

Learners' career choices in STEM education: A review of empirical studies

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Abstract

The purpose of this study was to systematically review articles on the career choices of learners and STEM. The first goal was to classify research on career choice and STEM to identify trends and gaps in the literature. The second goal was to summarize the findings related to learners' career choices at STEM and interpret them according to what has been reported in the literature. In this study, the PRISMA method was used to review articles in the educational literature STEM. Sixty-seven articles published in indexed journals in SCOPUS that met the specified criteria were analyzed systematically. The results showed that 51 of 67 articles were involved in the analysis to review by researchers. The results also showed that the earliest article that addressed career choice and STEM was published in 2011, and most of the articles studied were published after 2017. The results also showed that most articles on career choice in STEM were conducted in the United States, Israel, and Spain. The preferred sample groups in research on career choice in STEM fields are mostly high school and undergraduate students. In addition, the studies were broadly classified into five categories, including the effects of STEM activities and the effects on teachers, the effects of some variables on learners' career choices, the study of learners' career choices, and parental attitudes. Based on the results obtained from this research, implications are made for future research.

Keywords: STEM education, learners' career choices, PRISMA method, systematic review

INTRODUCTION

STEM is a term that integrates the four disciplines of science, technology, engineering, and mathematics (Adebusuyi et al., 2022). It refers to a holistic teaching approach to achieve its objectives and the goals of countries' educational policies and reform documents in the 21st century (Zakeri et al., 2023). STEM education is "an instructional approach in that science and mathematics concepts are learned in the context of technology and engineering." (Yaki, 2022, p. 2). De Loof et al. (2022, p. 2)

pointed out that "STEM education is a promising approach to attracting more qualified and motivated students in STEM fields by improving students' interest and learning in STEM."

To achieve this goal, countries have launched more education policy documents and reforms to cultivate individuals with scientific literacy and train more individuals in STEM fields to compete with other countries worldwide (U.S. Department of Education, 2018).

In parallel with these policy and reform documents, countries have invested much more money and

Contribution to the literature

- Since the advent of STEM, research has emphasized the importance of preparing students to choose careers in STEM fields and to develop them in one of the related fields.
- To our knowledge, however, there has been only one study that addressed career choice studies of learners and STEM.
- There is a need for further studies to review learner career choice studies in STEM, identify research trends and gaps in the literature, and present promising findings from this research.

approved research projects in STEM areas to achieve their goals (U.S. Department of Education, 2018). Specifically, countries have allocated grant funds and created policies and projects to educate students and teachers and promote STEM education in schools and STEM teacher training programs. Since STEM education has been emphasized in policy and reform documents, researchers have conducted various studies on STEM education at all levels (Kareem et al., 2022). Generally, researchers have focused on student-level factors, including attitudes, engagement, career choices, creativity, critical thinking, communication and collaboration, dispositions, interest, motivation, problem-solving, and self-efficacy in STEM education research (e.g., Franz-Odenaal et al., 2020; Kohen & Nitzan, 2022; Mau et al., 2021; Wang, 2013b).

Numerous research studies have included many variables to understand students' opinions, views, and perceptions of STEM (e.g., Jones et al., 2018; Kolesnikova & Kudenko, 2022; Williams & Mangan, 2016). Student career choice is one of these variables addressed in research studies in literature (Hasanah, 2020; Shin et al., 2017). In particular, Hasanah (2020, p. 5) indicated that STEM was seen by researchers as a career to become the main future goal. Research has shown that career choice (STEM) is one factor that influences a person's choosing a career in the future (Kazi & Akhlaq, 2017; Luna & Arce, 2021; Shin et al., 2017). Specifically, students' career choices are influenced by their interactions with school life and the environment (Kazi & Akhlaq, 2017; Shin et al., 2017). For example, Sasson (2021) indicated that specialization in STEM subjects during high school could predict their career choices in one of the related fields.

Since the advent of STEM education, research has stressed the importance of preparing students to choose a career in STEM fields and encouraging them in one of the related areas. A student's interest in STEM fields and career opportunities play a significant role in STEM persistence beyond future achievements (Maltese & Tai, 2011; Morgan et al., 2022; Sasson, 2021; Yoel & Dori, 2022). However, to our knowledge, only a study focused on the career choice studies of learners and STEM. For example, Maphosa et al. (2022) examined the factors influencing student choice and success in STEM programs. To do so, they reviewed 179 documents published on the Web of Science between 2004 and 2020.

They analyzed the articles using standard bibliometric metrics. Their results showed that research on program choice is still growing and identified thirty-two factors. Thus, there is a need for further studies to review the studies on learners' career choices in STEM, identify research trends and gaps in the literature, and present promising findings from this research. The purpose of this study was to systematically review articles on the career choices of learners and STEM. The study has two objectives. The first is to classify research on career choice to identify research trends and gaps. The second is to summarize the experimental findings related to learners' career choices at STEM and interpret them according to what has been reported in the literature.

