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Practices for promoting scientific creativity among adolescent students: a systematic review

Práticas de promoção à criatividade científica entre estudantes adolescentes: uma revisão sistemática

Practices to promote scientific creativity between adolescent students: A systematic review

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Highlights

Educational practices associated with interdisciplinarity and technological resources enhance scientific creativity among students.

Certain individual characteristics can contribute to the development of scientific creativity during adolescence.

Stimulating creativity in students is essential for progress in science.

Abstract

The goal of this study was to analyze the practices aimed at promoting scientific creativity among adolescent students, as evaluated in empirical articles published between 2018 and 2022. Research pursuits were conducted in four databases. The results revealed that the practices proved to be effective and were associated with science, technology, engineering, and mathematics (STEM) approaches, technological support, teaching and learning methods, and the assessment of cognitive and behavioral characteristics of students. Further research is recommended in national contexts to investigate strategies for fostering scientific creativity among adolescent students.

Resumo | Resumen

Keywords

Creativity. Adolescents. Scientific Creativity. Systematic Review.

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Introduction

Creativity, in general, is an indispensable skill for the evolutionary process of humanity and for overcoming challenges in various fields (Alencar et al., 2016; Vries & Lubart, 2017). In science, as well as in the arts, it is an essential requirement, although the methods and modes of expression differ due to domain-specific characteristics (Glăveanu et al., 2013). In order to understand creativity in the field of science, scholars have dedicated themselves to the specific and independent investigation of the phenomenon known as scientific creativity (Huang & Wang, 2019).

Various definitions can be found in the literature, such as the capacity to generate new ideas based on existing scientific knowledge (Ayas & Sak, 2014; Hu & Adey, 2002); the willingness to combine knowledge in an original way to solve problems (Garcés, 2018); and the generation of hypotheses, experiments, and the evaluation of evidence (Klahr, 2002). On the other hand, Qiang et al. (2020) understand the phenomenon as an interaction between cognitive and behavioral skills aligned with interests, motivation, educational opportunities, and continuous learning. According to the authors, this combination of factors can enable individuals to create new products, whether they are theories, methods, solutions, or other types of scientific artifacts.

Scientific creativity is therefore the result of a comprehensive process that involves both individual characteristics and the social and cultural environment in which one is immersed. It is also a dynamic process, as it relates to developmental trajectories and interactive contexts (Feist, 2020). The school environment plays a central role in fostering this skill, as its educational and nurturing nature can promote it in students and make them capable of producing creative solutions in an increasingly globalized world (Huang et al., 2017; Qiang et al., 2020; Vries & Lubart, 2017).

This encouragement should happen as early as possible in educational settings to promote it continuously. However, concerning creativity in the field of science, research points to adolescence as a promising period, as it is considered a phase with characteristics similar to those experienced by professional scientists (Hu & Adey, 2002; Zhu et al., 2019). This is due to the changes in adolescent neurodevelopment, which involve more advanced levels of objective, rational, hypothetical, abstract, and metacognitive thinking, conditions optimized for learning (Kleibeuker et al., 2017; Van der Zanden et al., 2020). Additionally, during adolescence, there is a predisposition for exploratory behavior, flexible thinking, and curiosity. These characteristics can be drivers for the development of both general and scientific creative skills, depending on individual interests (Barbot, 2018; Sica et al., 2017).

However, data presented by the Organization for Economic Co-operation and Development (OECD) indicate that the creativity of adolescents has been negatively impacted due to a lack of more developed socio-emotional skills (Idoeta, 2021). According to the organization, there is a need for strategic changes in educational systems that consider both emotional issues and the encouragement of creativity in this space for holistic learning to occur. In response to this demand, active teaching methodologies have gained prominence and play a fundamental role in assisting in this process (Bacich & Moran, 2018).

With the aim of understanding the current research landscape on this phenomenon, this systematic review article aimed to analyze which practices aimed at promoting scientific creativity among adolescent students have been evaluated in studies and what their results are. It should be noted that this work is part of a broader and ongoing research effort by the authors of this text. The broader investigation aims to analyze the academic journey of recognized creative professional scientists. Therefore, studies like this one can help expand knowledge about pathways that assist in the education of those interested in the field of science or future scientists.

Method

The study consisted of a systematic literature review in which scientific publications were examined based on pre-established criteria. The goal was to gain an overview of recent empirical studies involving practices for promoting scientific creativity among adolescent students. The search, selection of works, and data synthesis procedures will be presented, allowing other researchers to replicate the process.

