



# Research Trends and Readership Growth: a Brief Review of the Journal's First Five Years

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## Abstract

Since December 2018, the *Journal for STEM Education Research* had published five volumes from 2018 to 2022. In this editorial, I take a retrospective look at these volumes, summarize the journal's publication performance over its first five-year development, and share some insights with the broad international STEM education community.

**Keywords** Access · Impact · Readership · SCOPUS · STEM education research · Trends

## Introduction

In previous editorials (Li, 2021, 2022), I shared the journal's performance in terms of its publication growth, access, and citation metrics during the first 3 years (2018–2020) and then over 4 years (2018–2021). The journal's steady growth has demonstrated the ever-increasing support for and confidence in this journal from the broad international STEM education community.

In October 2022, the journal was accepted for inclusion in Scopus. It took the journal four publication cycle years from December 2018 to November 2022 to gain this performance recognition. It is a significant step in the journal's development.

In the following sections, I will provide a brief review of the journal's publications and performance over the past 5 years and discuss efforts to further its development.

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## Trends of the Journal's Publications from 2018 to 2022

The development in the journal's outputs over the years can illustrate its stability and growth potential, reflecting its ability to attract and publish high-quality articles. As the *Journal for STEM Education Research* (JSER) publishes articles in the grouped format of issues per volume, I will summarize the journal's publications in terms of both the number of issues per volume and the number of items published each year.

JSER published a total of 79 items in its first 5 years, averaging about 16 items per year. Figure 1 shows the journal's growth in terms of the numbers of issues and items published for each year, from December 2018 to December 2022. It should be noted that the journal published one combined issue (issues 1–2) with a total of 9 items in December 2018 for its first volume. The journal shows a steady growth in terms of both the numbers of issues and items published over its first 5 years. Even though the journal's free access has been discontinued since 2020 (Li, 2021), the journal was able to stabilize the numbers of issues and articles published with clearly visible growth since 2020.

The journal publishes several types of articles, including research articles (initially called "original paper"), research reviews (initially called "review paper"), research briefs, and book reviews (Li, 2018). Table 1 shows the breakdown of these 79 publications by article type for each year.

In terms of the types of publication, the journal has shown a consistent pattern over the years. The journal published mainly research articles, followed by editorials and book reviews. There is a noticeable shortage of research reviews and research briefs. Over recent years, there have been continuous and substantial advancements in STEM education research (Li et al., 2020c, 2022a). In conjunction with this development, the publication of research reviews started to increase in some other journals, e.g., the *International Journal of STEM Education* (Li

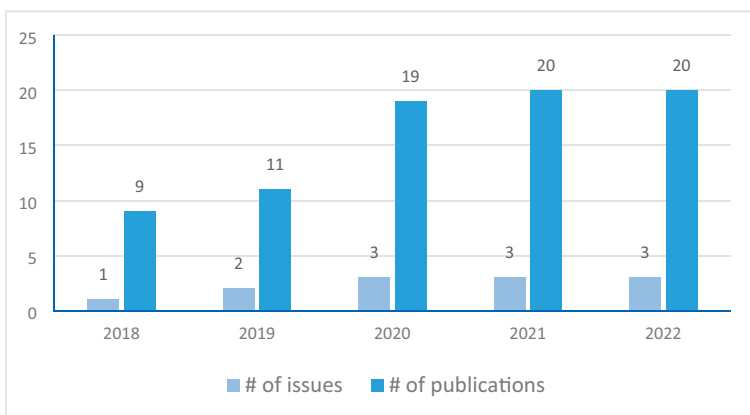


Fig. 1 Number of issues and number of publications by year

**Table 1** Number (percentage) of publications of each type by year

	Research articles	Research reviews	Research briefs	Others*
2018	7 (78%)	1 (11%)		1 (11%)
2019	9 (82%)			2 (18%)
2020	15 (79%)	1 (5%)	1 (5%)	2 (11%)
2021	13 (65%)		3 (15%)	4 (20%)
2022	16 (80%)	2 (10%)		2 (10%)
<b>Total</b>	<b>60 (76%)</b>	<b>4 (5%)</b>	<b>4 (5%)</b>	<b>11 (14%)</b>

\* including editorials, book reviews, and errata

& Xiao, 2022). JSER certainly likes to encourage the submission of many more research reviews, echoing what I mentioned in a previous editorial (Li, 2022).