METHOD

SCOPUS and ERIC databases were selected for the present study to identify relevant studies regarding learners' career choices in the STEM education literature. In each of these databases, the keywords "career choice," "STEM," and "STEM education" were used to search for relevant studies in the keywords. As is well known, the term "STEM" is a concept that encompasses the disciplines of science, technology, engineering, and mathematics. The search used these keywords to focus on learners' learner choices with STEM. We used the PRISMA flowchart (Basantes-Andrade et al., 2022) to systematically show the number of articles identified, included, and excluded and explain the exclusions' reasons. We did not limit our search to a specific period. We focused solely on journal articles to review the research and summarize the major research findings on career choice in the educational context of STEM. In addition, we limited the search to social sciences to find articles in the education field. The initial search for journal articles yielded 67 results (See [Figure 1](#)).

While searching, we applied the following criteria to further filter the retrieved articles after reading the articles. First, the article should be written in English and should be empirical. Second, the article should be related to career choices in STEM. Third, we limited the articles to social sciences using the databases' filtering option. After downloading the articles in the search, 67 studies were downloaded, and the full texts of the articles were obtained. Later, 16 studies were excluded from the analysis because they were irrelevant to the keywords "career choice" or "STEM." Thus, 51 articles were found

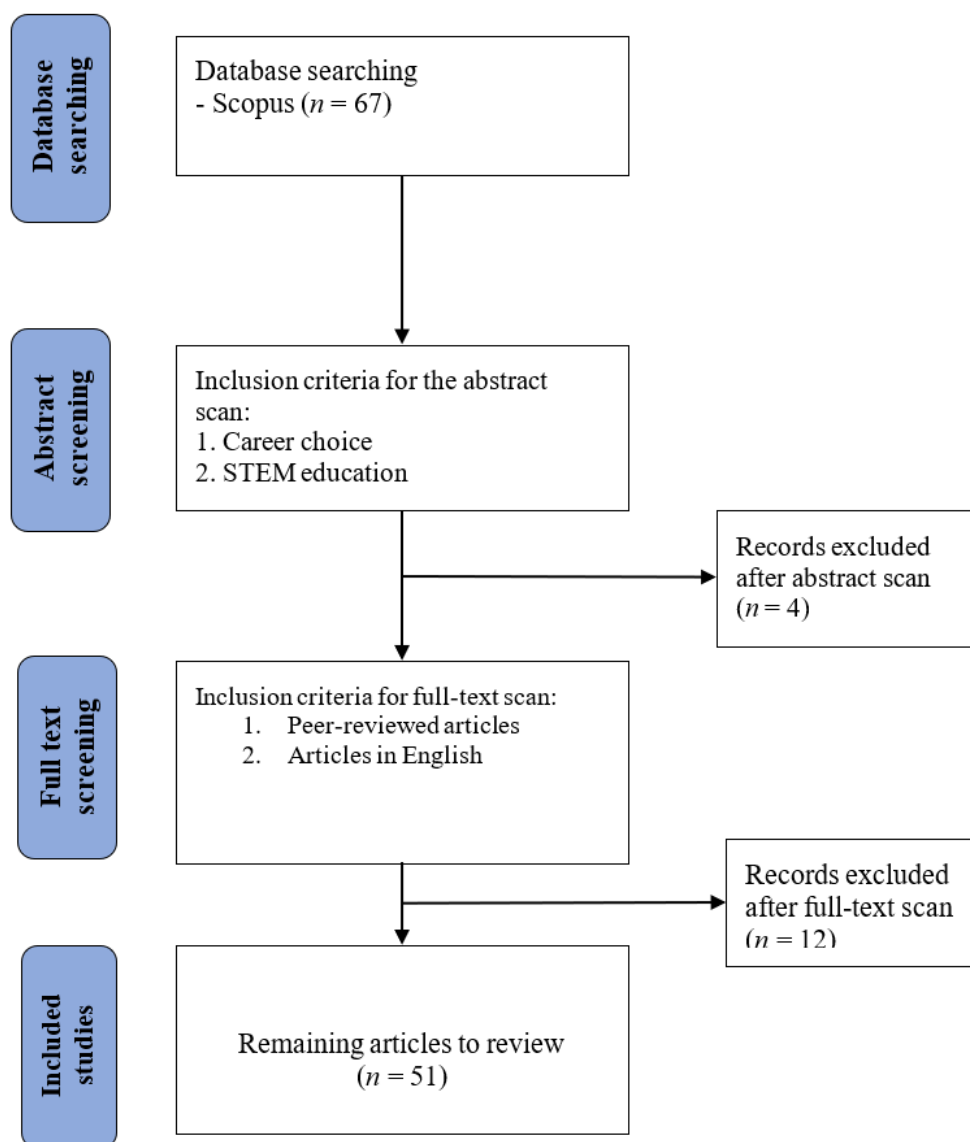


Figure 1. PRISMA flow chart showing article reviewing process (Source: Authors' own elaboration)

suitable for the final eligibility assessment. The last search was conducted on March 1, 2023. After obtaining the full texts of the retrieved articles, two researchers read all articles to ensure that all reviewed studies could reflect the integration of “career choice” and STEM.

