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Systematic Review

Creative Thinking in Art and Design Education: A Systematic Review

Mariela Samaniego *, Nancy Usca, José Salguero and William Quevedo

Facultad de Ciencias de la Educación Humanas y Tecnologías, Universidad Nacional de Chimborazo, Riobamba 060108, Ecuador; nancy.usca@unach.edu.ec (N.U.); jsalguero@unach.edu.ec (J.S.); wquevedo@unach.edu.ec (W.Q.)

* Correspondence: msamaniego@unach.edu.ec

Abstract: This study aims to identify and analyze relevant characteristics associated with creative thinking, particularly in arts and design education. A systematic literature review was conducted following the PRISMA protocol, utilizing the Scopus database, where 292 studies were retrieved through search strings. From these, 187 studies were selected for the final analysis. The results highlight an emphasis on experiential learning, STEAM (Science, Technology, Engineering, Arts, and Mathematics), and interdisciplinary approaches as prevalent educational methodologies for fostering creative thinking. The identified techniques include interdisciplinary projects, artistic practices, nature-based activities, and the use of digital tools. The core skills identified include originality, fluency, flexibility, and elaboration. Furthermore, it was observed that most of the studies were conducted in higher education institutions. The study underscores the urgency of promoting research in specific regions, such as Latin America, to contribute to advancing and enriching the educational landscape in these areas. Additionally, it emphasizes the importance of fostering creativity from an early age. The significance of this study lies in its contribution to more effective pedagogical practices for the development of creative thinking that positively impacts education and prepares individuals for the challenges of the 21st century.

Keywords: STEAM education; creativity; innovative education; interdisciplinary projects; 21st-century skills

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1. Introduction

The foundations for implementing educational practices centered on creative thinking are rooted in an understanding of learning and skill development. In the 21st century, the demands of the workforce and society have transformed, placing more value on creativity, problem solving, and critical thinking [1,2]. In this context, educators recognize the need to prepare students to face complex challenges, where creativity becomes an essential competitive advantage. Simultaneously, the educational paradigm has evolved toward a more holistic understanding of learning, acknowledging that creative thinking is crucial for innovatively addressing problems and promoting deep and more meaningful learning [3]. This transformation is supported by criticism of the traditional education model, centered on memorization and repetition, which has acted as a catalyst for adopting more creativity-oriented approaches. This shift acknowledges that the old paradigm may not be effective for all students, driving the need for a more diversified approach adaptable to various learning styles [4]. Here, integrating creative thinking practices promotes a deeper understanding and prepares students for a constantly changing world and emerging challenges [5]. Furthermore, the evolution of technology has played a crucial role in changing how we access information and address problems, requiring students to develop creative skills to innovate and use technology effectively [6]. These backgrounds reflect the pressing need for an educational approach that fosters creative thinking as an essential skill for success in a complex and dynamic world.

1.1. Creative Thinking

Hernández et al. [7] characterize creative thinking as the ability to think, imagine, and act differently, highlighting its capacity to contribute new meaning, solve problems, and add value to a specific task. On the other hand, Al-mahasneh [8] conceptualizes creative thinking as a complex mental activity aimed at transforming and enhancing common ideas, emphasizing the importance of seeking innovative solutions that diverge from typical patterns. Meanwhile, Khuana et al. [9] define creative thinking as a form of thinking that enables the generation of novel methods, approaches, and perspectives to address challenging problems. Collectively, various authors underscore the diverse and multifaceted nature of creative thinking, emphasizing its ability to generate innovative ideas, solve problems, and provide fresh approaches to specific challenges.

Thinking creatively involves generating uncommon and practical solutions and represents an authentic, innovative way of conceiving and addressing reality. Creative activities are beneficial for students to acquire 21st-century skills [10]. In the context of integrated learning situations, such as problem-based learning and STEAM (Science, Technology, Engineering, Arts, and Mathematics), students are encouraged to develop unique approaches to problem solving, interact with their peers, and efficiently utilize both the physical and digital environment. This promotes a creative and innovative atmosphere [11].

