



Evidence syntheses in educational technology research: What is not published in English is not visible? A tertiary mapping review

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Abstract

Evidence syntheses, such as systematic reviews, aim to summarise the current state of research in a field, often using the publication language of a study as a criterion for inclusion or exclusion. However, this has serious implications for capturing evidence from a wider range of geographical areas, and the potential for linguistic bias. In order to explore this issue, a trilingual tertiary mapping review of 446 evidence syntheses within the field of educational technology (EdTech) and published in English, Spanish and German was undertaken, analysing the frequency of multi- and monolingual evidence syntheses, reasons for language choice by research teams, and the composition of research teams in multi- and monolingual evidence syntheses. Items were included if they were a form of evidence synthesis with an explicit method section, indexed within ERIC, Scopus, Web of Science, Dialnet, FIS-Bildung, or Google Scholar, education-related, and published between 1983 and May 2022. The results showed that only eight languages were considered in published syntheses, only five languages were used to construct search strings, most evidence syntheses included research published in English without explaining why, and multilingual research team composition did not predict multilingual evidence syntheses. The findings suggest the need to address publication languages not only as a formal criterion but as an integral aspect

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of methodological approach, influencing the content and scope of syntheses in educational research.

KEYWORDS

educational technology, linguistic bias, meta review, publication language, research methods, research synthesis, review of reviews, systematic review

Context and implications

Rationale for this study: Evidence syntheses (e.g. systematic reviews) often use publication language as an inclusion or exclusion criterion, which can lead to linguistic bias and influence our understanding of the state of research. This mapping review focuses on the field of EdTech, owing to the rapid growth of evidence syntheses published in the past five years.

Why the new findings matter: This review shines a light on the lack of consideration of linguistic bias within EdTech evidence syntheses, with most studies not addressing the issue at all. Taking both publication language and geographical focus into consideration when designing search strategies are two parameters that would make educational evidence syntheses more precise and fit for context and purpose.

Implications for researchers and practitioners: It is important for education researchers to conduct evidence syntheses that more consciously consider the limitations arising from confining reviews to one language, while equally not limiting the search to one geographic region. Researchers should ensure that a wide range of platforms are searched, that ideally capture a diverse range of teaching and learning experiences globally, as well as engage in international research collaborations that enable multilingual searching and extracting, or the use of translation software to augment research teams where multilingual teams are not possible.

INTRODUCTION

Evidence syntheses examine primary studies to identify research gaps and trends, and/or to appraise and synthesise findings, with the aim of promoting evidence-based practice (Sutton et al., 2019). Although methodological approaches differ, conducting a thorough and systematic search for literature through multiple databases is a prerequisite, with the aim of limiting researcher bias (Newman & Gough, 2020). The language in which research is published is a key aspect that evidence synthesis researchers must consider when designing their search strategy, as limiting research included in a review to one language only can increase bias and reduce the generalisability of findings (Berliner, 2002; Oakley et al., 2005). Within the medical field, this practice of limiting included studies to those published in English only was coined as the 'Tower of Babel bias' (Grégoire et al., 1995, p. 160) and is considered an extension of publication bias due to positive results being more likely to be published, as non-English-speaking authors were more likely to publish a study with null results in a local journal within their language community. Indeed, an analysis of 250 systematic reviews in the field of medicine (Jackson & Kuriyama, 2019), found that 34%

explicitly excluded non-English articles, 32% did not declare whether they excluded non-English articles although they did not include any, and while 34% claimed that they searched without language restrictions, only 22% of those included non-English trials, 'representing 2% of the total articles included in those studies' (p. 1388).

There has been a recent surge of evidence synthesis approaches used in the field of educational technology (EdTech), indicating 'an interest in the field in identifying what works and synthesising findings across contexts in a sea of articles that continues to grow' (Kimmons & Rosenberg, 2022, p. 134). In the subfield of artificial intelligence in education alone, 309 evidence syntheses with a methods section have been published in the last five years (Bond et al., 2024), and in their text-mining analysis of 2699 journal articles on EdTech research published in 2020–2022 (Allman et al., 2023), showed that the bigram's 'systematic review' and 'meta-analysis' are among the most frequently used methods, used in 4.7% and 7.3% of studies, respectively. However, there is a notable tendency for research from 'Western' contexts to be published in EdTech journals (Mertala et al., 2022), which is then reflected in reviews that synthesise that evidence (e.g., Bond et al., 2024). Given the recent finding that EdTech articles written in English by non-English authors often have different meanings within different contexts, despite using the same words (Marín et al., 2023), there is a pressing need to understand the specific role that publication language of primary studies plays in EdTech evidence syntheses. This not only has implications for the generalisability of evidence synthesis findings within the EdTech field, but it also has potential ramifications for educational research at large. To that end, this tertiary mapping review (Bond et al., 2024; Kitchenham et al., 2009) aims to understand how often multilingual search strategies are conducted within EdTech evidence syntheses, what purposes researchers give for choosing to do so, and whether the geographical location and research collaboration of authors has any impact on that decision.

LITERATURE REVIEW

This study combines the theoretical approach of world systems theory (Wallerstein, 2004) as an overarching framework alongside the critical theory of technology (Feenberg, 2009). This combination provides both a systems view and a lens through which a critical stance can be taken. World systems theory was developed in the social sciences to understand the world as divided into different regions defined by their role and position in the global economic and political system (Wallerstein, 2004). While certain countries are at the centre due to their great influence on the global commodity market and their political dominance, other countries are on the periphery and play a subordinate/dependent role. The semi-periphery is then formed by countries that occupy a middle position, whereby this status is potentially fluid and not fixed. World systems theory has been used in the study of higher education to delineate the academic profession in the so-called peripheral higher education systems and to outline its characteristic features (e.g., Altbach, 2016), as well as to describe academic publishing practices (Collyer, 2014, 2018) or the flow of international students (Barnett & Wu, 1995; Shields, 2013).

However, world systems theory is not uncontroversial when it comes to conceptualising research and research systems in a global perspective (Marginson & Xu, 2021):

By claiming that science is a zero-sum game and is determined by a fixed division of labor in a unique world system, it underestimates the potential of the agency of states and scientists in emerging economies. It also neglects institutions, language and cultural factors that perpetuate Eurocentrism.

(p. 8)

In support of this cautious stance, Marginson (2022) traced the development of publication patterns that have emerged in mid-sized higher education systems, which can be interpreted as the dynamics present in the semi-periphery that may not be explained by world systems theory.