For the coding of the articles received, the authors created an Excel spreadsheet to have a robust analysis between researchers in the first phase of the analysis. In this Excel spreadsheet, they entered information about the articles studied, including researcher, year of publication, participants, category of research, purpose, and main results. In the second phase, the researchers created the initial codes after reading the articles and began analyzing the articles in the third phase. To form broader categories, the researchers identified five common themes (as a selection of codes), including the impact of the activities of STEM, the effects on teachers, examining the career choices of learners with STEM, and examining the relationships between career choices and other variables, and parental attitudes. During the

analysis, the researchers viewed the coding process as an ongoing journey of coding, comparing, and refining common themes that emerged from the data and analysis. For this reason, the authors discussed the codes and themes to identify the items studied in the data.

RESULTS

What is the Current Situation of Research on Career Choice and STEM Studies?

When examining the years of the articles reviewed, the results showed that the earliest article that addressed career choice and STEM was published in 2011 (**Figure 2**). The increase in the number of studies per year is quite remarkable. Moreover, the results show that most of the 51 articles studied (39 articles) were published after 2017 (2017-2022). The increase in the number of studies on career choice in STEM education in the last five years may indicate that career choice research has developed a trend in research in STEM education.

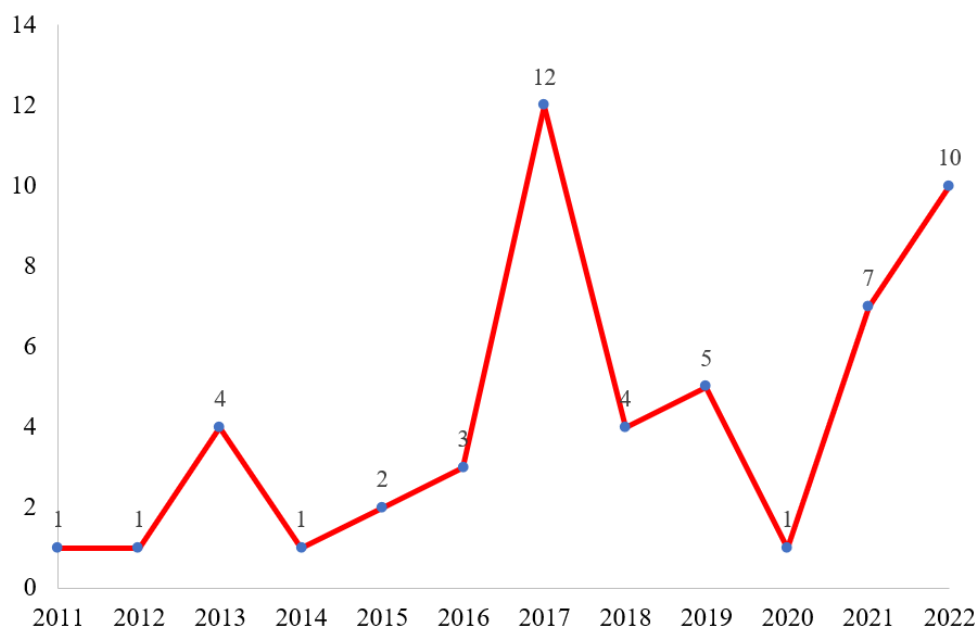


Figure 2. Distribution of research by publication years (Source: Authors' own elaboration)

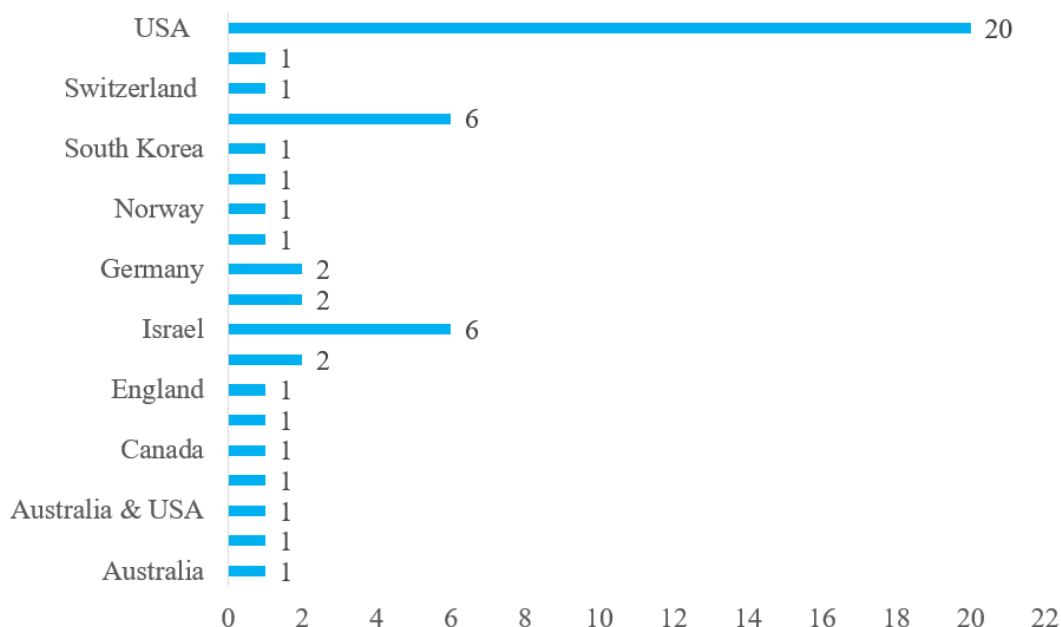


Figure 3. Distribution of research by countries (Source: Authors' own elaboration)

The results in Figure 3 shows that most articles on career choice in STEM fields were conducted in the United States (n=20), Israel (n=6), Spain (n=6), Finland (n=2), Germany (n=2), and Netherlands (n=2). Three articles with Australian students were conducted (n=2, see Figure X). Only one study was found in other countries about career choice and STEM in Cambodia, Canada, Colombia, England, Finland, Mauritius, Norway, Russia, South Korea, Switzerland, and Taiwan.