1.2. Creativity

Creativity is the act of generating and applying valuable and original ideas, regardless of the field or subject matter. This process is not limited to any specific area. Creativity manifests in diverse fields, including artistic expression, invention, mathematical disciplines, engineering, and the natural, social, and biological sciences. Creativity is also present in medicine, business, leadership, and sports [12]. Creative capacity transcends disciplinary boundaries, positively influencing a wide scope of human activities [13]. This perception of creativity as a transferable skill has led to a significant expansion in educational approaches, aiming to nurture creative thinking across a broader range of disciplines. This shift reflects the growing understanding that creativity is not confined to artistic expressions but plays a crucial role in diverse contexts. It underscores the importance of incorporating educational approaches that comprehensively foster creativity.

Teaching to promote creativity can be a way to motivate students to engage in diverse scientific and artistic tasks, equipping them with the necessary skills for the contemporary world. This implies that various fields evolve together with other disciplines [14]. Only through this coevolution of ideas will new perspectives emerge and new ways of thinking be achieved.

1.3. State of the Art

Throughout this research, a review and identification of previous studies related to the study topic (state of the art) were conducted. This procedure was carried out to gain an understanding of the current state of information available on the subject. The review of previous research provided a solid foundation for the present investigation and allowed for the identification of knowledge gaps that require more detailed attention. Therefore, the following question arises: What are the previous research studies that have been conducted in the field of education in creative thinking?

One such identified study was conducted by Monteza [15], which aimed to establish a conceptual framework around didactic strategies and creative thinking. Additionally, it analyzed the impact of implementing various strategies on the development of creativity in secondary education students. The research was based on a documentary review of 50 articles published in various reliable databases. As a result of the review, it was identified that the proper application of didactic strategies aimed at developing higher-order skills has the potential to expand opportunities to enhance students' creative thinking.

Similarly, Delgado [16] conducted a study aiming to examine the foundations of creative thinking, its relevance, and the most prominent didactic strategies in the classroom

for its effectiveness. Data were collected from 54 scientific articles through a descriptive–analytical study that reviewed the scientific literature in various indexed journals. The results reveal numerous classroom strategies that strengthen creative thinking, such as educational games, problem-based learning, educational robotics, brainstorming, mind maps, creative drama, and the Moodle platform. The challenge for teachers relies on transforming their pedagogical practices by incorporating innovative strategies.

In a study by Zambrano [17], the author explains the relevance of fostering creativity in higher education students, addressing the psychological structure of creativity, its stages, and levels of development. The article emphasizes the importance of providing freedom in the search for solutions, supporting the application of creative approaches to specific problems, and creating an environment that promotes openness, critical thinking, and self-confidence. The crucial role of university professors is highlighted in using teaching methods that contribute to the comprehensive training of future professionals, facilitating the application of knowledge to address social, scientific, and technological challenges.

Likewise, Acuña's research [18] focuses on exploring the development of critical and creative thinking through learning strategies, critical reading, and problem-based learning (PBL), as well as analyzing the correlation between these variables. The author begins with a thorough review of scientific articles providing updated empirical data on higher-order thinking skills. The results highlight the employment of diverse learning strategies (cognitive, metacognitive, and affective) that influence the development of critical and creative thinking skills, and teaching strategies such as critical reading and PBL play a fundamental role. Critical reading stimulates critical thinking for thoughtful argumentation, while PBL contributes to the development of both critical and creative thinking in practical situations.

The previous studies addressed have provided valuable contributions to the study of creative thinking and associated didactic strategies. Moreover, it has been evidenced that creative thinking plays an increasingly relevant role in personal development and problem solving. It emerges as an essential component in individuals' adaptation process, enabling technological and economic development by providing tools to address everyday challenges [19]. Furthermore, it stands as a fundamental element for the comprehensive development of students, nurturing collective creativity that drives advances in various fields. Creative thinking can enhance inventiveness and lead innovative processes [20]. Thus, creative thinking presents itself as a responsibility of educators to inspire, motivate, and stimulate the creativity of students.