Step 1 involved the search procedures, starting with the tracking of articles published in four databases: Education Resources Information Center (ERIC), Electronic Journals in Psychology (Pepsic), Coordination for the Improvement of Higher Education Personnel (Capes) Periodicals Portal, and ProQuest. The choice of databases aimed to broaden the retrieval of studies indexed in national journals, from Latin America, and from a broader international context. The following descriptor pairs were used: "scientific creativity and adolescence" OR "creativity in science and teenager students." Filters were also applied: research published between 2018 and 2022, peer-reviewed, and in English and Portuguese languages.

Step 2, related to article selection, 1,355 titles from the publications found were encompassed. Regarding distribution, most came from ProQuest (n=1,242; 91.66%), followed by the ERIC database (n=88; 6.49%). Following that were Pepsic (n=20; 1.47%) and the Capes Periodicals Portal (n=5; 0.38%). In a preliminary analysis, based on reading titles and abstracts, 20 (1.51%) duplicate articles and 1,316 (96.92%) articles that did not fit the study's scope were excluded. Excluded publications were related to: theoretical studies; systematic reviews; research involving early childhood, undergraduate, and graduate students; psychometric test validation; and other studies that did not discuss the themes of scientific creativity and adolescents in a related fashion. At the end of this stage, 19 studies were identified.

Step 3 included the procedures for the full reading of the 19 articles. After full reading, they were included in the review study. The selection criteria were based on: (a) empirical studies; (b) research conducted with adolescents; and (c) analysis of scientific creativity among adolescent students. Of the total selected: 15 articles (n=15) came from the ERIC Portal; three (n=3) were found in the Capes Portal; and only one (n=1) was from ProQuest. No corresponding articles were found in the Pepsic database.

In Step 4, the 19 selected articles were categorized to consider the number of publications per year and the country where the data were collected. Then, the study objectives, participants, instruments, and main results were examined. Based on the evaluation of each article, they were grouped into four categories of analysis: (a) STEM approach (Science, Technology, Engineering, and Mathematics); (b) technological support; (c) teaching/learning methods; and (d) assessment of cognitive and behavioral characteristics.

Results

Regarding the number of publications during the research period, six articles were published in both 2021 and 2022. In the year 2020, four articles were found. In 2019, three articles were published. No corresponding studies were identified in 2018. Concerning the countries where the data were collected, Turkey had the highest participation with nine articles (47.37%), followed by Indonesia with four (21.06%). China had three publications (15.79%), while South Korea, Malaysia, and Austria each had one publication (5.26%). In 2019, two studies were published in Indonesia and one in China. In 2020, two were published in China, one in Indonesia, and one in Malaysia. In 2021, five studies were published in Turkey, and one in South Korea. Finally, in 2022, four were published in Turkey, one in Austria, and one in Indonesia. The results are summarized in Table 1 below.

Table 1
Data from the analyzed studies.

Year	Number of publications	Countries
2018	0	-
2019	3	China (1) and Indonesia (2).
2020	4	China (2), Indonesia (1) and Malaysia (1).
2021	6	South Korea (1) and Turkey (5).
2022	6	Austria (1), Indonesia (1) and Turkey (4).

Source: prepared by the authors.

Regarding the mentioned categories, eight studies (n=8) examined the effects of STEM practices on students' scientific creativity. Among these, seven were conducted in Turkey. Eroglu and Bektas (2022) investigated the effect of STEM practices on students' scientific creativity through a control group and an experimental group, using pre- and post-tests. The sample consisted of 133 secondary school students in Turkey. The Scientific Creativity Test (Hu & Adey, 2002) was used for data collection. The instrument includes seven items that aim to analyze: (1) the fluency of scientific ideas for unusual uses of objects; (2) the degree of sensitivity to scientific problems; (3) students' ability to improve a technical product; (4) scientific imagination; (5) problem-solving skills; (6) creative experimental ability; and (7) the ability to design scientific products. The results indicated a statistically significant difference in favor of the experimental group regarding the effects of STEM practices on scientific creativity.

Doğan and Kahraman (2021) analyzed the effect of STEM activities on students' scientific creativity through a quasi-experimental study, comprising a control group and an experimental group, using pre- and post-tests. The study included 98 secondary school students from a school in Turkey. The Scientific Creativity Test (Hu & Adey, 2002) was used for data collection. The results identified a significant increase in the scores of scientific creativity tests in the experimental group compared to the control group. Additionally, differences were found in the sub-scales of fluency, flexibility, and originality in the experimental group.