Figure 4 shows that the preferred sample groups in research on career choice in STEM fields are high school students (n=18), undergraduate students (n=10), middle school students (n=5), high school and undergraduate (n=4), adults (n=3), and other mixed groups including

high school students and adults (n=1), high school students and graduates (n=1), undergraduate and graduates (n=2), undergraduate and women (n=1), and later children (n=1), graduate (n=1), parents (n=1), and teachers (n=1).

How and in What Ways are Learners' Career Choices Studied in the Research?

Effects of STEM activities

Some studies examined the effects of STEM activities and attempted to explore their effectiveness. Six studies examined the effects of integrated STEM activities on participants' learning choices. For example, Wyss et al.

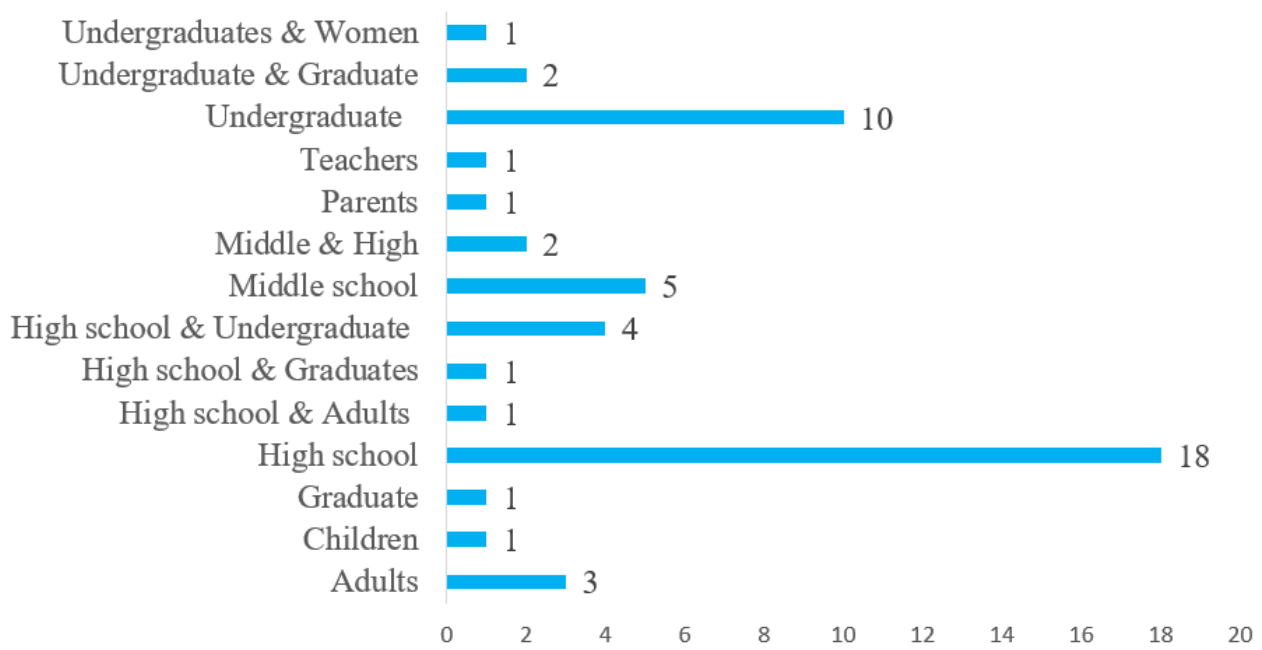


Figure 4. Distribution of research by participants (Source: Authors' own elaboration)

(2012) examined the impact of video interviews with STEM professionals to better inform students about STEM career opportunities. Evidence supports using video interviews to interest middle school students in careers at STEM. No gender difference in interest in STEM was found. Sasson (2019) sought to determine whether a STEM training program affects graduates' decision to specialize in a STEM career and whether there are gender differences. Results showed a positive correlation between the attitudes of students who participated in the program and their expectations to pursue a STEM-related career. In addition, the results showed a significant difference between young men's and women's attitudes. In another research, Reiss and Tamjid Mujtaba (2017) reported the results of two projects on STEM educational projects. Their results showed that students are generally more likely to choose STEM subjects if they believe they will benefit materially. Yoel and Dori (2022) studied the effects of a STEM activity program called FIRST in their study. They wanted to determine if the program they implemented increased high school students' STEM career choices and engagement and what factors influenced their choice. They also examined the impact of gender on their choices. Their results show that the program implementing STEM activities helped increase participants' STEM exposure and career choices in STEM fields. In addition, they found a significant, positive, and strong correlation between interpersonal skills, STEM exposure, career choice, family and school support, and external motivation.

