Reflection of STEM Education on Finance, Economics, Management: A Bibliometric Analysis

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Abstract

The aim of this study is to reveal the reflections of STEM education studies, which are becoming a multidisciplinary field, in the fields of finance, economics and management by using data obtained from the Web of Science (WOS) database and bibliometric analysis methods. In the study, the data obtained from the Web of Science (WOS) database were classified and analyzed using VOSviewer (Version 1.6.18) and presented in a certain order with visual mapping method. The results of the analysis clearly reveal the reflections of STEM education studies in the fields of finance, economy, and management. Supporting the fields of finance, economics, and management, which assume important functions in the economic development process, with STEM education understanding will make positive contributions to this process. While the study makes an important contribution to the literature on the one hand, the results are expected to make important contributions to the field of education, as well as to the employees and policy decision makers in the fields of economics, finance, and management.

To cite this article: Kazak, H., Çiftçi, T. E., Koçyiğit, N., Topaloğlu, E. Özer, & Yenilmez, D. T. (2024). Reflection of STEM education on finance, economics, management: A bibliometric analysis. *Journal of STEM Teacher Institutes, 4*(1), 51-64. Retrieved from https://jstei.com/index.php/jsti/article/view/68

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Introduction

The STEM movement began in the early 1990s. Initially, the National Science Foundation used the acronym "SMET," but over time, for phonetic reasons, it came to be used as STEM (science, technology, engineering, and mathematics) (Martín-Páez et al., 2019). As a term, "STEM education" refers to teaching and learning in the fields of science, technology, engineering and mathematics, and typically includes educational and training activities in all schools and grades, from preschool to postdoctoral, and in both formal and informal classroom settings (Gonzalez & Kuenzi, 2012). Today, the STEM approach provides a holistic framework through new technologies and design-oriented thinking through an investigative process by integrating with all disciplines as an interdisciplinary learning method. Many titles such as art and STEM (Stroud & Baines, 2019), finance and STEM (Jamil & Seman, 2017; Marin & Vona, 2023), economics and STEM (Peng et al., 2021; Nguyen, 2023), space, technology and STEM (How, 2022) are examples of an integrated perspective. STEM education and employment, volunteerism, information-processing skills such as literacy, numeracy, and digital problem-solving skills-the holistic consideration of these indicators provides a comprehensive view of a nation's well-being, encompassing both societal engagement and economic development. This perspective aligns with the recognition that the health and vitality of a society goes beyond economic indicators alone, encompassing aspects of education, social engagement, and cognitive skills (Yamashita et al., 2023).

STEM education is a very important topic for many fields of social sciences. For this reason, in our study, we tried to address the studies on STEM education in the field of business finance economics and management. The main purpose of this study is to reveal the reflections of STEM education studies, which have become a multidisciplinary field, in the fields of finance, economics and management by using the data obtained from the Web of Science (WOS) database and bibliometric analysis methods. This aim is quite important. Finance is an important element of the economic development process. The fields of economics and management are other important

elements that support this process. Structuring the STEM education process in a way to support these fields will make significant contributions to the development process of countries. This study will provide a basis for all parties, especially those interested in the field of education, to make decisions. Reviewing the existing literature supported by mapping analysis and revealing the connections is expected to contribute to the decision-making processes of all relevant parties. The study consists of five chapters in total: Introduction, Methodology, Findings, Review of Other STEM Related Literature and Conclusion.

Method

In the study, a bibliometric analysis of the STEM field was conducted using the WOS database. Document analysis, which dates back to Goode & Hatt (1952) Goode as a social science research method and recommends that scientists scan, count and code document content and use them as appropriate evidence, can be defined as "a systematic procedure for examining and evaluating documents that involves finding, selecting, evaluating (making sense of) and synthesizing the data contained in documents" (Kazak, 2023).

The timeframe of the research covers the studies until January 2024 and the data were obtained from the WOS database. The time period of the research covers studies up to 2024/January and the data were obtained from the WOS database. They were classified and analyzed using VOSviewer (Version 1.6.18) and presented in a certain order by visual mapping method.