English as lingua franca

Publishing research and disseminating knowledge to the scientific community and the wider society is an essential goal and part of the professional skills of researchers worldwide. However, the prominent role of English as a lingua franca in science can lead to potential linguistic bias and it can also be a barrier to career development (Englander & Uzuner-Smith, 2013). Journal publication guidelines have also made publishing more complex (Collyer, 2018), especially for researchers whose first language is not English (Amano et al., 2023). In part, social science researchers from the 'scientific periphery', tend to frame their research as case studies to fit within the framework of international journals (Baber, 2003), while researchers from 'scientific centres', such as the United States, tend to publish their research without further contextualisation, assuming its generalisability (Collyer, 2014). Not only the framing, but also the phrasing of English-language social science study titles support this imbalance, with studies originating from the Global South indicating their geographical location more often than studies from the Global North (Castro Torres & Alburez-Gutierrez, 2022). Amutuhaire (2022) points to systemic barriers in his critique of the 'publish or perish' concept applied to the African research context, not least in regard to available resources, including high publication costs and knowledge of English as unequally distributed. As Meneghini and Packer (2007) point out in their analysis of scientific communication in biology, '... many scientists in Africa, Asia, Latin America and Europe still publish their work in national journals, often in their mother tongue, which creates the risk that worthwhile insights and results might be ignored, simply because they are not readily accessible to the international scientific community' (p. 112). In an era where evidence synthesis approaches are growing rapidly (Buntins et al., 2023), identifying ways to mitigate this linguistic and geographical siloing is becoming more important than ever before (Giménez Toledo, 2024).

In a study of 300 epidemiological systematic reviews (Page et al., 2016), only 43% stated that they considered all languages, 31% explicitly included English-only studies, 10% declared that English and at least one language other than English was included, and 16% did not report any language criteria. These results were higher than those found in an analysis of 305 systematic reviews in psychology (Steil et al., 2022), which found that only 14 (6%) did not impose any restrictions on the language of studies included, and 133 (57%) stated that they only considered primary studies written in English. Twenty different languages were mentioned across the reviews, with the most cited being English, Spanish ($n=20$), French ($n=12$) and German ($n=8$). Although Jüni et al. (2002), Morrison et al. (2012) and Nussbaumer-Streit et al. (2020) found no systematic bias due to the exclusion of non-English language studies in the field of medicine, there is a strong argument that including multiple languages can capture the broadest possible spectrum for a given topic, thereby fulfilling the promise of systematic review research as being thorough and rigorous (Bahji et al., 2023; Stern & Kleijnen, 2020).

In an analysis of 123 social science reviews published by the Campbell Collaboration (Neimann Rasmussen & Montgomery, 2018), only 17 included non-English-language studies (14%), with these reviews more likely to be produced by international review teams. According to Jackson and Kuriyama (2019), resource constraints probably also contribute to the focus on English-language studies, which was also shown as a barrier in Neimann

Rasmussen and Montgomery's (2018) study. They also surveyed 47 review authors, who indicated that cost and time, lack of language resources and lack of language skills, followed by lack of access to non-English specialist databases were the most frequently cited barriers. At the same time, language resources, funding and time, training and guidelines for dealing with non-English studies, access to non-English subject databases and language skills were seen as facilitating the inclusion of studies in languages other than English.

Geographical and linguistic bias within EdTech evidence synthesis

While the examples presented thus far are from the medical field and the broader field of social sciences, the issue of including studies published in languages other than English in evidence syntheses also relates to EdTech research. Numerous syntheses, including those that are highly cited, have chosen to include only English-language peer-reviewed articles in their corpus and subsequent analysis (e.g., Ouyang et al., 2022; Zawacki-Richter et al., 2019). However, in addition to the linguistic issue, previous bibliometric studies have shown that frequently cited EdTech publications are predominantly from countries and regions of the world that are considered 'Western'. For example, in their analysis of 200 highly cited EdTech articles, Mertala et al. (2022) found that eight of the 10 journals examined were published by large (Western) publishers and that higher education was the most common research context in the sample. Based on the first author, 76.5% of all articles in the sample were from Europe, North America and Oceania, followed by Asia, while Africa and South Africa together accounted for only 2.0% of the articles in the corpus.

This geographical imbalance has also been confirmed by several other EdTech journal-specific bibliometric analyses (Table 1). For example, very low to non-existent research has been published from authors in South America, the Middle East and Africa in the *Australasian Journal of Educational Technology* (AJET; Bond, 2018), *British Journal of Educational Technology* (BJET; Bond et al., 2019), *Computers & Education* (C&E; Zawacki-Richter & Latchem, 2018), *International Journal of Educational Technology in Higher Education* (IJETHE; Bond, 2024), and the *International Review of Research in Open and Distributed Learning* (IRRODL; Zawacki-Richter et al., 2017). This also extends to an extent to research coming from authors in Oceania, which includes countries such as Fiji, Vanuatu and Papua New Guinea.

Not only the origin of EdTech research per author affiliation indicates a global imbalance in representation, but also the geographical distribution of study participants. Baek and Doleck (2024) show in their review of 360 empirical studies on learning analytics that the samples in these studies originate pre-dominantly from so-called 'Western, Educated, Industrialized, Rich, and Democratic' (WEIRD; Henrich et al., 2010, p. 61) countries ($n=269$) and only to a small extent from non-WEIRD countries ($n=91$). Similarly, analyses in related fields, such as human-computer interaction (Linxen et al., 2021) or human-robot interaction

TABLE 1 Author geographical distribution in the field of EdTech.

Journal	Time period	Africa	Asia	Europe	Oceania	Middle East	North America	South America
AJET	2013–2017	2%	39%	12%	39%	4%	15%	0%
BJET	2010–2018	4%	28%	47%	13%	6%	23%	1%
C&E	1976–2016	1%	20%	43%	4%	6%	24%	2%
IJETHE	2010–2024	3%	17%	54%	8%	8%	20%	7%
IRRODL	2000–2015	8%	11%	24%	6%	7%	42%	1%

(Seaborn et al., 2023) reveal that samples in empirical studies within these research areas are predominantly sourced from WEIRD societies. Using the concept of intersectionality, Seaborn et al.'s (2023) review additionally reveals that samples are often recruited from technology-savvy groups and with higher education backgrounds. However, as diverse populations are to interact with robots, the authors problematise current research practices with said focus on diversity. With education research being context-specific, conducted most often in the field rather than in experimental settings (Berliner, 2002), an imbalance comparable to the ones presented here could potentially yield unsuitable implications drawn from primary research as well as evidence syntheses. These results also suggest that evidence syntheses in EdTech research are called upon to carefully evaluate for which populations, educational settings and regions they can generalise their findings.

Research questions

Therefore, against this background, the following research questions guide this review:

RQ1. How often are multilingual evidence syntheses and multilingual search strategies conducted in the field of educational technology, how are they reported and how do they relate to each other?

RQ2. What reasons are given by researchers for carrying out multilingual or monolingual syntheses, and is this reflected in their methods?

RQ3. What role does the composition of research teams and the geographical focus of evidence syntheses play in conducting multilingual reviews?

METHODOLOGY

This tertiary mapping review (Garousi & Mäntylä, 2016; Kitchenham et al., 2009) was conducted using transparent and explicit methods (Gough et al., 2012; Zawacki-Richter et al., 2020), with the reporting in this article following the PRISMA reporting guidelines (Page et al., 2021) as closely as possible, and checked against the Quality of Evidence Synthesis Tool (see OSF¹ for the PRISMA and QuEST checklists). This review is part of a larger project on methodological rigour in EdTech evidence synthesis, with another review published exploring transparency of reporting and review reproducibility (Buntins et al., 2023), therefore some of the methodological reporting below will be identical.