Wang et al. (2021) used Australian and Taiwan 2015 data from PISA to examine how specific research-related learning activities affect students' enjoyment of science learning and their intended choice of a future STEM

career. Their analysis found that three activities, discussing and planning experiments, drawing conclusions and conducting hands-on experiments, and having teachers and students explain ideas, were significantly related to students' enjoyment of science learning and intended STEM career choices in these two countries. A cross-country comparison between the Taiwan and Australian data showed that the percentage of inquiry-related activities was higher among students with high or low science literacy in Australia than among Taiwanese students. Explaining ideas by teachers and students was a significant influencing factor for the enjoyment of learning for Taiwanese students with high science literacy and Australian students with high and low science literacy. Discussing and planning experiments was a positive influencing factor for Taiwanese students with low science literacy. Students with high science literacy from Taiwan and Australia showed significantly higher preferences for future STEM careers than those with low science literacy.

In another research, VanMeter-Adams et al. (2017) examined the impact of a hands-on research experience on academic readiness and continued interest in STEM. The results reported that extracurricular encounters, such as the influence of a relative or family member and childhood experiences, were the most important factors that sparked their interest in STEM. At the same time, hands-on work in the laboratory maintained their interest in STEM. Based on these findings collected from a cohort of students who demonstrated a strong talent for and interest in STEM, community-based programs that create awareness of STEM should be both for children. The summary of experimental studies in this category can be found in **Table 1**.

Table 1. Details of studies on effects of STEM activities

Research	Country	Participants	Activities	Duration	Key results
Reiss and Tamjid Mujtaba (2017)	England	Middle and high	NA	NA	Students are generally more likely to choose STEM subjects if they believe they will benefit materially.
Sasson (2019)	Israel	High school	NA	NA	Positive correlation between the attitudes of students participating in the program and their expectation to pursue a STEM-related career. Significant differences were found between the attitudes of the young men and women.
VanMeter-Adams et al. (2017)	USA	High school and undergraduate	Hans-on practices	NA	The extracurricular encounters was stated as sustaining their interest in STEM (92.6%).
Wyss et al. (2012)	USA	Middle	Interviews with STEM professionals	Eight weeks	Provided evidence for implementing video interviews as a way to interest middle school students in pursuing STEM careers exists.
Yoel and Dori (2022)	Israel	High school and graduates	Project-based learning Robotics programming	Six weeks	The program increased participants' STEM exposure and career choice in STEM domains.

Effects of teachers

Only one research by Bottia et al. (2015) examined the role of high school faculty, demographics-specifically, the proportion of female high school math and science teachers-in and college student's decision to choose a field of study STEM. Their results showed that while the proportion of female high school math and science teachers did not affect male students, it had a strong effect on female students' likelihood of choosing and graduating from a field of study STEM and that the effects were greatest for students with the highest math skills.

Effects of some variables on learners' career choices

An important part of the research studies reviewed explored the effects of some variables on learners' career choices concerning STEM education. Generally, these studies aimed to examine the relationships between learners' career choices and other variables. Among 51 articles reviewed in this research, 31 studies examined the effects of learners' career choices concerning STEM education. To present detailed information about the nature of research in this category, for example, Aeschlimann et al. (2016) researched the influence of the motivational design of mathematics, physics, and chemistry classes in high school students to obtain their high school diploma on the choice of a STEM field. Results showed that classes that supported student motivation increased the intrinsic value of mathematics and science among students and the likelihood of choosing a STEM career. In another research, Wegemer and Eccles (2018) sought to understand whether altruism and femininity may distinguish membership in STEM fields. Results showed that altruism mediated the relationship between femininity and STEM choice and was significantly more predictive than self-concept of ability. This study demonstrated the importance of values and provided evidence that STEM career trajectories may be influenced by congruence between

values, identity, and gender beliefs about STEM fields. The research of Jones et al. (2018) examined the relationship between free-choice STEM activities (hobbies) and career choice, as well as the factors that influence the development of science interests and science identity of those who chose to pursue STEM careers those who did not. Results showed that hobbyists with STEM careers were significantly more likely than those without STEM careers to rate experiences in elementary, middle, and high school, college, museums, science centers, and clubs as influential in developing the hobby. Recent research by Cribbs et al. (2021) used a structural equation model to examine whether the factors of mathematics mindset, mathematics anxiety, mathematics identity, and mathematics self-efficacy are related to each other and undergraduates' STEM career choices. The results showed that mathematics identity was a full mediator between mathematics mindset and STEM career interest and between mathematics anxiety and STEM career interest.