Our data collection process started with the identification of keywords that will determine the scope of our study. The identified keywords were examined and verified by 3 (three) expert academicians who are experienced in STEM education and have studies on this subject. The identified keywords were queried in the Topic (searches title, abstract and author keywords) field in the WOS database as used in bibliometric studies in the literature (İyibildiren et al., 2023; Kazak, 2023; Arik et al., 2023; Tsai & Wu, 2023). Accordingly, the keywords queried are "stem*" and "educat*". In addition, the following filters

were used in the database. Document Types: Article. Web of Science categories: Social Sciences Interdisciplinary (319 Studies) or Economics (298 Studies) or Management (239 Studies) or Business (135 Studies) or Education Educational Research (85 Studies) or Social Issues (70 Studies) or Social Work (66 Studies) or Social Sciences Mathematical Methods (12 Studies) or Business Finance (29 Studies). Some studies fall into more than one category and the total number of analyzed studies (Articles) is 1,067.

Findings

Author Citation Analysis

Table 1 shows that Eric A. Hanushek is the most cited author in this field. The author ranks first with 396 citations for 2 publications. This is followed by Ludger Woessmann with 2 publications and 396 citations, Junsen Zhang with 2 publications and 198 citations. Kevin

Shih, with 3 publications and the highest number of citations, ranks 7th with 156 citations, and Christopher S. Hayter, with 4 publications and the highest number of citations, ranks 13th with 62 citations.

In order to apply the author citation analysis in the mapping analysis, a minimum of 2 publications and 5 citations were set as criteria. The citation averages of the authors are given in Figure 1. The highest citation is shown in yellow color.

In this context, while 81 of the 2,752 authors in the field had 2 or more publications, 11 of the most intensively cited affiliate cluster members were subjected to analysis. In the analysis, concentration was determined for "Citation". In addition, layer mapping analysis was used to examine the current citations of the authors. The authors' link-layer analysis is shown in Figure 2.

Table 1

Author Citation Numbers

N	Author	Doc.	Citat.	N	Author	Doc.	Cit.
1	Hanushek, Eric A.	2	396	11	Golley, Jane	3	77
2	Woessmann, Ludger	2	396	12	Kong, Sherry Tao	2	76
3	Zhang, Junsen	2	256	13	Hayter, Christopher S.	4	62
4	Rico, Ramon	2	198	14	Cobb-Clark, Deborah A.	3	57
5	Sanchez-Manzanares, Miriam	2	198	15	Loeb, Susanna	2	57
6	Lundberg, Shelly	2	170	16	Speer, Jamin D.	2	56
7	Shih, Kevin	3	156	17	Delaney, Judith M.	2	44
8	Nielsen, Helena Skyt	3	149	18	Devereux, Paul J.	2	44
9	Joensen, Juanna Schroter	2	129	19	Altshuler, Sandra J.	2	43
10	Alajoutsijarvi, Kimmo	2	86	20	Dellaportas, Steven	2	40

Note. Source: Created by the authors using the VOSviewer program.
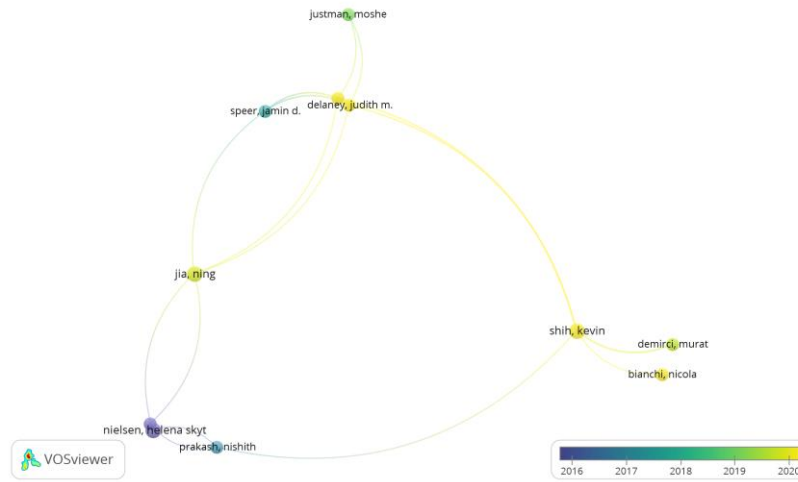
Figure 1

Author Network Map (Avg. Citations)

Note. Source: Created by the authors using the VOSviewer program.