Search strategy

The search was conducted in February and March 2022 and included studies in English, Spanish and German language. For English-language literature, the ERIC, Scopus and Web of Science databases were searched due to their comprehensive coverage of research (Gusenbauer & Haddaway, 2020), with Google Scholar also searched as a supplement. Spanish studies were searched via the Dialnet database, while German studies were searched via the FIS database, as they have both been used widely in evidence syntheses within their respective language communities (e.g., Steffens et al., 2017). The choice of the three languages follows a rationale derived from previous research and individual linguistic ability. Firstly, studies have shown that a vibrant Spanish language EdTech research

community exists, but whose findings are little read or shared beyond their own contexts (Marín & Zawacki-Richter, 2019). Secondly, distinct research topics are addressed within the Spanish, German and English-speaking scientific communities (Marín et al., 2023). Thirdly, despite being dated, a bibliometric analysis also revealed that prominent journals in the field of distance education are distributed in a core-periphery structure, favouring journals hosted in English-speaking countries (Zawacki-Richter & Anderson, 2011). Thus, in order to capture authors' decision-making with regard to publication language, we deemed it necessary to include syntheses published in English to capture the breadth of research, as well as in Spanish and German to delve more deeply into linguistically diverse communities. Fourth, in order to be able to screen studies for inclusion, understand linguistic nuances in the manuscripts and therefore support accurate data extraction, we relied on our respective native languages of English, Spanish and German. Including publication languages based on one's own capabilities, which in turn also facilitate access to local databases, is also one rationale for multiple publication languages in a synthesis (Neimann Rasmussen & Montgomery, 2018).

Search strings

Three different search terms were developed, derived from the preliminary work of the authors in different collaborations (Bond et al., 2020; Buntins et al., 2023). The Spanish and German search terms were developed on the basis of the English search string (Table 2). The Spanish search string (Table 3) had to be shortened to comply with the 50-word limit imposed by the Dialnet database, resulting in a more general representation of the three key elements (evidence synthesis, EdTech and education). The German search string (Table 4) was considerably simplified and shortened. This was done in collaboration with an information scientist from one of the author's universities.

Inclusion/exclusion criteria

An expansive perspective in defining evidence synthesis was deliberately adopted, as advocated by Sutton et al. (2019), although reviews had to have an explicit method section to be included (Table 5). The focus of the reviews needed to be on EdTech and related to teaching and learning. Those that were exploring the impact of EdTech in their personal lives, for example, were excluded. Reviews also needed to be published in journal articles, book chapters, reports or conferences. No time limits were imposed on any of the searches, with items identified from 1957 to March 2022.

Screening and sampling methods

Following searching in each database, 9050 English, 898 Spanish and 534 German language items were identified and imported into EPPI Reviewer (Thomas et al., 2023) where 3207 duplicates were automatically removed by the software (Figure 1). The first 100 remaining studies were screened on title and abstracted by five of the authors, resulting in a moderate Fleiss kappa score of $k=0.60$ (Landis & Koch, 1977). After clarifying differences, pairs of authors reviewed the remaining studies together to ensure broad agreement.

After screening 1311 studies, the decision was made to undertake a random sampling procedure for the English and Spanish corpora, owing to the scope of the project. The aim was to draw a sample that would estimate the parameters of the population within a

TABLE 2 English search string.

Evidence synthesis	('systematic review' OR 'scoping review' OR 'narrative review' OR 'meta-analysis' OR 'evidence synthesis' OR 'meta-review' OR 'evidence map' OR 'rapid review' OR 'umbrella review' OR 'qualitative synthesis' OR 'configurative review' OR 'aggregative review' OR 'thematic synthesis' OR 'framework synthesis' OR 'mapping review' OR 'meta-Synthesis' OR 'Qualitative Evidence Synthesis' OR 'Critical Review' OR 'Integrative Review' OR 'Integrative Synthesis' OR 'Narrative Summary' OR 'State of the Art Review' OR 'Rapid Evidence Assessment' OR 'Qualitative Research Synthesis' OR 'Qualitative Meta-Summary' OR 'Meta-Ethnography' OR 'Meta-Narrative Review' OR 'Mixed Methods Synthesis' OR 'Scoping Study' OR 'Systematic Map')
AND	
Educational technology	('education*technology*' OR 'digital technology*' OR 'ICT' OR 'computers*' OR 'information and communication*' OR 'digital media' OR 'online learning' OR 'blended learning' OR 'distance learning' OR 'remote learning' OR 'distance education' OR 'mobile learning' OR 'online education' OR 'social media' OR 'e-learning' OR 'learning analytics' OR 'Facebook' OR 'technology' OR 'e-learning' OR 'multimedia learning' OR 'media in education' OR 'interactive learning environments' OR 'computer-mediated communication' OR 'virtual reality' OR 'distance learning' OR 'human-computer interface' OR 'gamification' OR 'game-based learning' OR 'learning analytics' OR 'Facebook' OR 'technology' OR 'e-learning' OR 'multimedia learning' OR 'media in education' OR 'interactive learning environments' OR 'computer-mediated communication' OR 'virtual reality' OR 'distance learning' OR 'human-computer interface' OR 'gamification' OR 'game-based learning' OR 'distance learning' OR 'learning environments' OR 'technology integration' OR 'multimedia/hypermedia systems' OR 'intelligent tutoring system*' OR 'flipped classroom' OR 'flipped learning' OR 'multimedia' OR 'evaluation of CAL systems' OR 'MOOC*' OR 'computer-supported collaborative learning' OR 'distance learning and telelearning' OR 'serious game*' OR 'learning management system*' OR 'LMS' OR 'CSCL' OR 'm-learning' OR 'human-computer interaction' OR 'computer science education' OR 'architectures for educational technology system' OR 'distributed learning environment*' OR 'Moodle' OR 'online teaching' OR 'technology-enhanced learning' OR 'adaptive learning' OR 'open educational resources' OR 'OER' OR 'technology enhanced learning' OR 'digital technology*' OR 'virtual environments' OR 'web-based learning' OR 'video games' OR 'augmented reality' OR 'educational games' OR 'massive open online course*' OR 'computer-assisted teaching' OR 'information and communication technologies*' OR 'open education' OR 'virtual learning environment*' OR 'distributed learning' OR 'learning technologies' OR 'educational robotics' OR 'computer-assisted learning' OR 'online educational video games' OR 'educational videos')
NOT	
Outside the scope of application	(smoking OR clinic* OR pathology OR telemedicine OR telehealth OR inflammation OR patient* OR neurology* OR disease* OR 'mobile health')

TABLE 3 Search term in Spanish language.

Evidence synthesis	('meta-análisis' OR 'metanálisis' OR 'metaanálisis' OR 'metarevisión' OR 'meta-revisión' OR 'revisión' OR 'síntesis cualitativa' OR 'meta-síntesis' OR 'metasíntesis')
AND	
Educational technology	('tecnologi*' OR 'ordenador*' OR 'computador*' OR 'TIC' OR 'digital*')
AND	
Education	('educa*' OR 'aprend*' OR 'enseña*' OR 'docen*')

TABLE 4 Search term in German language.