Detailed information is presented in a table in the **Appendix** to present more information about the results of the other research in this category. To summarize the research more specifically, some studies have been conducted on adults (Jones et al., 2018; Lauermaun et al., 2017; Scheitle & Ecklund, 2017), culturally relevant pedagogy theory (Charleston et al., 2014), and parental attitudes (Lissitsa & Chachashvili-Bolotin, 2021). The other research in this category has examined the effects of various variables on learners' career choices in STEM fields. The sample following research follows as:

- altruism and femininity (Wegemer & Eccles, 2018)
- behavioral and environmental factors (Tandrayen-Ragoobur & Gokulsing, 2022)
- career goal (Mau et al., 2021)
- enjoyment (Jensen & Sjaastad, 2013); Palmer et al., 2017; Wang et al., 2021)

- gender stereotypes (Diez et al., 2022)
- identity (Cribbs et al., 2021; Mica et al., 2018)
- interest (Cordero & Frutos, 2015; Gómez et al., 2022; Jensen & Sjaastad, 2013; Jones et al., 2018; Kaleva et al., 2019; Kurban & Cabrera, 2019; Mau et al., 2021; Palmer et al., 2017; Sáinz & Müller, 2018; Smith, 2022; Taskinen et al., 2013; VanMeter-Adams et al., 2017; Wang, 2013; Wang et al., 2017; Wyss et al., 2012)
- mathematics anxiety (Cribbs et al., 2021)
- mathematics self-efficacy (Cordero & Frutos, 2015; Cribbs et al., 2021; Wang 2013b)
- self-efficacy (Cordero & Frutos, 2015; Cribbs et al., 2021; Eam et al., 2021; Kurban & Cabrera, 2019; Shin et al., 2017; Tandrayen-Ragoobur & Gokulsing, 2022; Wang 2013b)
- motivation (Aeschlimann et al., 2016; Watt et al., 2017),
- social influences (Gómez et al., 2022)
- values (Mica et al., 2018)

Learners' career choices

The results demonstrated that some studies among the reviewed articles studied learners' career choices. Generally, these studies aimed to have more information about learners' career choices in STEM fields and also studied the effects of a few background factors (e.g.) on their career choices. In this category, 12 studies aimed to explore learners' career choices. To present more evidence about the nature of the studies in this category, for example, Xu (2016) examined the factors influencing college graduates to choose a job congruent with their major, and the differences between genders and between STEM and non-STEM graduates in choosing a job congruent with their major. In addition, this study examined that positive career outcomes, such as higher earnings and greater job satisfaction, are associated with choosing a job congruent with the field of study. STEM Graduates have lower unemployment rates than non-graduates STEM, but the presence of women in STEM fields of study remains low. Gender inequality in STEM occupations was significant even at the beginning of post-baccalaureate employment. Watt et al. (2017) explored whether gender differences in mathematics motivation and perceptions of socializers influenced the choice of different STEM careers with varying mathematics intensity. Findings included that in both samples, female adolescents preferred biological careers more than male adolescents; male adolescents preferred physics-related careers in the Australian sample and also preferred mathematics-related careers. Regarding children's views of learning choices regarding STEM, Mulvey and Irvin (2018) examined children's judgments about the acceptability of STEM careers. Their results showed that younger children judged counter-

stereotypic career choices as less acceptable than older children and that parental attitudes and beliefs about science and mathematics were related to children's evaluations. Sasson (2021) examined the career choice characteristics of high school students, young adults, and adults in STEM in Israel. The results showed that attitudes toward STEM and feelings of employability in STEM become significantly more positive with age. The number of family members engaged in STEM careers was not found to be a significant factor influencing occupational choice. In addition, a significant correlation was found between high school majors and graduates' career choices.

By combining the studies discussed above, the other research in this category on the career choices of learners in STEM education can be presented as follows.

- develop a methodology to describe and evaluate the career choice processes of STEM teachers (Kuijpers et al., 2022)
- factors influence college graduates choosing a job (Xu, 2016)
- personal, environmental, and behavioral factors (Tandrayen-Ragoobur & Gokulsing, 2022)
- the influence of gender stereotypes on career choice (Diez et al., 2022)
- the key experiences that shaped the academic paths (Smith, 2022)
- individual characteristics and social structural factors (Xu, 2017)
- participants' STEM motivation (Jensen & Sjaastad, 2013)
- perceptions of gender-appropriateness of occupations (Ikonen et al., 2019)

Parental attitudes

The results demonstrated that some studies among the reviewed articles studied parents' attitudes. For example, Lissitsa and Chachashvili-Bolotin (2021) interviewed parents of sons pursuing higher education in science, technology, engineering, and mathematics (STEM). They examined the STEM career choice process of students whose parents were in STEM or non-STEM-related occupations and from different SES. All parents indicated that they encouraged their children to acquire higher education and shared their career expectations for high-level occupations, emphasizing the importance of education while almost completely avoiding recommendations for specific occupations. The results suggest that parents' occupational status has less influence on their son's career choice than their parents' educational level.

DISCUSSION AND CONCLUSION

51 empirical studies were included in this review after we searched journal articles in a database with no year limit. Although many studies in a database helped to illustrate the current situation of research on career choices of learners in STEM education without limitation of a year and provide a basis for future research, the results show that studies on career choices of students in high school are mostly under-researched. The findings were very broad and distributed across five categories in general. These categories are the effects of STEM activities, the effects of teachers, exploring the effects of some variables on learners' career choices, studying students' career choices with a few variables, and parental attitudes. Each of these areas is complex and requires much research to summarize and present the results of these studies in more detail.