Figure 2

Author Network Map

Note. Source: Created by the authors using the VOSviewer program.

As can be seen in Figure 2, "Kevin Shih" stands out among the authors with the highest number of citations and timeliness. In the visualization, the size of the author's circle and label indicate the high number of citations, while the "yellow" color of the circle represents its timeliness. Accordingly, the authors of other publications that remain current are: "Judith M. Delaney", "Paul J. Devereux", "Ning Jia", "Nicola Bianchi", as shown below.

Journal Citation Analysis

The top 5 ranking of STEM journals in terms of number of citations and publications is shown in Table 2 below. It is seen that the journal "Economics of Education Review" ranks first in terms of the number of publications and citations. The journal draws attention with 28 publications in the field and 803 citations to these publications. The high number of citations indicates that the journal is in an important position in terms of reliability. In this context, Economics of Education Review is an important journal that contributes to the related field. Although "Sage Open" ranks second with 20 publications, it can be stated that the number of citations is quite low. Similarly, "Qualitative Report" and "Social Sciences-Basel" journals can be interpreted. Although these journals also rank high in terms of the number of publications, the number of citations is quite low. Here, it is also important to evaluate and interpret the accessibility of the journals. "International Journal of Educational Management" ranks second in terms of the number of citations. The journal has 12 publications and 334 citations. "Journal of Human Resources" ranks third in the number of citations. The journal achieved its place in the ranking of the number of citations with 271 citations to 7 publications.

Table 2

Publication Numbers of Journals

Publication Numbers of Journals

Journal	Number of Publications	Number of Citations
Economics of Education Review	28	803
Sage Open	20	55

Qualitative Report	17	46
Social Sciences-Basel	17	39
American Behavioral Scientist	14	143

Note. Source: Created by the authors using the VOSviewer program.

Table 3

Citation Numbers of Journals

Journal	Number of Publications	Number of Citations
Economics of Education Review	28	803
International Journal of Educational Management	12	334
Journal of Human Resources	7	271
Small Business Economics	5	255
Journal of Labor Economics	10	239

Note. Source: Created by the authors using the VOSviewer program.

In the mapping analysis of journal citations, the constraint of providing at least 5 publications was determined for 546 journals. A total of 44 journals exceeding the relevant criterion were identified. In the analysis, some of the 44 journals were not related to each other, and 16 journals were subjected to mapping analysis. The analysis of the link layer of the journals is shown in Figure 3.

Figure 3

Journals Network Map

Note. Source: Created by the authors using the VOSviewer program.

As can be seen in Figure 3, 6 clusters, 25 links and 36 link strengths were created in the analysis. The weight in the analysis was determined as "citation". The journal "Economics of Education Review" in the visualization has 803 citations, 11 links with 11 journals and a total of 16 link strengths. Due to these characteristics, it is seen that it is positioned in the center of the visualization and its circle size stands out prominently. In the visualization, it was observed that the "Journal of Human Resources" has 4 links with 4 other journals in the field and 4 total link strengths. In addition, the number of citations for this journal is 271. Another journal, "Journal of Labor Economics", is behind the first two journals in terms of citations, although the number of journals it is linked to is 8 and the total link strength is 12.
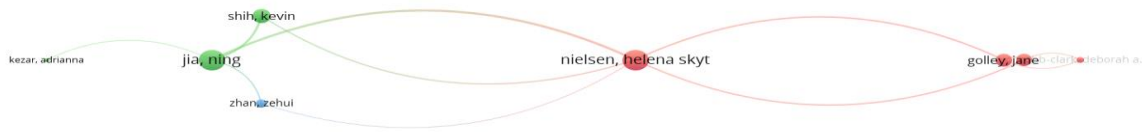
Bibliographic Matching Analysis

In this part of the study, the author network was revealed in terms of bibliographic matching. A mapping analysis program was used for bibliographic matching. In order to reveal the visualization, the authors were constrained to have at least 3 publications. Among a total of 2,752 authors, 10 authors exceeding the threshold were identified. In addition, 2 of the 10 authors could not establish a network connection with others and bibliographic matching was achieved for 8 authors. In the mapping analysis, 3 clusters, 11 links and 43 total link strengths were obtained. "Total Link Strength" was chosen as the weight parameter in the creation of the visualization. The author network link-layer analysis is shown in Figure 4.