Evidence synthesis	('Review*' ODER 'Synthes*' ODER 'Meta-Analyse' ODER 'Metaanalyse' ODER 'Metanalysen' ODER 'narrative summary' ODER 'Meta-Ethnographie' ODER 'scoping study' ODER 'systematische Übersichtsarbeit' ODER 'Literaturstudie' ODER 'Übersichtsarbeit' ODER 'Meta-Synthese' ODER 'systematisches Literaturreview' ODER 'Literaturüberblick' ODER 'systematische Übersicht' ODER 'Second-Order-Review')
AND	
Educational technology	('Bildungstechnolog*' ODER 'Technolog*' ODER 'IKT' ODER 'ICT' ODER 'computer*' ODER 'Lerntechnolog*' ODER 'Informations- und Kommunikationstechnolog*' ODER 'augmentierte Realität*' ODER 'AR' ODER 'virtuelle Realität' ODER 'VR' ODER 'Bildungsroboter' ODER 'Bildungsrobotik' ODER 'Mensch-Computer-Schnittstelle' ODER 'Mensch-Computer-Schnittstellen' ODER 'intelligente Tutorensysteme' ODER 'intelligentes Tutorensystem' ODER 'Architektur*' für Bildungstechnolog*' ODER 'Moodle' ODER 'Lernmanagementsystem' ODER 'Lernmanagementsysteme' ODER 'Mensch-Computer-Interaktion' ODER 'learning analytics' ODER 'LMS' ODER 'Lernumgebung' ODER 'Lernumgebungen' ODER 'multimedia System')

TABLE 5 Inclusion and exclusion criteria.

Inclusion	Exclusion
Form of evidence synthesis	Primary research
Focus on educational technology	No focus on educational technology
Education-related (e.g. eAssessment, meta-analysis of experimental studies on teaching and learning)	Non-educational (e.g. students focusing on something in their personal lives—no connection to teaching and learning)
Journal articles, book chapters, reports and conference papers (both full and short papers)	Workshop papers, poster contributions, editorials
Has a method section	Has no method section

certain margin of error, using methods commonly used in the social sciences (Kupper & Hafner, 1989). To this end, the R package MBESS (Kelley et al., 2018) was used, assuming a margin of error of 5%, a power of half, and an alpha error of 5%. This sampling approach was applied separately to the Spanish and English corpora. German-language syntheses were screened in their entirety as it was assumed that many would not be eligible due to changes in search terms and the overall sample size would otherwise be quite small. In addition, the discrepancies in search terms in the German and Spanish databases are due to linguistic and search limitations, which may result in relevant records being overlooked. This process led to 734 items being screened on full text, with a final corpus consisting of 446 evidence syntheses.

Data extraction

Data extraction included publication details (publication type, publication year, journal name, language), author information (number of authors, country of author affiliation, first author's discipline, national or international author collaboration), review type (categorised based on self-classification and aligned with Sutton et al.'s, 2019 classification), geographic focus of the review and education level. Language-related data were partially coded according to the scheme used in Neimann Rasmussen and Montgomery (2018), with the full coding scheme available online at OSF.²

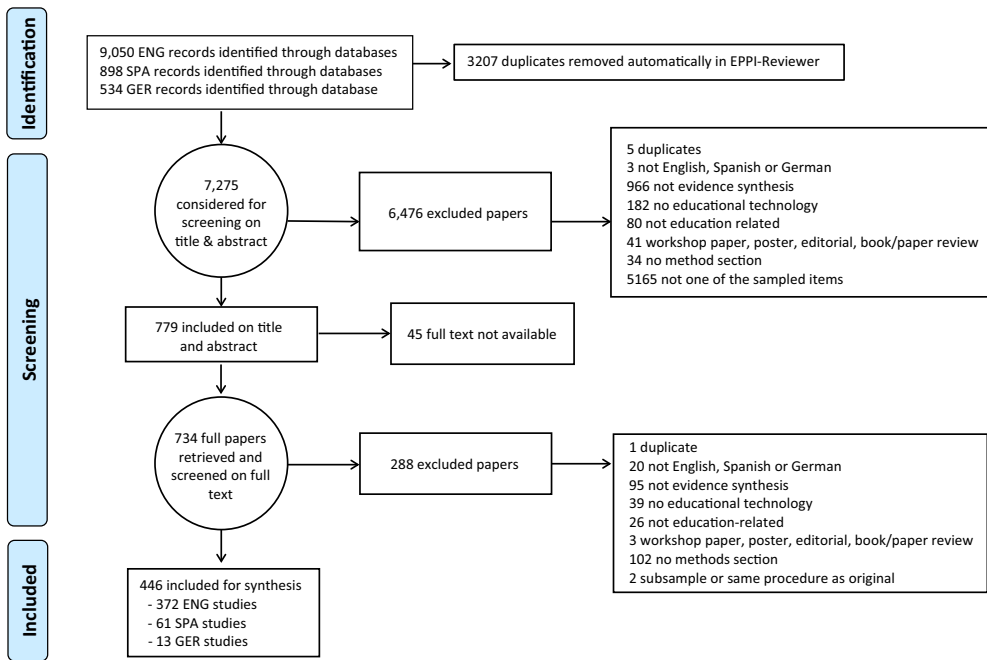


FIGURE 1 PRISMA flow chart.

Data analysis

The analytical tests included univariate and bivariate analyses. Only descriptive results were reported, with bivariate results reported only when the number of cases exceeded five. Percentages should be interpreted comparatively because of possible inaccuracies due to sample size, selection, and researcher bias. In order to further visualise the results and to provide an openly accessible and more transparent record of the coding undertaken, a web database was created³ using the EPPI Visualiser app within EPPI Reviewer. This database enables users to create their own frequency and crosstabulation reports, as well as export metadata and view full coding records of included items.

Methodological limitations

As with all evidence syntheses, there are some methodological limitations that must be acknowledged. Firstly, five reviewers covering English, Spanish and German languages participated in the searching, screening and coding of studies. Although this ensured a broader reach for publication languages compared to syntheses relying on only one language, it still means that the linguistic scope is limited. Secondly, data extraction and coding were limited to the information available within publications themselves and no additional searches were conducted to identify the author's discipline, country of origin, or type of study if this information was missing from the manuscript. While this caused information to be partially incomplete, it equally served to minimise inconsistent and non-systematic search for meta-information beyond the document. Thirdly, although all steps of the study were taken with the highest care and within author pairs, we cannot fully rule out that other reviewers would understand and extract information from the documents differently. Finally, efforts were made

to maintain representativeness during the applied sampling procedure, but it is important to acknowledge the limitation that not all publications included in the sample could be included.

FINDINGS

Study characteristics

Most studies were published in 2021 (Figure 2) and are articles ($n=397$, 89%), followed by proceedings ($n=33$, 7%), book chapters ($n=10$, 2%), reports ($n=4$, 1%) and dissertations ($n=2$, less than 1%). Based on the authors' classification of reviews, 28 different types of reviews were identified, with systematic reviews ($n=331$, 74%) being the most common. In terms of geographical distribution, most studies were written by researchers from Europe (36%; see Appendix A, Table A1), followed by North America (26%), Asia (22%), South America (16%), the Middle East (10%), and Oceania (5%), with the fewest studies hailing from Africa (3%). At the country level, most studies were written by authors in the USA ($n=95$, 21%), Spain (11%), Turkey (7%), China (7%), and Germany (5%; see Figure 3). It should be noted that studies from Germany and Spain are overrepresented due to the search strategy.