However, it is necessary to note some limitations present in these studies, as the limited number of articles analyzed in these investigations may not fully encompass the diversity of approaches to educational creativity. Additionally, there is a tendency in these studies towards conventional didactic strategies without thoroughly exploring other emerging methodologies. To a large extent, the lack of research focusing on creative thinking applied to the field of art and design from a systematic review perspective has left a significant knowledge gap. It is crucial to note that creative thinking is closely related to the art of communication. This lack of specific studies underscores the need to delve more deeply into the role of creativity in the sphere of art and design. A detailed understanding of this phenomenon enriches theory and provides a solid foundation for driving innovation and artistic expression at the intersection of creativity and communication.

1.4. Purpose and Research Questions

In this context, educators must possess the strategies, tools, and skills necessary to foster creative thinking in their students, thereby moving towards a more competitive and innovative educational model. This allows the utilization of theories, methods, and innovative technologies [21], transforming them into guides that inspire exploration and innovative expression. The present research stands out for its primary focus on the field of arts and design, analyzing a significantly larger number of studies and exploring a broader variety of methodologies, techniques, and tools. This study aims to identify correlations

between these variables more deeply, providing a more comprehensive and detailed insight into the landscape of creative thinking in an educational context.

The present research aims to explore the methods, techniques, and practices employed globally to foster the development of creative thinking in an educational context, with a particular emphasis on the field of art and design. The research questions guiding this analysis are as follows: RQ1 What are the predominant educational methods for the development of creative thinking? RQ2 What techniques or activities are most frequently applied to cultivate creative thinking? RQ3 What technological tools are employed to support activities for the development of creative thinking? RQ4 What are the skills of creative thinking? and RQ5 at what educational levels have studies related to this specific theme been conducted? Demographic data such as the country and year of the studies are also identified and analyzed. These questions will be addressed based on the resulting studies related to art and design. This systematic approach will provide a comprehensive understanding of global practices and approaches to promoting creative thinking in an educational context, with particular attention to the specificities of artistic and design disciplines.

2. Methods

This section outlines the eligibility criteria, sources of information, search strategy, study selection, methods for assessing the risk of bias, and techniques for establishing the synthesis in this systematic literature review (SLR). The PRISMA 2020 guideline [22], has been employed for this purpose, and compliance with each of its items has been reviewed using a checklist. Documents detailing the process and the checklist can be found in the following reference [23].

2.1. Eligibility Criteria and Information Sources

Table 1 presents the eligibility criteria for this SLR, categorized into inclusion and exclusion criteria. It defines the parameters considered for the selection of studies. The scientific database Scopus was utilized as the search resource, given its compilation of information from various scientific databases, publishers, and high-impact journals [24]. The selection of this database was also grounded in the fact that it yielded a significant number of studies (292), deemed a substantial sample. Moreover, the search included works belonging to the control group. The final search string was defined in the last inquiry conducted on 31 October 2023.

Table 1. Inclusion and exclusion criteria.

Inclusion Criteria	Exclusion Criteria
Scopus database. Studies that contain terms related to the topic in the title, abstract, and keywords. Studies exclusively from the last 10 years (2013–2023). Studies published in both English and Spanish.	Studies containing retractions or errata reported. Books not specifically related to the study questions. Studies unrelated to arts or design.

2.2. Search Strategy

The search strategy was systematically defined; Table 2 describes the blocks, initial terms, terms used, and a description of the study variables. Four blocks were constructed with key terms that could potentially address the research questions posed in this study. These blocks allowed the establishment of an initial search string from which eight closely related articles, referred to as studies from the control group (CG), were retrieved (see Table 3). Using the title, abstract, and keywords of the CG studies, a term-linkage chart was created (see Figure 1). In this chart, the central word "Creative" is highlighted in orange, surrounded by a total of 20 other frequently occurring words. These words were utilized to broaden the search.

Table 2. Search query term blocks.

Block	Initial Terms	Terms Used	Description
Block 1	"Creative Thinking"	"Creative Thinking"	Ability to generate original ideas and innovative solutions when addressing problems or challenges, involving imagination and mental flexibility to explore unconventional perspectives—this specific term is sought after.
Block 2	"Art", "Graphic Design"	"Art", "Graphic Design", "Visual"	Focus of the review oriented towards arts or graphic design.
Block 3	"Education", "Academic", "Teaching"	"Education", "Academic", "Teaching", "Student", "Teacher", "Learning"	Education studies.
Block 4	"Strategies", "Skill", "Technique", "Practice"	"Strategies", "Skill", "Technique", "practice"	Educational studies, strategies, skills, techniques, and tools of creative thinking are sought.