Figure 4

Author Network Mapping Analysis in terms of Bibliographic Matching

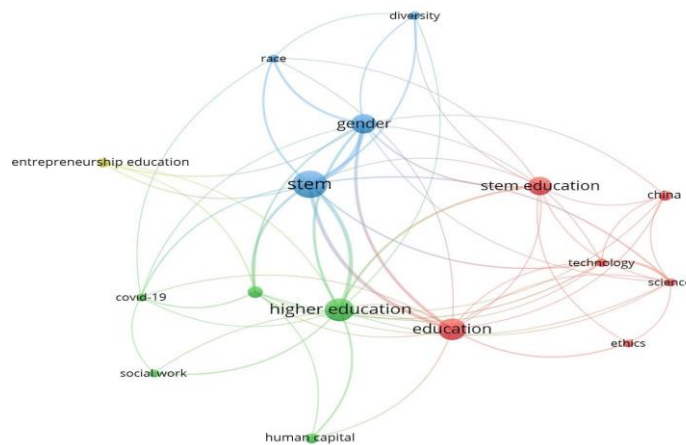Note. Source: Created by the authors using the VOSviewer program

As can be seen in Figure 4, Ning Jia and Helena Skyt Nielsen are the most prominent authors with a total link strength of 24 in the bibliographic matching network. These two authors are the closest to each other in terms of the topic studied, citing the same studies the most. The third author following them is Kevin Shih with a total link strength of 12.

Keyword Analysis

A mapping program was used to analyze the keywords used in the STEM field. In the restriction of the words to be used in the analysis; the number of keywords used at least 10 times was determined. Accordingly, 16 out of 3,373 keywords exceeded the threshold value. The mapping analysis revealed 4 clusters, 60 links and 166 total link strengths. The keywords link-layer analysis is shown in Figure 5.

Figure 5

Mapping Analysis of Keywords Used in STEM Field

Note. Source: Created by the authors using the VOSviewer program

As can be seen in Figure 5, the most used keyword was "STEM", which represents the subject of the study and is at the center of the visualization. In the analysis, the word "STEM" stands out with 114 times of usage, 11 times of connection network with other keywords and 77 total connection strength. The second most used keyword in the related field is "Higher Education". This keyword was used 78 times in the field, 13 link networks and 40 total link strengths were identified in the analysis. The keyword "Education", which is used in the third place in the field, was used 71 times, there were 13 association networks with other keywords, and the total link strength was 35.

Authors' Institutional Analysis

In Table 4, the institutions working in the field of STEM are ranked in terms of the number of citations. The number of publications of the top five institutions with the highest number of citations is also given in the table. Accordingly, the "National Bureau of Economic Research (NBER)" ranks first with 526 citations and 10 publications. The "Institute of Labor Economics (IZA)" ranks second with 437 citations and the number of publications is 13. "CESIFO" ranks third with 334 citations. The number of publications of the related institution is 6.

Table 4

Publication and Citation Numbers of Institutions

| Institution	Number of Publications	Number of Citations
National Bureau of Economic Research (NBER)	10	526
Institute of Labor Economics (IZA)	13	437
CESIFO	6	334
University of California	12	166
University of Washington	7	140

Note. Source: Created by the authors using the VOSviewer program

Mapping analysis was used to examine inter-institutional collaboration in the field. The constraint value for the number of publications of the institutions was set as 5. While there were 1361 institutions in total, 48 of them exceeding the threshold value were subjected to analysis. "Total Link Strength" was determined for weighting in the analysis. The mapping analysis revealed 8 clusters, 90 institutional connections and 104 total connection strengths. In Figure 6, the "NBER" institution stands out in terms of total link strength. The authors of the relevant institution collaborated with authors of 12 institutions. Moreover, the total link strength of the institution is 14. Another prominent institution is "IZA" with 13 total linkages. The authors of this institution have collaborated with 9 other institutions. In the visualization analysis, "CESIFO", one of the prominent institutions with a total link strength of 9, collaborated with the authors of 5 other institutions.