RQ1—Frequency, reporting and relationship of multilingual evidence syntheses and multilingual search strategies

Multilingual syntheses and research

Multilingual syntheses, i.e. syntheses that summarise research published in different languages and included as an explicit inclusion criterion, account for less than one-fifth of the syntheses in the corpus (17%, $n=77$), for example the systematic review on adaptive learning by Li et al. (2021), which included both studies written in English and Chinese. The other studies are either limited to publications in one language only (41%, $n=183$; e.g., Portuguese in Silva et al., 2017) or do not provide information on the publication languages of the research included (42%, $n=186$).

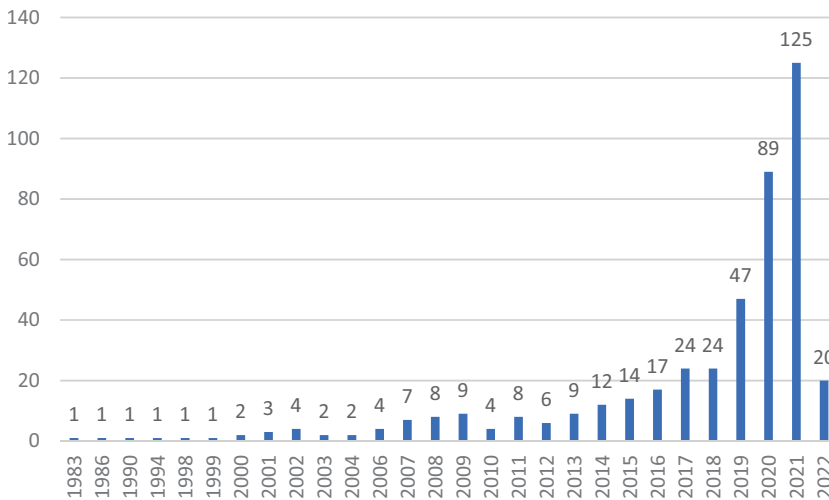


FIGURE 2 Publication years.

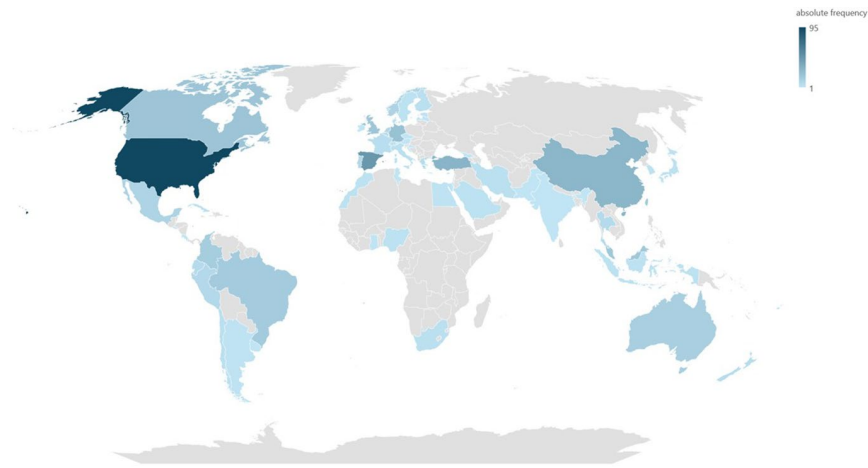


FIGURE 3 Origin of the research syntheses per country affiliation of all authors (see Appendix B)

As for multilingualism or monolingualism in the search terms used, a large proportion of syntheses either explicitly stated that search terms were only used in one language (36%, $n=161$), or did not explicitly mention languages included, but wrote the search string in a specific language (44%, $n=195$), with all but five of these written in English. For example, the systematic review on technology and education in museums by Llamazares De Prado and Arias Gago (2021) included a search string written only in English but specified that included studies could be written in English, French, German, Italian and Spanish. Fewer syntheses did not specify any languages used (11%, $n=51$), by not providing any kind of keywords or search string at all, and only 9% stated that search terms were used in multiple languages ($n=39$; e.g., Kröner et al., 2021).

Relationship between multilingual syntheses and multilingual searches

Of the 39 possible syntheses that used search terms in multiple languages, 32 are indeed multilingual, including both multilingual search terms and the inclusion of studies written in other languages. In one study (Cantuña Avila & Cañar Tapia, 2020), the search is written in a mixture of English and Spanish, but the language of the included studies is Spanish. In 88 studies, only one language is used for both the search and the included studies, which is either explicitly stated or it can be reasonably assumed (Table 6). In 20 studies, however, the search string is monolingual (generally written in English), while the research included in the synthesis was published in several languages (e.g., Vega-Angulo et al., 2021).

English is the most frequently represented publication language when it comes to included studies in EdTech evidence syntheses (55%, $n=243$; see Table 7), followed by Spanish ($n=45$), 'any language' ($n=11$), German ($n=10$), Portuguese ($n=10$) and Turkish ($n=9$). When it comes to search strings, English is by far the most frequently used language (86%), with only a small number of studies providing search strings in Spanish ($n=34$), German ($n=10$), Turkish ($n=5$) and Portuguese ($n=4$). 11% of evidence syntheses did not provide a search string or any keywords used to conduct their search.

Table 8 depicts the multilingual syntheses. The percentage of total studies depends on the language used in the included studies and in the search term. Here too, English is the most common language, followed by Spanish, both in the included studies and in

TABLE 6 Relationship between multilingual syntheses and multilingual searches.

Is the review limited to...			
Search term only in one language?	Inclusion of studies in only one language?		
	Yes	No	Not specified
Yes	88	20	53
No	1	32	6
Not specified	6	3	42
Not explicitly, but written in a specific language	88	22	85

TABLE 7 Publication languages included in the searches and syntheses (*n*=446).

Language	As an inclusion criterion		Language of search string	
	<i>n</i>	%	<i>n</i>	%
English	243	54.5	384	86.1
Chinese	3	0.7	0	0
French	2	0.4	0	0
German	10	2.2	10	2.2
Italian	1	0.2	0	0
Portuguese	10	2.2	4	0.9
Spanish	45	10.1	34	7.6
Turkish	9	2.0	5	1.1
All languages	12	2.7	0	0
Not specified	186	41.7	51	11.4

TABLE 8 Publication languages included in multilingual searches and syntheses.

Language	As an inclusion criterion (<i>n</i> =77)			Language of search string (<i>n</i> =39)		
	<i>n</i>	% Due to multilingualism	% By language	<i>n</i>	% Due to multilingualism	% By language
English	65	84.4	26.6	38	97.4	11.5
Chinese	3	3.9	100.0	0	0.0	0.0
French	2	2.6	100.0	0	0.0	0.0
German	9	11.7	90.0	8	20.5	88.9
Italian	1	1.3	100.0	0	0.0	0.0
Portuguese	9	11.7	90.0	3	7.7	75.0
Spanish	43	55.8	95.6	26	66.7	81.3
Turkish	9	11.7	100.0	5	12.8	100.0
All languages	11	14.3	100.0	0	0.0	0.0

the search terms. Looking at this proportion, but also at the total proportion of the above-mentioned studies that included a specific language in the analysis or search, a different picture emerges. There are four languages that appear exclusively in multilingual overviews (Chinese, French, Italian, Turkish)—Turkish is particularly noteworthy due to the large

number of studies. For Spanish, Portuguese and German, this proportion is 90% or more. Only the overviews containing English studies present a significantly different picture. Here, only 27% of the studies are multilingual.