The study conducted by Hebebci and Usta (2022) aimed to examine the effects of STEM practices on scientific creativity, problem-solving skills, and critical thinking of students. The study involved 44 high school students from a private school in Turkey, divided into control and experimental groups, with pre- and post-tests. Data were collected using the Scientific Creativity Test (Hu & Adey, 2002), a Problem Solving questionnaire, and the Critical Thinking Disposition Instrument (Kılıç & Şen, 2014, as cited in Hebebci & Usta, 2022). The results indicated that integrated STEM education practices positively affected the scientific creativity, problem-solving skills, and critical thinking of students. The experimental group scored higher on the test compared to the control group.

Çalışıcı and Benzer (2021) analyzed the effects of STEM practice on environmental attitudes, scientific creativity, and problem-solving skills. The research included 44 high school students, divided into control and experimental groups, with pre- and post-tests. Data were collected using the Environmental Attitude Scale (Uzun & Sağlam, 2006, as cited in Çalışıcı & Benzer, 2021), Problem Solving Skills (Ekici & Balim, 2013, as cited in Çalışıcı & Benzer, 2021), and the Scientific Creativity Test (Hu & Adey, 2002). The results indicated that STEM practices positively contributed to environmental attitudes, problem-solving skills, and scientific creativity in students in the experimental group compared to the control group.

The study conducted by Kırıcı and Bakırcı (2021) examined the effect of a research-inquiry-based and STEM-supported approach on scientific creativity. A quasi-experimental design with pre- and post-tests was adopted, involving 64 high school students. The Scientific Creativity Test (Hu & Adey, 2002) was used to assess the impact of the approach. The results revealed a significant difference in test scores, favoring the experimental group, particularly in the sub-scales of originality, flexibility, and fluency. No significant difference was found in the pre- and post-test results of the control group.

Benek and Akcay (2022) aimed to analyze the effects of STEM activities integrated with scientific issues on students' creative skills. Sixteen high school students from a public school in Turkey participated in the study. The instruments used included the 21st Century Skills Scale (Turiman et al., 2012, as cited in Benek & Akcay, 2022) and interview forms. The results indicated that STEM activities integrated with scientific issues had a positive effect on students' creative skills. Interviews further revealed that STEM activities contributed to the development of creative and innovative potential, critical thinking, and problem-solving abilities in students.

Hasancebi et al. (2021) investigated the effect of a conventional argumentation-based and STEM-supported inquiry approach on academic performance, scientific creativity, and problem-solving skills of students. The study included 41 high school students from a school in Turkey, divided into two groups: conventional argumentation-based and STEM-based approaches. Data were collected using the Academic Achievement Test (Pressley et al., 1997, as cited in Hasancebi et al., 2021), Reflective Thinking Scale for Problem Solving (Kizilkaya & Askar, 2009, as cited in Hasancebi et al., 2021), Scientific Creativity Test (Hu & Adey, 2002), and semi-structured interviews. The results indicated that students' reflective thinking skills for problem-solving, scientific creativity, and academic success were more developed in the STEM-based approach.

In Malaysia, Siew and Ambo (2020) investigated the effects of a STEM project on the assessment of students' creative and scientific skills. The study included 360 students from public schools, who underwent the Scientific Creativity Test (Hu & Adey, 2002). The results indicated that the STEM method integrated into learning had a significant effect on the assessed dimensions of scientific creativity among the participants.

With regard to the technological support category, three studies (n=3) were identified. The research conducted by Astutik et al. (2020) in Indonesia examined the effectiveness of technological support and collaboration among students in improving scientific creativity. The study included 276 high school students from both private and public schools who were subjected to the Scientific Creativity Test (Hu & Adey, 2002) and mathematical reasoning activities. The results indicated that collaboration among the subjects and technological support were effective in enhancing the scientific creativity skills of the students.

In Turkey, Gök and Sürmeli (2022) investigated the impact of scientific activities related to toy design based on the engineering learning process among 40 high school students. Data were collected using the Scientific Creativity Test (Hu & Adey, 2002). The results showed a significant improvement in the scientific creativity of the students through toy design activities related to engineering.