Most studies reviewed (20 of 51) have been conducted in the United States. Six studies have been conducted in Israel and Spain compared to the United States. This result shows that dramatic cultural differences may exist among countries regarding views on STEM teaching and practices regarding the implementation of it. Therefore, more studies should be conducted to explore students' career choices in STEM in different regions and countries so that researchers can learn more information and implementations from the differences among these countries in exploring more culturally appropriate STEM curricula and implementations.

Only one study (e.g., Lissitsa & Chachashvili-Bolotin, 2021) identified in this study examined parents' views on students' career choices in STEM education. This finding may be because the researchers generally focused on students rather than parents. It is well known that parents play a much more important role in students' cognitive and affective development and career choices in STEM. Therefore, more work should be conducted by researchers to understand parents' views of STEM fields and practices and their influence on students' attitudes and career choices needed for STEM learning. To support students' career choices and make an informed decision about their career choices, it is also necessary to explore the view of parents and research how parents may work with their children in out-of-school settings STEM.

Very little research has focused on teachers compared to elementary students and teachers. Interestingly, only one study (Kuijpers et al., 2022) was conducted with STEM teachers. Although they are also practitioners of STEM education in school and out-of-school contexts, the number of studies with teachers on students' learning choices is very limited. They face many difficulties in implementing STEM activities and helping students make career choices in STEM fields. Teachers are important in encouraging students to pursue careers

in STEM fields. In addition, it is necessary to study the interaction between students and teachers in choosing careers and promoting careers in STEM fields.

Implications

The results of this study show that researchers examine learners' career choices in various ways and include many different variables in their studies to examine their effects on learners' career choices. We noted that the first line of research has focused on the effects of STEM activities on the development of learners' career choices. However, teachers may have difficulty implementing some of the activities presented in these studies because they are not sure how to integrate these activities into the classroom and how to implement them in the classroom or outside of school. Given the number of studies on STEM activities and student's career choices, there is also a need to explore further the impact of STEM activities on learners' learning decisions.

The results show that research on the career choices of learners in STEM education can be broadly divided into five categories. The first research category was conducted to investigate the impact of STEM activities on learners' career choices. The studies examined in this paper approached the teaching of STEM activities in different ways. Because STEM is an integrated concept encompassing four disciplines, future studies should provide more insight into how STEM can be integrated into the classroom and highlight how it is integrated. Specifically, STEM should provide considerable information for teachers to use these activities in the classroom by emphasizing all four disciplines.

Including all STEM disciplines in the classroom is important to streamline student choices in these subjects. Consequently, well-designed and planned STEM activities lead to effective teaching in all four disciplines and help integrate with other disciplines. For example, a scientific inquiry approach can easily incorporate all four disciplines into instruction because a well-designed STEM activity may include some patterns in all four disciplines. The well-designed STEM activities will help improve students' career choices and enhance their creativity, critical thinking, and problem-solving process.

To integrate knowledge and skills from different STEM disciplines in the classroom and to promote students' career choices, students should be educated in an interdisciplinary context. Therefore, there is a great need to complete the integration of STEM into the classroom. Most articles reviewed in this study did not refer to applying theory to implementing STEM activities in their experimental studies. Therefore, practitioners and researchers should consider pedagogical approaches when designing learning-teaching processes of STEM activities. Studies

investigating the effects of STEM activities found limited reporting on how integration was achieved in the classroom or during instruction. Therefore, researchers need to provide and present more explanations of how STEM activities were integrated into the classroom. As we found in this review, the number of experimental studies in the reviewed articles in the SCOPUS database is limited. The results indicate that the impact of STEM activities on learners' career choices needs to be investigated in further studies. Although experimental studies provided some evidence of effectiveness on learners' career choices, more results are needed to add researchers' knowledge in further studies. More results and explanations about the implementation of the activities from STEM will guide teachers who want to implement these activities from STEM to develop and improve learners' career choices. The results show that it is necessary to have more information about the content and details of the STEM activities to promote students' learning choices. The experimental studies show that STEM activities help increase the students' affective characteristics. For this reason, teachers should consider and follow their students' emotional processes and help students develop their career choices in STEM fields by considering their emotional situations.

Limitations and Recommendations

In this study, the articles indexed in the SCOPUS database were reviewed. However, the results obtained in this study provide new insights for future research and provide more evidence on learners' career choices. As career choice studies increase in literature, more studies can be conducted to track and understand the changes in learners' career choices. In addition, other databases, including other studies in literature, were not considered in this review. Therefore, it is necessary to include more studies in the literature to obtain more information and results about learners' career choices and the factors that influence their career choices in STEM. Future studies could consider this detail when conducting this limitation in this study. In addition, when comparing the results of the studies examined, special attention should be paid to more details of the studies. Most of the studies included many variables related to career choice, so it was difficult for the authors to classify them. The participant groups and variables in the studies also differed. Future research should consider this limitation in the present study.

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Ethical statement: Authors stated that the study did not require ethics committee approval since it is based on articles already in the existing literature.

Declaration of interest: No conflict of interest is declared by authors.