Figure 6

Interagency Cooperation Mapping Analysis
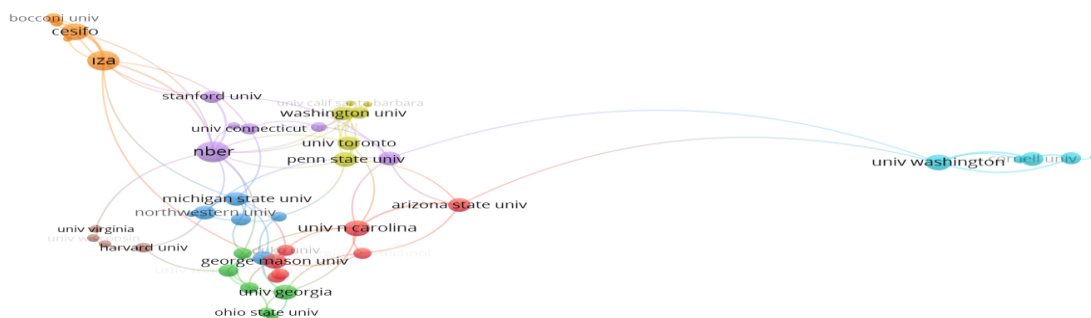
Note. Source: Created by the authors using the VOSviewer program

In the next section, the studies on STEM, which are indexed in the field of business finance economics and management, will be reviewed in brief details together with the studies that have been analyzed in the mapping analysis above.

Reviewing Other Literature Related to STEM

While there are quite a number of studies in the literature on STEM, there are relatively fewer studies in the field of business finance economics and management. At this stage of the study, the relevant studies in the literature will be briefly mentioned in order to have information about these studies.

Ambramitzky et al. (2024) explored the influence of financial incentives on higher education decisions and major choices, focusing specifically on a reform within Israeli kibbutzim. The reform involved a shift from the traditional policy of equal distribution to a system of productivity-based wages. The results find a substantial impact of the reform on higher education outcomes. The significant increase in the rate of return, coupled with pronounced variation across fields of study, especially in STEM fields, which are expected to yield higher financial returns, leads to a significant increase in the probability of individuals having a bachelor's degree.

Thomas summarizes in his study 2024, which empirically examines how universities make decisions about what courses to offer. He also considers the impact of these decisions on students. According to the findings, this indicates a strategic focus on STEM and business fields. The study focuses on a sample university and finds that the range of courses offered significantly influences the choices made by students. In particular, the university appears to prioritize increasing enrollment in STEM and business and professional courses, potentially at the expense of student value. This suggests that the university is making strategic decisions to reserve resources in a way that prioritizes certain disciplines, possibly due to factors such as demand, institutional goals, or external pressures.

The research integrates economic modeling (extended Roy model) to investigate the complex factors that influence important decisions, with a particular focus on understanding the underrepresentation of women in STEM higher education. The model considers both monetary and non-monetary aspects of the decision-making process. In particular, it explicitly explores the complexities involved in disentangling the contributions of actual or perceived gender biases, particularly those related to considerations of family friendliness and work-life balance, from behavioral and preference biases rooted in gender stereotypes (Henry, et.al., 2024).

The integration of digital systems, big data, artificial intelligence, and other technological advancements into the professional landscape has increased the demand for STEM (science, technology, engineering, and mathematics) skills across industries and occupations. However, statistical data indicate that a significant portion of individuals, particularly women, minorities, students of color, low-income, and first-generation students, who initially enroll in STEM majors experience a transition, with approximately 40 percent either switching to non-STEM majors or dropping out of college. Building on the research of (Karpova et al., 2023), their proposal focuses on addressing the observed low interest and retention in STEM majors among high school students, particularly those from underserved backgrounds, through the implementation of applied STEM education. Applied STEM education involves the practical application of STEM concepts and principles in domains that are familiar and captivating to students, such as entrepreneurship and fashion. The overarching aim is to enhance students' interest and cultivate their intention to pursue college careers in STEM fields. The study's findings indicate a notable increase in participants' knowledge, interest, and intentions to enroll in a STEM-related college major following their engagement in the applied STEM education program.