Koç and Büyük (2021) conducted research in Turkey with the aim of analyzing the impact of technology and robotics-mediated activities on the creativity and scientific attitude of students. Seven high school students were subjected to the Scientific Creativity Test (Hu & Adey, 2022) and the Scientific Attitude Scale (Duran, 2008, as cited in Koç & Büyük, 2021). The results demonstrated that the use of technology and robotics contributed to the development of scientific creativity and the level of scientific attitude among the students.

In the category of teaching/learning methods related to the promotion of creativity in science, four studies (n=4) were found. Tambunan (2019) sought to investigate the most effective teaching methods to enhance students' scientific creativity. The methods were divided between problem-solving strategies and a scientific approach to assess students' creative skills in mathematics. The study involved 276 high school students from public and private schools in Indonesia. Data were collected using problem-solving strategies in mathematics and a scientific approach based on the ability to observe, question, experiment, and connect acquired knowledge. The results indicated that learning through problem-solving strategies was more effective in promoting creative and reasoning skills in mathematics.

In Indonesia, Septaria and Rismayanti (2022) evaluated the effects of learning based on a scientific inquiry approach on students' creativity. This study employed a pre-experimental design without a control group. Seventy high school students participated in the research and underwent pre- and post-tests. Data were measured through fifteen essay tests and analyzed statistically. The results showed that the implementation of teaching through the scientific inquiry approach was positive, as both creativity and student learning improved after its implementation. Additionally, students reported a significant difference in their learning after adopting this methodology.

In Indonesia, Suyidno et al. (2019) assessed the effectiveness of the Creative Responsibility-Based Learning program on students' creative and scientific skills in Physics. In this study, the authors understand creative responsibility as a conscious, flexible, and innovative form of learning about issues in the field, aimed at maximizing students' creative performance in the scientific process. The research used a quasi-experimental design with pre- and post-tests, involving 66 high school students. Data were collected through the observation of students, focusing on participation, questioning, cooperation, and leadership. Additionally, the Scientific Creativity Test (Hu and Adey, 2002) was used to evaluate imagination, scientific problem-solving, and product design abilities. The results indicated a significant increase in creativity after adopting the learning method. The authors argue that creative responsibility-based learning was effective in enhancing students' scientific creativity in Physics.

In Austria, Haim and Aschauer (2022) investigated the impacts of the Flex-Based Learning program on promoting the scientific creativity of 3,516 high school students. Flexibility, as defined by the authors, is the ability to adopt various perspectives on a given topic and to implement strategies for solving scientific problems. The program focuses on promoting flexibility, divergent, critical, and associative thinking, as well as problem-solving skills. Several interventions were proposed to assess the program's effectiveness, including: 1) carefully listening to the task; 2) thinking independently; 3) discussing answers in small groups; and 4) sharing results with the class. Data were collected using semi-structured interviews, questionnaires, and video recordings. The results indicated that the Flex-Based Learning program significantly contributed to promoting the scientific creativity of students.

Four studies (n=4) evaluated cognitive and behavioral characteristics and their influence on scientific creativity. In China, Zhu et al. (2019) investigated the effects of convergent and divergent thinking and their impact on the scientific creativity of adolescents. The study assessed 588 high school students. Data were collected using a convergent thinking test - the Remote Association Test (Jen et al., 2004, as cited in Zhu et al., 2019), divergent thinking - the Alternate Uses Tasks (Guilford, 1967, as cited in Zhu et al., 2019), and a questionnaire to assess scientific creativity. The results showed that all aspects related to divergent thinking significantly impacted scientific creativity. Convergent thinking, on the other hand, did not have a direct impact but served as a mediator in the process.

Sun et al. (2020), in a study conducted in China, investigated the influence of divergent thinking and individual differences on students' scientific creativity. For this analysis, training was conducted to assess students' abilities to associate, decompose, and combine knowledge. The study involved 105 high school students. Data were collected using the Scientific Creativity Test (Hu & Adey, 2002) and the Runco Ideational Behavior Scale (Runco, 2001, as cited in Sun et al., 2020). The results indicated that divergent thinking and individual differences positively influenced students' scientific creativity, and there was a significant improvement after the training.

The research conducted by Qiang et al. (2020) in China investigated the impacts of critical thinking and self-efficacy on scientific creativity among 1,153 high school students. The instruments used for data collection were the Critical Thinking Disposition Inventory (Peng et al., 2004, as cited in Qiang et al., 2020), the Creative Self-efficacy Scale (Karwowski et al., 2013, as cited in Qiang et al., 2020), and the Scientific Creativity Test (Hu & Adey, 2002). The results indicated that the participants' critical thinking and self-efficacy had a positive impact on their scientific creativity.

