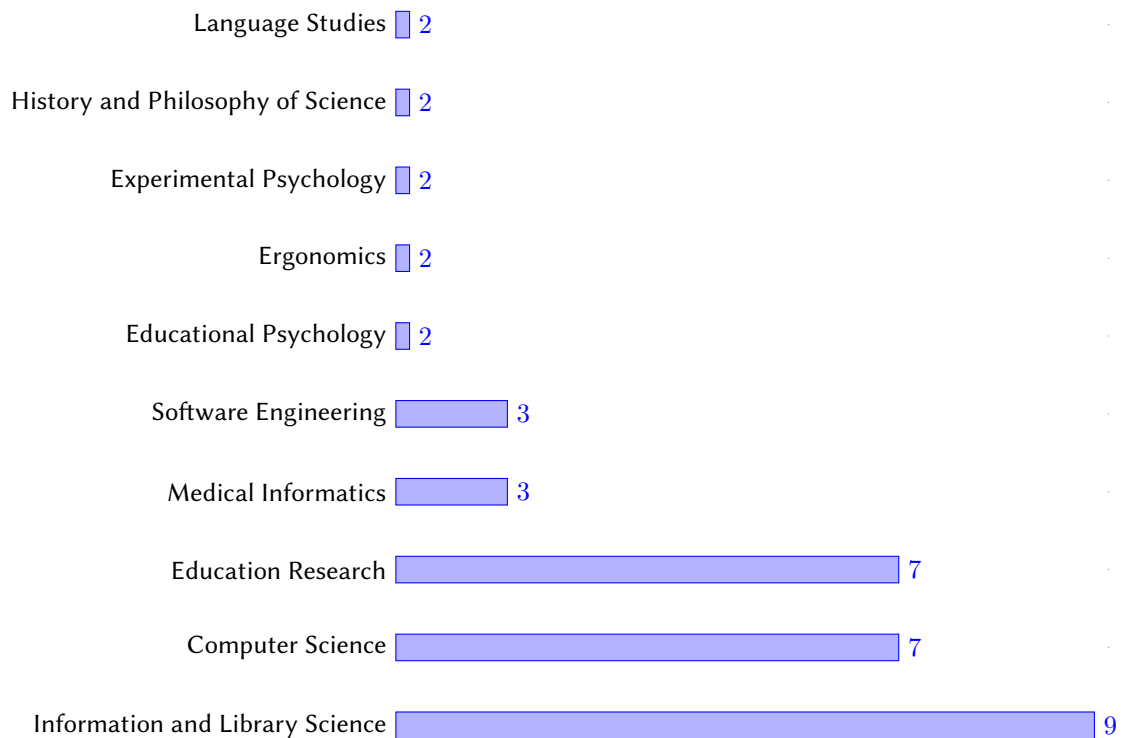


Figure 3: ETQ top subjects in 2021-2023 (<https://www.scilit.net/sources/123485>).

“Problem” also connects across clusters, indicating problem-solving research integrates topics from learning approaches to cloud tools.

Certain connections like “blended learning” – “practice” are weaker despite their shared cluster, revealing nuances in the associations between related keywords.

Network analysis reveals tightly interconnected topic communities and keywords that serve as bridges between clusters. It highlights cross-cutting ideas that may link disparate domains within educational technology scholarship. Analyzing these connections sheds light on the composition and relationships of research themes clustered based on their co-occurrence patterns.

The most common topics covered in the journal articles are shown in figure 3 (according to Scilit).

3.4. Geographic analysis

Analysis of the author affiliations provides valuable insights into the geographic distribution of research published in ETQ from 2021-2023 (figure 4).

Author affiliations spanned 13 countries, led by Ukraine (69%). In 2023, the proportion of contributions from Ukraine decreased to 50%, and the proportion of contributions from Middle Eastern and African countries grew from 0% in 2021 to 25% in 2023. This points to increasing global diversification, albeit with Europe still dominant.

Poland led in publications among European countries, reflecting the broader collaboration of Polish and Ukrainian universities in educational technology research.

4. Conclusion

This bibliometric analysis of ETQ research articles published from 2021-2023 provides quantitative evidence regarding educational technology research’s recent trends and evolving landscape.