## The Journal's Top 13 Most-Cited Articles in 2022

Going beyond the number of a journal's publications, we can learn about research development through identifying and examining some highly cited articles (Li et al., 2022b). Table 2 shows the top 13 most-cited publications in descending order. Out of 79 publications from 2018 to 2022, these articles (about 16%) were cited eight times or more (with an average of about 13.4) in 2022. Six of these 13 most-cited articles were not-openly-accessible (i.e., closed) publications, and the other seven were published with either open or free access. The result suggests that many of this young journal's publications have been well cited, even if they were not published with public free access. Moreover, among these 13 most-cited publications, four were published in 2018, five in 2019, three in 2020, and one in 2021. It is understandable that it takes time for published articles to get noticed and accumulate citations.

Table 2 also shows that the vast majority (10) of these 13 articles were contributed by scholars from the USA, consistent with what we learned from other literature reviews in STEM education (Li et al., 2022b). At the same time, it is important to note that three of the most-cited publications were contributed by scholars from other countries/regions (i.e., Germany, Hong Kong, and mainland China). The result suggests that STEM education research is also growing in other education systems, consistent with what we can learn from the authorship development trend in the *International Journal of STEM Education* (Li & Xiao, 2022). We hope that this journal can attract and publish more and more high-quality articles contributed by researchers from many more different education systems. It is critical to develop STEM education research with support and contribution from diverse researchers, educators, and readers worldwide.

In a previous editorial (Li, 2021), a list of the top 12 most-cited articles was also identified and examined. By comparing these two lists, Table 2 shows that a vast majority (10) of these 13 most-cited articles in 2022 were also on the most-cited article list in 2021. The result suggests that these articles (with bolded titles in

**Table 2** Top 13 most-cited articles in 2022\*

Title (year of publication)	Author(s) (country/region)**	Publication access type	Times cited in 2022
<b>Computational thinking is more about thinking than computing (2020a)</b>	Li et al. (USA)	Free access	36
<b>Design and design thinking in STEM education (2019b)</b>	Li et al. (USA)	Free access	24
<b>On computational thinking and STEM education (2020b)</b>	Li et al. (USA)	Free access	24
<b>On thinking and STEM education (2019)</b>	Li et al. (USA)	Free access	12
<b>Journal for STEM Education Research – promoting the development of interdisciplinary research in STEM education (2018)</b>	Li (USA)	Free access	11
Factors influencing student STEM learning: Self-efficacy and outcome expectancy, twenty-first century skills, and career awareness (2021)	Han et al. (USA)	Open choice	9
Youths' and adults' identity in STEM: A systematic literature review (2020)	Simpson et al. (USA)	Closed	9
<b>Kindergarten teachers' attitudes toward and confidence for integrated STEM education (2019)</b>	Tao (China)	Closed	9
<b>From teacher-designer to student-researcher: A study of attitude change regarding creativity in STEAM education by using Makey Makey as a platform for human-centred design instrument (2019)</b>	Chen et al. (Hong Kong)	Closed	8
How to foster functional thinking in learning environments using computer-based simulations or real materials (2018)	Lichti et al. (Germany)	Closed	8
<b>Bringing user experience design to bear on STEM education: A narrative literature review (2018)</b>	Minichiello et al. (USA)	Closed	8
<b>On classroom observations (2018)</b>	Schoenfeld et al. (USA)	Closed	8
<b>Classroom observations indicate the positive impacts of discipline-based professional development (2019)</b>	Viskupic et al. (USA)	Open choice	8

\* Citation counts in 2022 were retrieved from Springer Nature Insights/Dimensions. The number of citations in 2022 used to identify the top 13 most-cited articles, and an article title is bolded if the article was also identified and included in the 2021 list of top 12 most-cited articles (source: Springer)

\*\* Country/region refers to where the corresponding author's research organization or institution was located at the time of publication