The pattern of results is similar for the search terms, with a few exceptions. The first is that the percentile ranks are lower, with the exception of Turkish and German. There were no searches at all in Chinese, French or Italian.

RQ2—Reasons and considerations for multilingual and monolingual syntheses

Reasons

In the vast majority of studies (94%, $n=420$), no reasons were given for the choice of language. Even excluding the 186 studies in which the language of publication of the included research was not mentioned at all, there were still 235 studies that gave no reason for focusing on specific languages. In the 25 syntheses that gave reasons for choosing a particular language of publication for inclusion in the study, eight different groups of reasons can be identified (Table 9). The most common reason is that English is a ‘worldwide recognised international language’ (Velasco & Valente, 2020, p. 1287) or that it is the language of science. For example, Yu (2022) states, ‘Those written in languages other than English were not included, because English is the main medium for the dissemination of knowledge’ (p. 22).

Considerations on limitations due to the publication language of the research included

The choice of language, but also the choice of search terms and databases, suggests that there may be bias in one direction or the other. Only 11% of the studies address this as a limitation, the vast majority do not (Figure 4). Of the 47 studies that consider language choice as a limitation, only one has a geographical focus, and eight studies are multilingual (17%), which is no more than in the overall corpus. In most cases, the language choice of the included studies or the search is only mentioned as a limitation without reflecting upon this limitation (e.g., Nesenbergs et al., 2021; Palalas & Wark, 2020). The same happens in some multilingual syntheses where the choice of language is seen as a constraint without any further justification or evaluation of its impact (e.g., Lizárraga Juárez et al., 2021; Manzano-Leon et al., 2021). However, there are syntheses that suggest a link between language constraints

TABLE 9 Reasons for the choice of language.

Reason	<i>n</i>	Example
English is the language of science	7	Yu (2022)
Increasing efficiency/limiting resources	5	Alkis et al. (2014)
Lack of understanding of other languages	5	Granić and Marangunić (2019)
Taking a global perspective	4	Al-Samarraie (2019)
Quality assurance	4	Chernikova et al. (2020)
No possibility of translation	1	Muirhead et al. (2021)
Mother tongue	1	Sánchez Vera et al. (2017)
Undetermined difficulties	1	Means et al. (2013)

Do the authors comment on or reflect the language decision of their study?

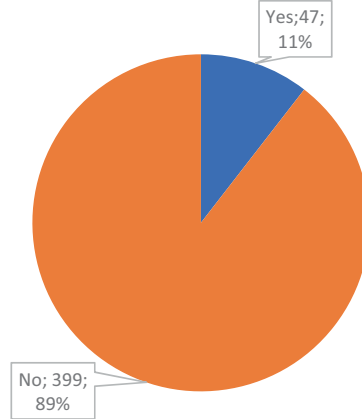


FIGURE 4 Comments on linguistic decisions.

Do authors comment or reflect about the geographical limits of their study?

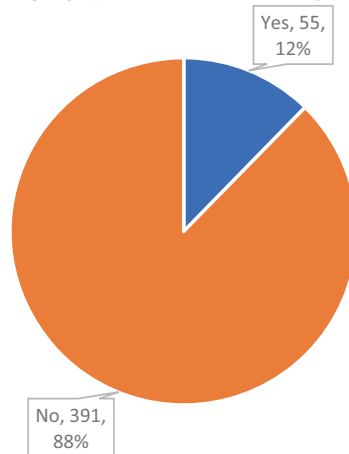


FIGURE 5 Comments on the geographical boundaries.

and potential geographic issues (e.g., Manzano-Leon et al., 2021; Valle et al., 2021) or that argue for consideration in future research (e.g., Murchan & Siddiq, 2021).

Geographical focus and considerations on limitations due to geographical focus

Of the 446 studies, only 12% refer to their geographical limitations, while the majority do not (Figure 5). Of these 55 studies, 17 had a specific geographical focus as part of their synthesis (31%). The limitations can be divided into three major categories: (1) cross-cultural differences, (2) geographical limitation due to study design, and (3) geographical limitation due to the studies found. For cross-cultural differences, it is mentioned that the review intentionally combined different cultural groups to compare them with another

cultural group (e.g., Scherer & Teo, 2019). Other authors only looked at one country or world region and therefore state that they cannot make generalisations beyond this context (e.g., Clinton, 2019; Nieding & Klaudy, 2020). The limitations of geographical restriction by study design primarily summarise the selection of specific studies from a particular area; for example, Delere (2020) suggests that the choice of language also limits the geographical focus, while Venn et al. (2020) indicate that the study is simply limited to a specific area. There are studies that did not intend to narrow their geographical focus a priori but found that regions of the world are very diverse and often very westernised (e.g., Escobar et al., 2018; Zawacki-Richter et al., 2009). In some of these syntheses, this fact is attributed to the lack of studies from specific regions of the world (e.g., Hernández Campillo et al., 2021; Humanante-Ramos et al., 2017).

RQ3—The role of research team composition and geographical focus in conducting multilingual evidence syntheses

Geographical distribution of authors

The analysis of geographical authorship distribution reveals that Spanish and Latin American authors in particular search in more than one language (Table 10), which is also very common in Turkey with 33.3%. In contrast, multilingual searching is comparatively rare in the US and Taiwan. However, the figures in key countries are also rather low. There are also a large number of countries where no multilingual studies are included at all. This applies, for example, to the United Kingdom or Australia, i.e. English-speaking countries. The search

TABLE 10 Geographical distribution of authors.

Country	As an inclusion criterion		Language of search string		Number of studies per country
	<i>n</i>	% of studies by country	<i>n</i>	% of studies by country	
Spain	27	57.4	12	25.5	47
Argentina	1	50.0	1	50.0	2
Cuba	2	50.0	3	75.0	4
Mexico	5	45.5	5	45.5	11
Colombia	5	33.3	2	13.3	15
Morocco	1	33.3	0	0.0	3
Turkey	10	33.3	5	16.7	30
Brazil	5	31.3	1	6.3	16
Chile	1	25.0	0	0.0	4
Peru	2	25.0	1	12.5	8
Portugal	2	22.2	1	11.1	9
France	1	20.0	0	0.0	5
Germany	4	18.2	3	13.6	22
China	5	17.2	0	0.0	29
Ecuador	1	14.3	2	28.6	7
Canada	1	5.0	0	0.0	20
Taiwan	1	5.9	0	0.0	17
USA	2	2.1	0	0.0	95

strings for studies shows a similar picture, but with significantly fewer studies that are multilingual searches.

Number of authors

Table 11 shows a breakdown of the number of authors involved in each synthesis, divided into syntheses that included studies from more than one language and into those that searched in more than one language, indicating how large the multilingual proportion is in comparison to the total number. The largest proportion of multilingual syntheses is written by two authors. However, the largest proportion of studies based on multilingual studies is more than six authors, followed by single authorships. A comparison across all studies does not provide a clear pattern. It cannot be concluded that there is a clear correlation between the number of authors and the multilingualism of the included studies. The results are somewhat different for the search string. Here it can be described descriptively that the fewer authors, the higher the multilingualism in the search, although the effects here are so small that the trend is not reliable.