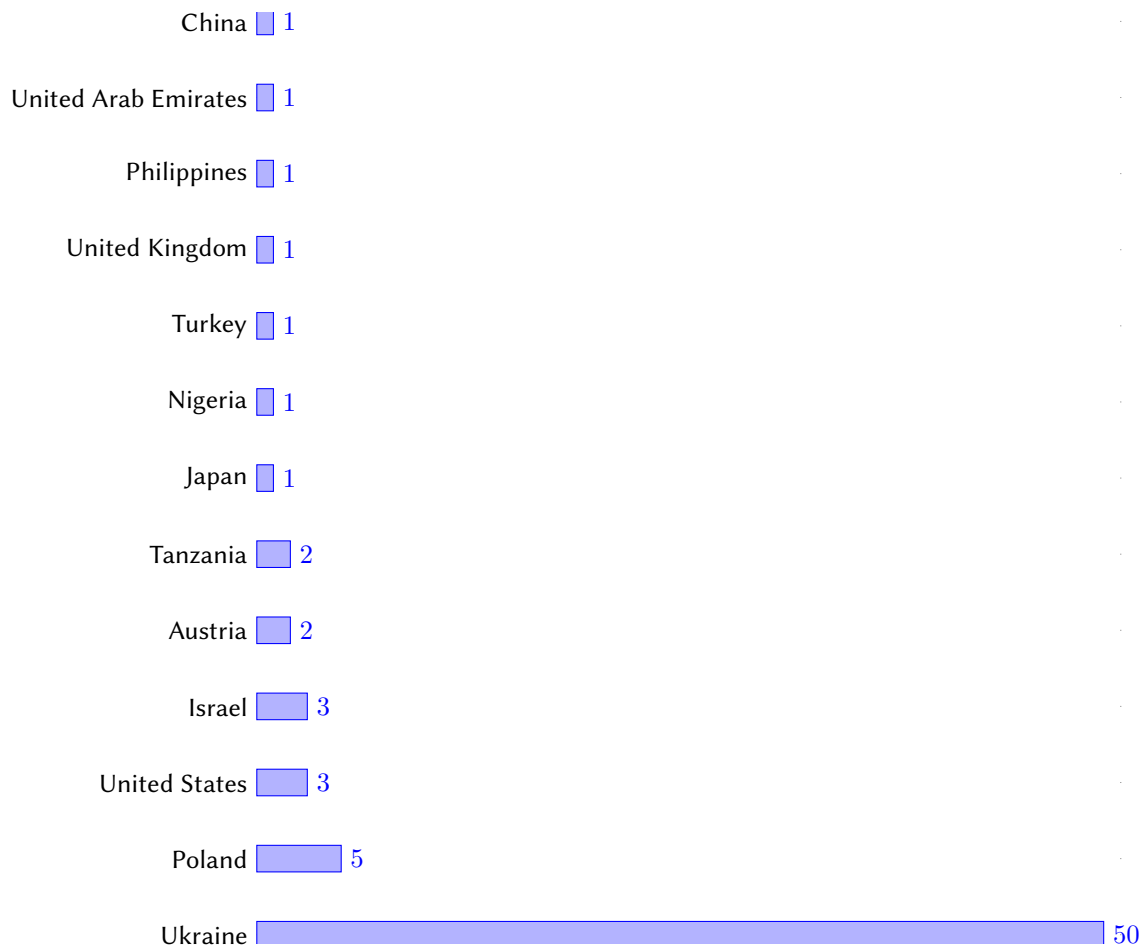


Figure 4: Publications by country.

Keyword analysis surfaced prominent topics such as blended learning, cloud computing, COVID-19 impacts, digital competence development, and learning environments. Network analysis revealed connections between cross-cutting ideas like problem-solving, learning processes, conceptual models, and cloud tools across cluster boundaries.

Temporal mapping illuminated enduring trajectories, as in the steady rise of digital competence, versus transient peaks of pandemic-driven priorities. Geographic patterns highlighted the persistence of traditional research powers amidst increasing global participation.

Together, these findings portray a research field adapting to current shocks like COVID-19 while still expanding in scope and attention on longer-term priorities like enhancing digital skills. They showcase ETQ's extensive coverage at the forefront of these developments.

However, this study represents only a preliminary bibliometric examination of recent ETQ literature. Further work could conduct more sophisticated statistical analyses of topic correlations and distributions. Moreover, associating observed patterns with broader technological and educational contexts could add explanatory power.

Comparative analysis against other educational technology journals may offer additional insights into ETQ's coverage and contributions vis-à-vis the broader field. Longer-term longitudinal tracking could reveal continuities and disruptions in focus areas over decades.

This paper provides a data-driven perspective into the foci and trends shaping current educational technology research, as ETQ's recent publications exemplify. The findings set the stage for more advanced and contextualized bibliometric studies that can unpack the forces and implications driving knowledge production in this dynamically evolving domain.

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