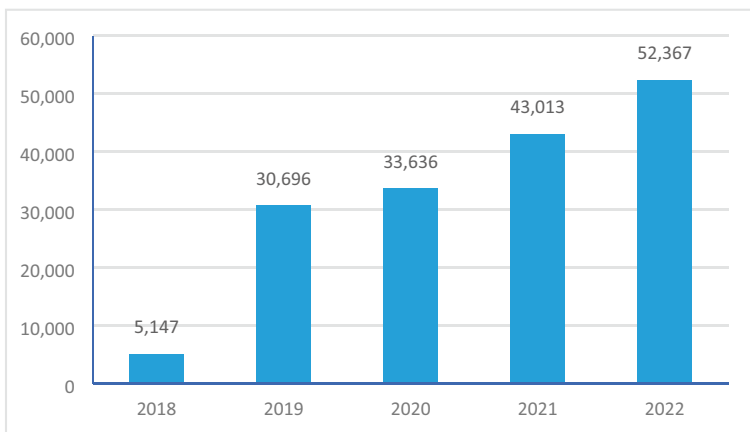
Table 2) have been consistently well received and cited by researchers in the broad STEM education community. It is also important to note that two of these 10 most-cited articles from both lists were contributed by scholars from outside of the USA, i.e., mainland China and Hong Kong, respectively (Chen et al., 2019; Tao, 2019).

Taking a closer look at these articles, we find that the vast majority of the 13 most-cited articles are clearly about STEM in general rather than one of the component disciplines of STEM. Consistent with what we learned from a previous editorial (Li, 2021), the journal has been recognized for its focus on interdisciplinary research in STEM education as originally designed (Li, 2018).

## The Journal's Publication Access Performance over the Years

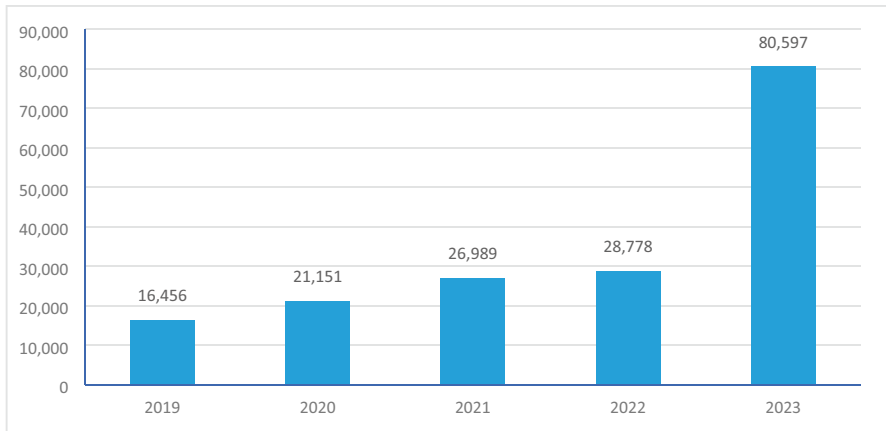
The journal's publication access performance provides a valuable measure of its visibility and impact. Figure 2 shows the total number of the journal's full-text article accesses by year. Not only has the number of accesses steadily increased over the years, but the figures for each of the years 2019, 2021, and 2022 also show a "jump" in comparison to other years. As the journal's articles are no longer freely accessible from 2020, it is reassuring that there was no drop in article accesses, and there actually was a slight increase from 2019 (30,696 accesses) to 2020 (33,636 accesses). There is a "jump" in accesses from 2020 (33,636) to 2021 (43,013) and again from 2021 (43,013) to 2022 (52,367). The access performance suggests that the journal's articles continue to be sought after by readers and researchers even without the free access since 2020.