In another study's key findings from this study revealed a dynamic relationship between the logics of civil society and market orientations. The former perspective regarded STEM education as a catalyst for fostering equal opportunities and instigating social

change, while the latter perceived STEM as a conduit towards cultivating a technologically skilled workforce and driving economic gains. The study underscored the pivotal role played by state actors in influencing both the operational procedures and the social outcomes of the initiative. These observations elucidate the intricate interactions and power dynamics within multi-sectoral endeavors, contributing to a comprehensive understanding of the complexities inherent in initiatives aimed at addressing societal challenges through STEM education (David & Rubel-Lifschitz, 2023).

Children's future career development and their key competencies acquired through STEM education are influenced by parents' expectations. The studies of Zhan et al. (2023) aimed to determine the effect of parents' expectations on children's key competencies acquired from STEM education, especially focusing on gender difference. According to the results, the most emphasized 10 competencies determine into four categories. These are: the innovation factor (creativity and inquiry competency), the social factor (expression and cooperation competency), the learning factor (concentration, thinking, knowledge acquisition competency), and the making factor (problem solving, practical, antifrustration competency).

In another research involves a mixed-methods approach, combining quantitative and qualitative analyses, with the objective of identifying opportunities to enhance the inclusivity and attractiveness of Vocational Education and addressing the persistence of gender stereotypes in STEM education. The analytical part of the study utilized ordinal logistic regression to explore determinants influencing female and male students' attitudes toward gender stereotypes and their future career aspirations in STEM fields. The key findings indicate that university students exhibit a higher resistance to gender stereotypes compared to high school students. Additionally, university students are more likely to envision a future in STEM compared to their high school counterparts. Notably, the results highlight that there are no statistically significant differences in the career plans of male and female students (Simovicová & Urbanciková, 2023).

Kong et al.'s (2023) paper explores the impact of a CEO's personal background, specifically in STEM, on a company's digital transformation. The results suggest a positive relationship between a CEO's STEM qualifications and a firm's digital transformation performance. In other words, companies led by CEOs with STEM backgrounds may bring unique perspectives and skills that positively influence their decisions regarding innovation and digital strategies, and they perform better in digital transformation efforts.

Obstfeld's (2023) article discusses the intersection of social inequality and access to higher education. The article highlights the disproportionate allocation of resources to elite universities and privileged students, in contrast to under-resourced comprehensive universities that tend to serve more minority, first-generation, and working-class students. Based on the findings, recommended approaches include improving undergraduate business education at comprehensive universities, emphasizing career-related job opportunities for underrepresented students, addressing employment disparities among different student groups, and establishing a social capital academy for them.

During the COVID-19 pandemic, an engineering project supported by the National Science Foundation (NSF) adapted to the pandemic and transitioned to a virtual format. The project involves collaboration between engineering and education undergraduates who design and deliver engineering lessons to elementary students. The outcomes of the virtual format were positive, with undergraduate students perceiving that they gained new skills and knowledge during the virtual engineering lessons. Although some students regretted missing face-to-face learning opportunities, the general consensus was that they learned more than expected, and in some cases, more than they would have in a traditional face-to-face setting. On the STEM content side, students acquired knowledge in areas such as coding and the engineering design process (Gutierrez et al., 2023).

The case study highlights the initial challenges faced by a female student entering the STEM field at university. It emphasizes the importance of understanding the social and cultural dynamics that can impact students' self-perceptions and identities in STEM disciplines,

particularly in the context of a new learning environment. The concept of reflexive identity work suggests that individuals actively participate in shaping their identities as STEM learners through ongoing reflection and adaptation (Hu & Stahl, 2023).