Finally, in South Korea, Lee and Park (2021) investigated the necessary characteristics to promote scientific creativity among high-achieving students. The study involved 145 high school students, and a 30-item questionnaire with indicators for becoming creative scientists in the future was used. The results pointed out that conducting experiments, asking questions, solving complex problems, and sharing ideas within teams were driving factors for creativity in science.

Discussion

This systematic review examined practices for promoting scientific creativity among adolescent students, as evaluated in empirical articles published from 2018 to 2022, along with their respective results. Regarding the investigated period, it was identified that the quantity of publications on this topic increased from 2019 onwards. Stretch and Roehrig (2021) hypothesize that the emphasis on creativity has expanded due to challenges posed by the Coronavirus Disease 2019 (Covid-19) pandemic and other 21st-century issues in areas such as the environment, sustainability, and global development. These challenges will continue to be part of global dilemmas, making it necessary to qualify human resources to address these difficulties.

Concerning the countries where the studies were conducted, Turkey in the Middle East, between Europe and Asia (n=9), and some Asian countries like Indonesia (n=4) and China (n=3) stood out. These countries are all considered emerging in the global economy. These results reflect a pursuit of educational and scientific enhancement of human capital to enable them to keep pace with progress in their respective nations. Yildirim et al. (2016) highlight that Turkey has been constantly making changes to its school curriculum to adapt it to current needs. They suggest that an interdisciplinary research-based approach can be effective in developing skills for engaging in scientific processes and for education aligned with market demands and globalization requirements.

In Asian countries like China, they achieve some of the highest performances in the Programme for International Student Assessment (PISA) (Suarte et al., 2021). This program provides information about the performance of students aged 15-16 in the areas of science, mathematics, and reading. On the other hand, Indonesia records lower performances in the same assessment. However, interventions have been directed toward improving the quality of teaching and learning practices for students through training, guidance, and evaluation by teachers (Nurtanto et al., 2020). It is worth noting that, although the PISA assessment does not focus on creativity, the disciplinary knowledge acquired is crucial for future scientific innovations. Nevertheless, in 2021, the program identified the need to incorporate activities that assess creative thinking into the tests. The inclusion of this item in the program is an attempt by the OECD to align with the Sustainable Development Goals of the 2030 agenda (Gray & Morris, 2022).

Regarding the categories of analysis, it was observed that studies evaluating the STEM approach predominated (n=8). This practice is considered one of the most effective methods for developing students' scientific creativity due to its interdisciplinary nature, which involves the application of knowledge from various disciplines (Benek & Akcay, 2022). The goal of STEM education is to produce scientifically qualified individuals and assist in holistic knowledge acquisition to develop skills for solving real problems and making decisions (Rosenzweing & Wigfield, 2016). Furthermore, STEM practices are of global interest and align with the goals of the United Nations 2030 Agenda for sustainable development and social justice (UN, 2015).

Studies associated with technological support (n=3) indicated that the mediations adopted in the teaching process had a positive impact on students' scientific creativity. This scenario shows that integrating technology into education has become an imminent necessity to meet students' demands (Newman & Scurry, 2015). Considering that children and adolescents in today's society are immersed in this technological environment, the conventional model of education no longer suffices. New avenues must be explored to enable enriching experiences where students can think and develop knowledge in scientific and technological invention environments (Azevedo & Maltempi, 2023). It is evident that technological advancements are present in various domains, and concerning progress in science, high levels of knowledge alone are insufficient; tools capable of mediating diverse human activities are also needed.

In the category of teaching/learning methods (n=4), specific methodologies and programs used by the authors were identified. These included problem-solving (Tambunan, 2019), investigative approaches (Septaria & Rismayanti, 2022), creative responsibility (Suyidno et al., 2019), and flexibility in associating ideas (Haim & Aschauer, 2022) as effective for fostering students' scientific creativity. In this regard, Beghetto and Madison (2022) emphasize that in today's society, schools and teaching methods play a crucial role in delivering content in ways that generate interest, attitudes, and student agency. Therefore, promoting learning experiences based on various means can contribute to the acquisition of knowledge and skills necessary for the 21st century through innovative methods. In times of change, dismantling rigidity in education appears to be an important function for both schools and the individuals being educated in these spaces.