With the number of full-text article accesses in the first eight months of 2023 available at this time, we can glimpse a possible publication access trend beyond



**Fig. 2** Number of full-text article accesses\* by year (source: Springer)

Note: \*Accesses are defined as the number of times full-text or PDF versions of articles are accessed directly from the journal website and SpringerLink. Downloads are defined as HTML, LookInside, PDF, and Epub clicks. Note that accesses do not include article downloads from mirror databases such as PubMed Central. The meaning of access is the same for the rest of the article



**Fig. 3** Number of full-text article accesses in the first eight months by year (source: Springer)

**Table 3** Distribution of full-text article accesses in 2022 and 2021 by geographic region

Geographic region	2022	2021
Asia–Pacific	40%	37%
North America	37%	39%
Europe	12%	13%
Africa	3%	3%
Latin America	3%	4%
Middle East	2%	4%

Source: Google Analytics

2022. Figure 3 shows publication accesses based on the first eight months from 2019 to 2023, respectively. It presents a trend of steadily increasing accesses over the years from 2019 to 2022, together with a huge jump in 2023. The trend provides a clear confirmation of the journal’s growing popularity in the broad STEM education community.

It is also important to examine the scope of the journal’s international reach. Table 3 shows the access distribution in percentages in 2022 and 2021 by geographic region. Asia–Pacific had the highest percentage of all publication accesses in 2022, followed closely by North America and then Europe, Africa, Latin America, and the Middle East. As noted before (Li, 2022), the journal enjoys a great international reach with room for further expansion in some regions, such as Latin America and the Middle East.

In comparison to publication access in 2021 (Li, 2022) and the first 3 years (see Li, 2021), it is important to note the increased percentage of access from the Asia–Pacific region that overtook North America for the first time as the #1 region to access this journal’s publications in 2022. It presents a pattern of access change similar to what happened with the *International Journal of STEM*

*Education* (Li et al., 2019a). If narrowing the access down to the country level, the USA remained the #1 country in accessing this journal's publications in each of the 5 years (2018–2022). But the percentage of access from the USA experienced a dramatic drop from 75% of all accesses in the journal's first 3 years to 36% in 2022. The result shows an international readership development trend for this journal, consistent with the readership development trajectory of the *International Journal of STEM Education* (Li et al., 2019a). It would be interesting to see if the publication readership trends will continue in the future.

## The Journal's Top 10 Most-Accessed Articles in 2022

JSER is a traditional subscription-based (“closed” as opposed to “open access” or “free access”) journal, with the option of open-access publication available. Access to the journal's publications has been restricted since 2020, when free access to “closed” publications was no longer provided. It is not surprising that the journal's most-accessed articles were those that were published as either open access or free access. As the top 10 most-accessed articles in 2021 were identified and discussed in a previous editorial (Li, 2022), we can identify and examine the top 10 most-accessed articles in 2022. By comparing the top 10 most-accessed articles in 2022 versus 2021, we can also glimpse possible trends in readers' interest.

Table 4 shows the top 10 most-accessed articles in 2022 in descending order, together with the number of accesses in 2021 if the article was also on the top 10 list in that year. It is not surprising to find out that all these most-accessed articles are either freely accessible or published as open access with a fee payment from the author(s). Among the top 10 most-accessed articles, the first six were also the most-accessed in 2021. Access to these six articles decreased from 2021 to 2022, except for two articles: one by Han et al. (2021) on factors influencing student STEM learning and the other by Li et al., (2020a, 2020b, 2020c) on computational thinking. The last four articles on the 2022 list (Campbell et al., 2021; English, 2022; Li, 2022; Pijls et al., 2022) were published more recently; thus, they were not able to make it to the 2021 top 10 list. Among these four articles, two of them are also about student STEM learning experience. The results provide an indication of readers' ongoing strong interest in articles on such topics, including students' STEM learning experiences and computational thinking.

The 2021 list of the top 10 most-accessed articles was all contributed by authors in the USA (Li, 2022). It is important to note that the 2022 list (see Table 4) includes two articles contributed by scholars in Australia and the Netherlands, respectively. The international expansion process is occurring in not only who accessed articles (readership), but also who contributed the most-accessed articles (authorship).