Patterns of collaboration

In regard to the frequency of multilingual syntheses occurring according to collaboration type (Table 12), single authors and domestic collaborations had the highest rate. Somewhat surprisingly, when authors were from two or more completely different countries, no multilingual searches were conducted, with only 7.8% of domestic and international collaborations including multilingual research as an inclusion criterion, and only 3.9% of domestic and international collaborations using multilingual search strings. This indicates a particularly weak link between international collaboration and multilingual research in EdTech evidence synthesis.

DISCUSSION

This tertiary mapping review sheds light on the role that the language of publication in educational technology research plays in the synthesis of empirical evidence. The proportion of multilingual and monolingual evidence syntheses was presented descriptively (RQ1), the

TABLE 11 Number of authors in multilingual evidence syntheses.

Number of authors	As an inclusion criterion		Language of search string		Number of authors
	<i>n</i>	% by number of authors	<i>n</i>	% by number of authors	
1	16	22.9	12	17	70
2	22	17.3	14	11	127
3	20	18.5	12	11	108
4	6	8.5	1	1	71
5	5	17.2	0	0	29
6	2	10.0	0	0	20
>6	6	28.6	0	0	21

TABLE 12 Cooperation patterns in multilingual research syntheses.

	As an inclusion criterion		Language of search string		n Type of cooperation
	n	% According to type of cooperation	n	% According to type of cooperation	
No collaboration (single authorship)	16	22.8	12	17.1	70
Domestic collaboration (authors from the same country carried out the synthesis together)	56	18.6	24	8.0	301
International collaboration (authors from different countries worked together)	0	0.0	0	0.0	18
International and national collaboration (collaboration between authors from different countries and within the same country)	4	7.8	2	3.9	51
Cannot be found/country unclear	1	16.6	1	16.6	6

reasons given by the authors for the inclusion and/or exclusion of research published in specific languages were identified (RQ2) and potential predictors of multilingual syntheses (RQ3) were analysed.

The overarching finding of this review is that the authors of EdTech evidence syntheses give little to no consideration of the issue of publication languages of included research. The majority of studies do not address this issue at all, look for research in only one language of publication, and use predominantly one language, English. There is also a lack of justification for the selection or exclusion of studies. Where reasons are given for the inclusion or exclusion of particular languages, these are mostly pragmatic in nature—the geographical focus of a research synthesis or also the increase in efficiency. While Baber (2003) postulates that research from countries that are considered scientific centres is often presented without adequate contextualisation, this can be stated analogously for the synthesis of English-language publications in EdTech.

In the studies that report on the publication language of their included research, there is a core and peripheral structure that confirms the general idea of world systems analysis (Wallerstein, 2004) for the field of academic publishing in EdTech research. English is the leading language: almost all studies examined provided an English search string and included English-language studies. Only a fraction of syntheses searched in more than one language or included studies in more than one language, for example Spanish language evidence syntheses also searching in English and including English-language studies. This reinforces the finding that the Spanish-speaking scholarly community in this field receives and integrates English-language research but is largely overlooked by the English-speaking scholarly community (Marín & Zawacki-Richter, 2019). However, in line with the critique that world systems theory cannot explain the agency of emerging economies (Marginson & Xu, 2021), Turkey and China are reflective examples that the concept of hegemony may be more appropriate here (Kondakci et al., 2018; Oldac, 2022). In the context of global publication trends, China even ranks alongside the United States in terms of influence on science systems in the Muslim world (Oldac, 2023). These current trends require further investigation to recognise their linearity or increase in the long-term perspective.

Interestingly, there are only a few syntheses in the current corpus that aim to summarise the research under a specific regional focus. Given that education is context-bound (Berliner, 2002) and that formal education functions systematically differently in different countries, this raises questions in terms of the critical theory of (educational) technology (Feenberg, 2009). As evidence syntheses often attempt to provide results that are applicable in practice (Munk et al., 2023), the results of this study suggest that the lack of specification of context potentially hinders the application of the evidence gathered.

With 7168 languages currently in use in the world (Ethnologue, 2023), the evidence syntheses in our corpus relied on only eight explicitly named languages when synthesising research: English, Chinese, French, German, Italian, Portuguese, Spanish and Turkish. This fact raises questions about the inclusivity of the global research community and the potential knowledge gaps that may result from limited linguistic diversity, especially when considering syntheses that claim to summarise the current state of knowledge on a particular research question. Previous research from the medical field suggests strategies to mitigate the restriction of English-only publications, for example:

Papers written in French or Spanish were read by the authors. Papers in other languages were translated by colleagues or professional translators.

(Grégoire et al., 1995, p. 160)

Stern and Kleijnen (2020) suggest to 'work closely with a person who can read the language and facilitate identification and extraction of the required information' (p. 1819). In the

field of EdTech research, the inclusion of (primary) research in languages other than English should be recognised as a political desideratum (Macgilchrist et al., 2022), suggesting that automated translation could be a way forward.

This study also examined the nature of collaboration and the geographical location of authors in relation to multilingual evidence syntheses. Surprisingly, and contrary to findings in Neimann Rasmussen and Montgomery (2018), the analysis showed that collaboration between researchers from different countries tended to result in a low proportion of multilingual syntheses. In contrast, affiliation with an institution in a non-English-speaking country seems to be more likely to lead to a multilingual review (e.g. Conte et al., 2021). However, the numbers are still low. Overall, this confirms Gobbo and Russo's (2020) view that academia is increasingly monolingual, i.e. in English: 'The academic world is becoming a monolingual environment, which requires appropriate reflection at the linguistic and sociolinguistic level, at the epistemological and pedagogical level, and at the historical level' (p. 203, 204). This not only shows in research results but is also true for the actual collaboration between international researchers (Bond et al., 2021).

Implications for future evidence syntheses

Based on this review, the following recommendations are provided for future evidence syntheses in EdTech and the wider educational field:

1. To advance the theoretical framing of (EdTech) research, consideration must be given to the context, global positioning and the aim of the synthesis when developing the search strategy.
2. Wherever possible, research in any language should be considered and international collaborations should take advantage of multilingual abilities to construct and use multilingual search strings.
3. Syntheses should not impose language restrictions in the search string or when searching within databases, but rather they should have this as an exclusion or inclusion criterion if limiting to certain languages (Pieper & Puljak, 2021), alongside explicit reasons for why this decision has been made.
4. Where multilingual search strings are used, an example of each language string should be given in the text, with a full record-keeping log provided in an open online repository such as the Open Science Framework.
5. Translation software can be used to augment research teams, such as DeepL and Google Translate, to help facilitate the inclusion of a wider range of research.

Future research and next steps

Due to the design of the present study, it was not possible to investigate language-related potential bias, and further assessment of the extent to which bias effects occur is important. To do this, creating a more homogeneous study corpus in terms of content is a necessary prerequisite. In addition, the proportion of multilingual studies was too small to allow estimation of effects. It would be useful to investigate bias effects for specific subject areas.