The studies emphasize the importance of addressing the readiness of future science teachers in using the STEM approach. Results show that students majoring in natural sciences are poorly prepared for the integration of STEM tools. Comprehensive educational courses, practical activities, and the integration of virtual laboratory technologies were recommended as effective strategies to enhance the preparedness of students majoring in natural sciences for incorporating STEM tools into their teaching activities (Marushko et al., 2023).

Laferty et al.'s (2023) research examines persistent gender imbalances in the enrollment patterns of Australian students, particularly across different courses. Despite efforts to promote gender diversity, including initiatives to encourage young women to pursue non-traditional courses such as STEM, the trends show limited impact. The study aims to examine the relationship between conformity to social gender norms and work-family gender ideologies among Australian undergraduate students. Results show that conformity to gender norms influences decisions about postsecondary study.

The results of the Owen research 2023 underscore the effectiveness of providing relative performance information in altering biased beliefs about academic performance, particularly those related to gender differences. Nevertheless, the study posits that additional or alternative interventions are needed to substantially influence students' decisions regarding course enrollment and major selection. This is particularly relevant for efforts to increase female participation in STEM fields.

O'Connor (2023) article uses concepts derived from existing literature to challenge conventional perspectives in a provocative and innovative way. Using a case study approach, the research draws on extensive material gathered in Ireland, where research on gender inequality in higher education has been conducted over a quarter of a century. In particular, Ireland has experienced profound societal changes, moving away from a traditionally patriarchal structure. The discernible effects of these societal changes on higher education have manifested themselves primarily within the last decade.

Chang et al.'s (2023) research aims to investigate the effectiveness of civic engagement among students enrolled in STEM programs and its potential implications for societal sustainability. The study is based on the premise that students in STEM disciplines, which emphasize science-oriented teaching, may unintentionally overlook the importance of civic engagement. The study's methodology is based on quantifying civic engagement through self-efficacy assessments given to the student cohort.

Gender differences in STEM disciplines have been a topic of discussion for many years and are widespread in most OECD countries. They can also vary within specific disciplines. Various factors such as educational environment, role models, peer influences and societal expectations also contribute to the differences. Mathematics is the only subject in which girls tend to perform less well than boys. To this end, the studies of Contini et al. (2017) analyze the gender gap involving children in selected grades from second to tenth in mathematics test scores in Italy according to the latest Program for International Student Assessment (PISA). As is well known, Italy is one of the countries with the largest gap between girls and boys. According to the results, even after controlling for a number of individual and family background characteristics, the data show that girls systematically underperform boys.

In many countries, the emphasis on skill development has primarily centered around technical skills, while education systems have accorded limited attention to the productive potential of soft skills. This article contributes new empirical evidence regarding various facets of the wage returns associated with soft skills, challenging the prevailing notion that the value of education is predominantly derived from hard skills, thereby resulting in an unequal emphasis on the development of soft and technical skills within educational institutions (Balcar, 2016).

On the other hand, the studies note patterns related to labor market conditions. In assessing the returns to human capital, instead of focusing on early career earnings and school attainment, the analysis provides more nuanced insights into the relationship between cognitive skills and wages, highlighting differences across countries and the influence of institutional factors on the returns to skills. Otherwise, they show that focusing on early career earnings and school attainment underestimates the lifetime returns to skills by about 25 percent (Hanushek et al., 2015).

Innovation a key driver of productivity and STEM workers, fundamental contributors to innovation. The study discusses the critical role them and aims to determine the long-term effects of STEM workers development on outcomes for native workers across 219 cities in the United States from 1990 to 2010. The results show that the development in STEM workers is related with substantial wage gains for university-educated native workers. Additionally, in comparison there are wage gains for non-university-educated native workers, although these gains are smaller. In other words, STEM workers play a key role in productivity and innovation (Peri et al., 2015).