Regarding the assessment of cognitive and behavioral characteristics (n=4), the practice proved beneficial in identifying individual attributes that can enhance scientific creativity, such as divergent thinking, critical thinking, self-efficacy, and questioning behavior. Scholars indicate that many aspects need to be considered concerning scientific creativity, including cognitive (Redó et al., 2021; Sun et al., 2020), affective, attitudinal, and environmental influences (Kızkapan & Nacaroğlu, 2021; Ramnarain, 2020). Although cognitive abilities are highlighted in some studies, they should be analyzed in conjunction with other variables (Karwowski et al., 2016; Wai & Brown, 2021). Experts agree that the combination of cognitive ability, educational opportunities, and other non-cognitive attributes such as motivation and specific interests suggests better performance in academic-scientific domains (Araújo et al., 2017; Tang & Kaufman, 2015).

Overall, the results indicated that the practices employed in the studies, such as the STEM approach, technological support, teaching/learning methods, and assessment of individual characteristics, had positive effects on the promotion of scientific creativity among students. These practices align comprehensively with what is advocated in the parameters of active methodologies for the educational process. According to Bacich and Moran (2018), active methodologies encompass a set of diverse methods aimed at innovative and collaborative teaching/learning as well as the development of students' socio-emotional skills. Thus, these methodologies proved essential for promoting creativity in science, considering the various dimensions involved: individual, social, and situational (Huang et al., 2017).

Final remarks

Although the students analyzed in this study are in their formative process, the identification and development of talents within educational spaces can foster their formal entry into the scientific domain in the future. As highlighted by Benek and Akcay (2022), adolescents are referred to as potential resources, influential in a nation's progress. Investing in the education of this population through practices that encourage creative skills and learning about the scientific process can yield long-term returns in economic, social, and technological aspects, promoting advancements in the future. Therefore, studies like this one can help expand our knowledge of some of the pathways and strategies that can be adopted in educational settings to assist in the education of students interested in science.

Despite the research providing some insights into the phenomenon, this study identified certain gaps. There was a lack of investigations in a national context that discussed scientific creativity with a focus on adolescent students. Additionally, no studies were identified that considered the role that families play, in conjunction with educational strategies, in promoting students' creativity. The family context, as the individual's first social institution, represents fertile ground for creativity, as it offers the potential for powerful and challenging experiences that can mobilize creative actions and contribute to individual and social development (Alencar et al., 2016).

We recommend conducting research with a focus on interventions for the development of scientific creativity and involving the investigation of the influence of other variables, such as family relationships, socioeconomic status, among others. Furthermore, we present limitations that need to be considered in other research, such as the non-inclusion of investigations resulting from unpublished dissertations and theses in article format. Additionally, we suggest that the search for studies be conducted in other databases, using different descriptors, and extending the analyzed period.

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Resumo

O objetivo deste estudo foi analisar as práticas de promoção à criatividade científica entre estudantes adolescentes avaliadas em artigos empíricos publicados entre 2018 e 2022. A busca das pesquisas ocorreu em quatro bases de dados. Os resultados revelaram que as práticas demonstraram ser eficazes e estavam associadas com abordagem em ciência, tecnologia, engenharia e matemática; suporte tecnológico; métodos de ensino/aprendizagem e avaliação de características cognitivas e comportamentais dos alunos. Recomenda-se a realização de pesquisas em contextos nacionais, de modo a investigar as estratégias de incentivo à criatividade científica entre os estudantes adolescentes.

Palavras-chave: Criatividade. Adolescentes. Criatividade Científica. Revisão Sistemática.

Resumen

El objetivo de este estudio fue analizar prácticas para promover la creatividad científica entre estudiantes adolescentes, evaluadas en artículos empíricos, publicados entre 2018 y 2022. La búsqueda de investigaciones se realizó en cuatro bases de datos. Los resultados revelaron que las prácticas estuvieron asociadas con: acercamiento a la ciencia, tecnología, ingeniería y matemáticas; soporte tecnológico; métodos de enseñanza/aprendizaje y evaluación de las características cognitivas y conductuales. Se recomienda que las investigaciones se realicen en contextos nacionales, con el fin de investigar estrategias para fomentar la creatividad científica entre los estudiantes adolescentes.

Palabras clave: Creatividad. Adolescentes. Creatividad científica. Revisión sistemática.

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