Data sharing statement: Data supporting the findings and conclusions are available upon request from the corresponding author.

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APPENDIX

Table A1. Articles reviewed

No	Research	Country	Participants	Category
1	Aeschlimann et al. (2016)	Switzerland	High School	The effects of some variables on learners' career choices variables
2	Alonso et al. (2021)	Spain	High and Undergraduate	The effects of some variables on learners' career choices
3	Bottia et al. (2015)	USA	High School and Undergraduate	Effects of teachers
4	Charleston et al. (2014)	USA	Undergraduate	The effects of some variables on learners' career choices variables
5	Cordero and Frutos (2015)	Spain	High School	The effects of some variables on learners' career choices variables.
6	Cribbs et al. (2021)	USA	Undergraduate	The effects of some variables on learners' career choices variables
7	Diez et al. (2022)	Spain	High School	Examining learners' career choices
8	Dulce-Salcedo et al. (2022)	Colombia	High School	The effects of some variables on learners' career choices variables
9	Eam et al. (2021)	Cambodian	Undergraduate	The effects of some variables on learners' career choices variables
10	Estrada et al. (2018)	USA	Undergraduate and graduate	The effects of some variables on learners' career choices variables
11	Franz-Odendaal et al. (2020)	Canada	Middle	The effects of some variables on learners' career choices variables
12	Gómez et al. (2022)	Spain	Undergraduate	The effects of some variables on learners' career choices variables
13	Humburg (2017)	Netherlands	High School	The effects of some variables on learners' career choices variables
14	Ikonen et al. (2019)	Finland	High School	Examining learners' career choices
15	Jacobs et al. (2017)	USA	Undergraduate.	The effects of some variables on learners' career choices variables.
16	Jensen and Sjaastad (2013)	Norway	High School	Examining learners' career choices
17	Jones et al. (2018)	USA	Adults	The effects of some variables on learners' career choices variables
18	Kaleva et al. (2019)	Finland	High and Undergraduate	Examining learners' career choices
19	Kohen and Nitzan (2022)	Israel	High School	The effects of some variables on learners' career choices
20	Kolesnikova and Kudenko (2022)	Russia	Middle School	The effects of some variables on learners' career choices variables
21	Kuijpers et al. (2022)	Netherlands	STEM teachers	Examining learners' career choices
22	Kurban and Cabrera (2019)	USA	High School	The effects of some variables on learners' career choices
23	Lauermann et al. (2017)	Germany	Adults	The effects of some variables on learners' career choices variables
24	Lissitsa and Chachashvili-Bolotin (2021)	Israel	Parents	Parental attitudes
25	Mau et al. (2021)	Taiwan	Undergraduate	The effects of some variables on learners' career choices variables
26	Moses et al. (2011)	USA	Undergraduate	The effects of some variables on learners' career choices variables
27	Mulvey and Irvin (2018)	USA	Children	Examining learners' career choices
28	Nitzan-Tamar and Kohen (2022)	Israel	High School	The effects of some variables on learners' career choices
29	Palmer et al. (2017)	Australia	Middle and High School	The effects of some variables on learners' career choices variables
30	Peña-Calvo et al. (2016)	Spain	Undergraduate	The effects of some variables on learners' career choices variables
31	Reiss and Tamjid Mujtaba (2017)	England	Middle and High School	Effects of STEM activities
32	Sahin et al. (2017)	USA	High School	The effects of some variables on learners' career choices variables
33	Sáinz and Müller (2018)	Spain	High School	The effects of some variables on learners' career choices variables
34	Sasson (2019)	Israel	High School	Effects of STEM activities
35	Sasson (2021)	Israel	High School, young adults and adults	Examining learners' career choices
36	Scheitle and Ecklund (2017)	USA	Adults	The effects of some variables on learners' career choices variables
37	Shin et al. (2017)	South Korea	High School	The effects of some variables on learners' career choices variables
38	Smith (2022)	USA	Undergraduate	Examining learners' career choices
39	Taskinen et al. (2013)	Germany	High School	The effects of some variables on learners' career choices variables
40	Tandrayen-Ragoobur and Gokulsing (2022)	Mauritius	Undergraduates and women	Examining learners' career choices
41	van Meter-Adams et al. (2017)	USA	High School and Undergraduate	Effects of STEM activities
42	Wang (2013a)	USA	High School	The effects of some variables on learners' career choices variables.
43	Wang (2013b)	USA	Undergraduate	The effects of some variables on learners' career choices variables.
44	Wang et al. (2021)	Australia & Taiwan	Middle School	Effects of STEM activities
45	Wang et al. (2017)	USA	High School	The effects of some variables on learners' career choices variables
46	Watt et al. (2017)	Australia & USA	High School	Examining learners' career choices
47	Wegemer and Eccles (2018)	USA	Middle School	The effects of some variables on learners' career choices variables
48	Wyss et al. (2012)	USA	Middle School	Effects of STEM activities
49	Xu (2016)	USA	Undergraduates and graduates	Examining learners' career choices
50	Xu (2017)	USA	Graduates	Examining learners' career choices
51	Yoel and Dori (2022)	Israel	High School and graduates	Effects of STEM activities