MacPhee et al. (2013) conducted a study on the academic self-efficacy and performance of male and female undergraduate students before and after participating in a mentoring program in STEM fields. This supports the first hypothesis of the study. The study found that, despite similar academic performance, female students perceived themselves as academically weaker than their male counterparts. The authors suggest that mentoring can be a beneficial way to engage women in STEM fields, based on previous research results, and to enhance diversity in STEM professions starting from high school. Additionally, STEM mentoring programs and professionals should focus on disadvantaged minorities and underrepresented identities. Thus, graduation from a mentoring program may indicate a positive impact on academic self-efficacy for women and students with STEM minority status, considering both ethnicity and socioeconomic status.

Another study examined the effect of class size in early elementary school on postsecondary attainment and college enrollment. According to the results, being in a small class increases the probability of attending college by 2.7 percentage points and the probability of completing a degree by 1.6 percentage points. Moreover, the effects are seen in high-earning fields such as STEM, business, and economics. Students' preferences in these fields may be increasing. The effects are largest for students from high-poverty schools, low-income families, and black students. Thus, the study found that reducing class size in early childhood can help close income and racial gaps in postsecondary education (Dynarski et al., 2013).

The purpose of Griffith's (2010) research is to examine what factors contribute to the persistence of all students, especially women and minorities, in STEM field majors. Statistics show that male students persist in STEM majors. But smaller percentage of women and minorities persist in a STEM. It can be said in this situation institutional characteristics play a key role. According to the results, it can be caused by students entered college and choose an initial major with different educational backgrounds. They also take different classes, have different experiences, professors, and peers. Thus, women and minority students may be at a disadvantage, as both groups are also underrepresented as faculty members in STEM fields.

The problem of underrepresentation of women and minorities in science and engineering occupations is a longstanding challenge. Efforts to eliminate this inequality have included policies focused on increasing the registration of female and minority students in (STEM) fields at the university. The objective of Price's (2010) study is to investigate the impact of instructor race and gender on the persistence of minority and female students in STEM fields. The study uses data from public four-year universities in Ohio, specifically analyzing first-semester STEM courses, to determine whether instructor race or gender influences the likelihood of students persisting in STEM fields to provide a more comprehensive understanding of the impact of instructor characteristics on students' decisions to persist beyond the first semester and first year. In conclusion, the study contributed

valuable insights into the relationship between instructor characteristics (race and gender) and student persistence in STEM majors, with differential effects observed for Black students and female students. According to the findings, Black students are more likely to persist in a STEM major if they take a STEM course taught by a Black instructor. In contrast to the positive effect of racial matching for black students, female students are less likely to persist in STEM majors when more of their STEM courses are taught by female instructors. This finding is intriguing and contrasts with the notion that gender-matching might enhance female students' persistence in STEM fields.

Joensen & Nielsen (2009) that the causal relationship between advanced high school math education and labor market outcomes. The study utilizes a high school pilot scheme, which served to reduce the costs related to choosing advanced math by allowing for a more flexible combination of math with other courses. The main findings suggest a clear causal relationship between advanced high school mathematics education and earnings for students who were encouraged to take mathematics after exposure to the pilot program. Increased educational attainment plays a role in this observed effect. In addition, the flexibility introduced by the pilot program encourages students to choose advanced math and they experience higher earnings.

Discussion and Conclusion

This study analyzed research on the subject of 'STEM' indexed in the field of 'Business Finance Economics and Management' within a specific time frame until January 2024. The data was obtained from the Web of Science (WOS) database, classified, and analyzed using VOSviewer (version 1.6.18). In the Web of Science (WoS) database (1992-2024/January), 1,067 studies (Articles) were analyzed with the keywords "stem*" and "educat*". The results were presented in a logical order using visual mapping. Today, STEM has expanded beyond education and training to encompass all areas of life. This study shows how the field of "Business Finance Economics and Management", which is closely related to people and states within this scope, is affected by the STEM subject, how it is of interest and how it has developed through literature

analysis. Looking at the studies, it is observed that there are quite remarkable studies in this field and the weight of the studies has increased over the years. It is noteworthy that under the title of STEM and within the scope analyzed, studies have been conducted with a variety of different perspectives. It is expected that this study will shed light on researchers and decision makers interested in the field and contribute to the development of the STEM economic-financial management field.

Data Availability

The datasets generated during and/or analyzed during the current study are available from the corresponding author upon reasonable request.

Conflict of interest

None

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