The analysis has shown that the reasons why authors limit their synthesis to research in only one language of publication are rarely mentioned. Although this has been done to a certain extent in the wider field of social sciences (Neimann Rasmussen & Montgomery, 2018), in order to identify researchers' underlying justifications, primary research is needed into the

perspectives of authors of monolingual syntheses on their reasons and presumed effects are captured, either through qualitative interview research or quantitative approaches. A related aim would be to assess whether the issue of regional restrictions is actually of low relevance, or it is simply neglected. The assessment of different regions would be of particular interest.

It also seems necessary to take a closer look at the structure of author collaboration in evidence syntheses. It is important to develop an understanding of how they work together and whether reviews differ when different competencies or perspectives are involved, especially when considering international research collaboration (Bond et al., 2021). This also means broadening the view to include analysis of the academic systems in which authors operate (Collyer, 2014; Englander & Uzuner-Smith, 2013) and incorporating these as contextual factors that shape academic work and publication patterns, specifically as part of the macrosystem and exosystem of international research collaboration (Bond et al., 2021).

With the intention of advancing the methodological development of evidence syntheses, particularly in educational science and EdTech research, it seems advisable to establish standards that provide explicit guidelines for the consideration and inclusion of multiple languages of publication. An understanding of when to include which languages in evidence syntheses should be developed, and conscious thought should be given to the geographical, pedagogical and content area for which statements are to be made.

CONCLUSION

This study provides the gateway to a more in-depth discussion and analysis of the role that publication language, subsequent knowledge representation, and contextualization of research play in EdTech and wider educational research. Given that evidence syntheses are currently experiencing strong interest from researchers (Kimmons & Rosenberg, 2022), it is important to make authors aware of the multiple consequences of including or excluding studies based on publication language, and that further consideration should be given to the methodological design of evidence syntheses. The lack of multilingual syntheses as well as the lack of contextualization and the associated lack of justification for decision-making regarding publication languages in the majority of syntheses in the current corpus indicate that there is an increased need to address these issues and also to consider them as part of the review process and quality criteria for peer reviewers and editors. Addressing them and realigning the focus of evidence syntheses to make a meaningful contribution to research and practice alike also means recognising the many different regional approaches to educational technology research and the diverse research communities working in this field.

AUTHOR CONTRIBUTIONS

Svenja Bedenlier: Conceptualization; writing – original draft; supervision; data curation. **Katja Buntins:** Writing – original draft; methodology; visualization; formal analysis; data curation. **Melissa Bond:** Writing – review and editing; data curation. **Marion Härtel:** Data curation; writing – review and editing. **Victoria Marín:** Writing – review and editing; data curation.

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CONFLICT OF INTEREST STATEMENT

The authors declare that they have no competing interests related to this study. Any association or financial involvement with organisations or institutions that have a direct financial interest in the issues or materials discussed in this manuscript is disclosed.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available in Open Science Framework at <https://osf.io/>. These data were derived from the following resources available in the public domain: Coding Scheme, https://osf.io/69tdy/?view_only=1c0870b73b614550bb48cb5475e90ccb. Data visualisation, https://osf.io/69tdy/?view_only=1c0870b73b614550bb48cb5475e90ccb.

ETHICS APPROVAL STATEMENT

No primary data were collected for this meta-meta-review and therefore ethical approval from an institutional review board was not required. All trials analysed were previously published and ethical standards were checked by the relevant journals.

PERMISSION TO REPRODUCE MATERIAL FROM OTHER SOURCES

Apart from the articles cited, no other external sources were used. The original sources have been properly cited where applicable.

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Endnotes

¹<https://osf.io/83vp7/>

²<https://osf.io/83vp7/>

³<https://eppi.ioe.ac.uk/eppi-vis/login/open?webdbid=670>

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APPENDIX A

TABLE A1 Geographical distribution of authors ($n=446$)

Rank	Country	Count	Percentage
1	United States	95	21.3
2	Spain	47	10.5
3	Turkey	30	6.7
4	China	29	6.5
5	Germany	22	4.9
6	Canada	20	4.5
7	UK	19	4.3
8	Malaysia	18	4.0
9	Taiwan	17	3.8
10	Brazil	16	3.6
11	Colombia	15	3.4
12	Australia	14	3.1
13	Hong Kong	12	2.7
14	Mexico	11	2.5
=	Norway	11	2.5
15	Netherlands	10	2.2
16	Portugal	9	2.0
17	Peru	8	1.8
18	Ecuador	7	1.6
=	Thailand	7	1.6
19	Greece	6	1.3
=	New Zealand	6	1.3
=	not findable	6	1.3
20	Belgium	5	1.1
=	France	5	1.1
21	Chile	4	0.9
=	Cuba	4	0.9
=	Denmark	4	0.9
=	Finland	4	0.9
=	Iran	4	0.9
=	Italy	4	0.9
=	South Africa	4	0.9
22	Indonesia	3	0.7
=	Japan	3	0.7
=	Morocco	3	0.7
=	Nigeria	3	0.7
=	Saudi Arabia	3	0.7
=	South Korea	3	0.7
=	Sweden	3	0.7

TABLE A1 (Continued)

Rank	Country	Count	Percentage
=	Switzerland	3	0.7
23	Argentina	2	0.4
=	Cyprus	2	0.4
=	Egypt	2	0.4
=	Estonia	2	0.4
=	Qatar	2	0.4
=	Singapore	2	0.4
24	Austria	1	0.2
=	Brunei Darussalam	1	0.2
=	Costa Rica	1	0.2
=	Croatia	1	0.2
=	Czech Republic	1	0.2
=	El Salvador	1	0.2
=	Fiji	1	0.2
=	Georgia	1	0.2
=	Ghana	1	0.2
=	India	1	0.2
=	Ireland	1	0.2
=	Israel	1	0.2
=	Latvia	1	0.2
=	Pakistan	1	0.2
=	Palestine	1	0.2
=	Tunisia	1	0.2
=	Uruguay	1	0.2
Rank	Continent	Count	Percentage
1	Europe	161	36.1
2	North America	115	25.8
3	Asia	97	21.7
4	South America	70	15.7
5	Middle East	44	9.9
6	Oceania	21	4.7
7	Africa	12	2.7

= indicates that the rank of the subsequent cells is the same.

APPENDIX B

Country	Absolute frequency
Argentina	2
Australia	14
Austria	1
Belgium	5
Brazil	16
Brunei Darussalam	1
Chile	4
Canada	20
China	29
Colombia	15
Costa Rica	1
Croatia	1
Cuba	4
Cyprus	2
Czech Republic	1
Denmark	4
Ecuador	7
Egypt	2
El Salvador	1
Estonia	2
Fiji	1
Finland	4
France	5
Georgia	1
Germany	22
Ghana	1
Greece	6
Hong Kong	12
India	1
Indonesia	3
Iran	4
Ireland	1
Israel	1
Italy	4
Japan	3
Latvia	1
Malaysia	18
Mexico	11
Morocco	3
New Zealand	6
Netherlands	10

Country	Absolute frequency
Nigeria	3
Norway	11
Pakistan	1
Palestine	1
Peru	8
Portugal	9
Qatar	2
Saudi Arabia	3
Singapore	2
South Africa	4
South Korea	3
Spain	47
Sweden	3
Switzerland	3
Taiwan	17
Thailand	7
Tunisia	1
Turkey	30
UK	19
United States	95
Uruguay	1
not findable	6