The list of top 10 most-accessed articles provides a lens for us to learn about research interests in STEM education. When it is compared with the list of the top 13 most-cited articles (see Table 2), we may gain further insights from their connections and differences. Across these two lists, it is interesting to find that the first 5 most-accessed articles (Han et al., 2021; Li, 2018; Li et al., 2019b, 2020a, 2020b) are also on the list of top 13 most-cited articles. The result confirms both the quality

**Table 4** Top 10 full-text article accesses in 2022 (2021)\*

Title (year of publication)	Author(s) (country/region)**	Publication access type	# of article accesses
Factors influencing student STEM learning: Self-efficacy and outcome expectancy, twenty-first century skills, and career awareness (2021)	Han et al. (USA)	Open choice	7050(2692)
Design and design thinking in STEM education (2019b)	Li et al. (USA)	Free access	6546(7714)
Computational thinking is more about thinking than computing (2020a)	Li et al. (USA)	Free access	3869(3362)
On computational thinking and STEM education (2020b)	Li et al. (USA)	Free access	3739(4271)
Journal for STEM Education Research – Promoting the development of interdisciplinary research in STEM education (2018)	Li (USA)	Free access	1688(1776)
Undergraduate student concerns in introductory STEM courses: what they are, how they change, and what influences them (2020)	Meaders et al. (USA)	Open choice	1632(2300)
Fifth-grade students' quantitative modeling in a STEM investigation (2022)	English (Australia)	Open choice	1347
Activities and experiences of children and makerspace coaches during after-school and school programs in a public library makerspace (2022)	Pijls et al. (Netherlands)	Free access	1309
Improved and sustained graduate programs diversity outcomes: A 10-year analysis and summary of the Brown university IMSD program (2021)	Campbell et al. (USA)	Open choice	1259
Elevating the journal's impact with international reach (2022)	Li (USA)	Free access	1247

\*Number of accesses in 2022 used to identify the top 10 most-accessed articles, and its number of accesses in 2021 is provided in parentheses if it was also included in the 2021 list of top 10 most-accessed articles (source: Springer)

\*\*Country/region refers to where the corresponding author's research organization or institution was located at the time of publication



of these articles and readers' strong interest in related topics. The other five articles (Campbell et al., 2021; English, 2022; Li, 2022; Meaders et al., 2020; Pijls et al., 2022) appear on the top 10 most-accessed article list but not on the top 13 most-cited articles. It should be noted that these five articles were published more recently. The limited time exposure likely made it more difficult for these articles to get high citations. At the same time, some articles on the top 13 most-cited list (see Table 2) are not on the most-accessed article list. The results suggest important differences in what we can learn from these two lists. While both provide an important lens for readers' and researchers' interest, one cannot be simply replaced by the other.

## Coda

This brief review of publications in the *Journal for STEM Education Research* over its first 5 years (2018–2022) revealed steady development in both publication output and international accesses. Although the journal has discontinued the public free access since 2020, the journal shows great resilience to continue its upward trend in attracting researchers and readers, especially in its international reach. The journal's performance in its publication accesses and citations provides important measures of the publication quality over the years. The acceptance of Scopus indexing in 2022 serves as a confirmation of the journal's quality and performance.

Although the journal has a limited number of publications over the first 5 years, the analyses of the top 10 most-accessed articles and top 13 most-cited articles suggest possible trends in research development, in terms of scholarly interest and attention from both readers and authors. In many ways, research and readership development trends reflected in this journal are consistent with what we can learn from reviews of other journals (e.g., Li & Xiao, 2022; Li et al., 2019a, 2022b).

The journal aims to promote the development of interdisciplinary research in STEM education, especially on frontier topics. Amidst the on-going significant technological advances, the incorporation of technologies in STEM education presents considerable opportunities and challenges. To meet the needs of scholarship development in the intersection between technology and STEM education, the journal initiated and published its first special issue with a focus on the "affordances and challenges of emerging technologies in STEM education" in 2023 (Chiu & Li, 2023). The journal continues to welcome more manuscript submissions in this important topic area.

Last but not least, I want to take this opportunity to thank all authors, reviewers, members of the journal's editorial board, Springer's staff, and readers around the world for your strong and ongoing support and contribution. This brief review reveals that the journal has been well received by researchers and readers worldwide. I sincerely hope that the journal will continue its growth as a forward-looking research platform for many more international researchers and readers in STEM education in the years to come.

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## Declarations

**Competing Interests** The author declares no competing interests.

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