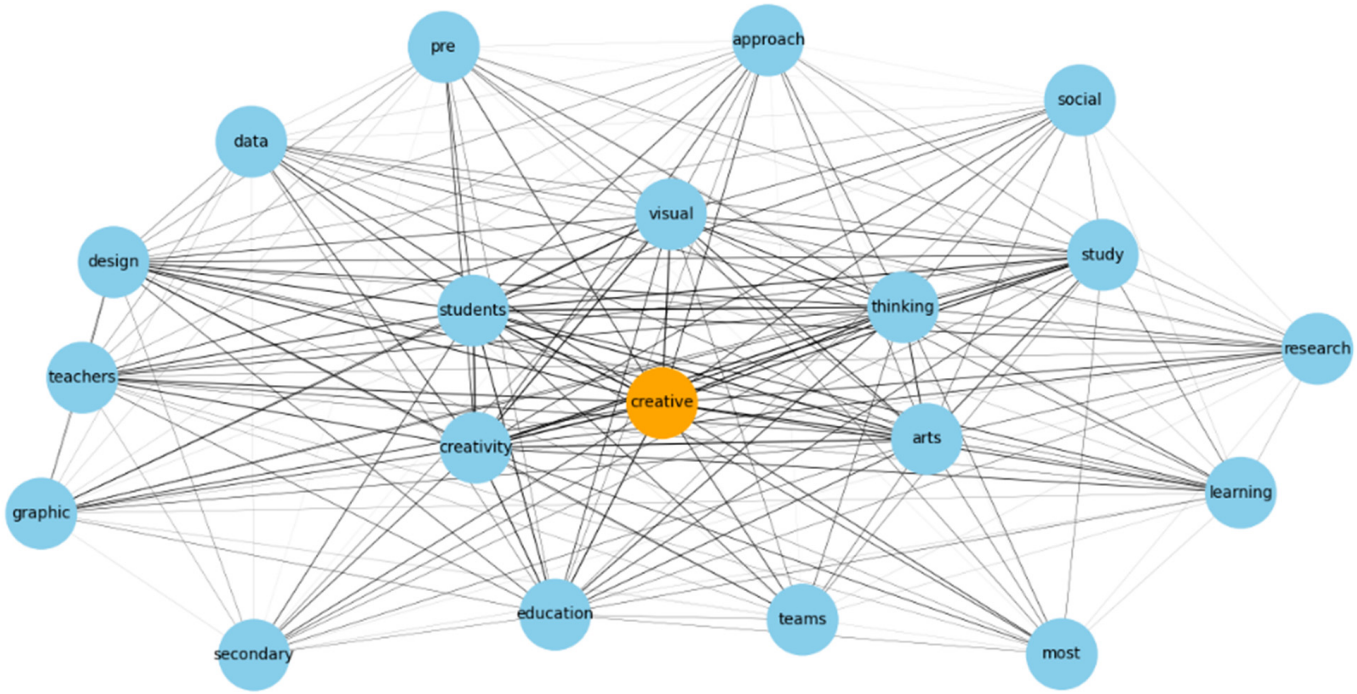

Figure 1. Network graph of key term connections.

Establishing a control group involves a set of reference studies that address the characteristics posed by an SLR, particularly concerning its research questions. Its purpose is to facilitate the identification of keywords. Despite not always returning all articles from the control group in candidate studies [25], in this research, the search string was refined in such a way that 100% of the control group studies are present in the candidate studies, ensuring the construction of the search string.

For the generation of the link chart, an algorithm with Python code was employed (see Supplementary Materials [23]). This algorithm conducts a keyword analysis, initiating by defining a list of words to exclude and then performing text preprocessing, extracting content from each page based on the title, abstract, and keywords. Subsequently, text tokenization was carried out, followed by the removal of stopwords (common words generally lacking specific meaning in the textual context) and specific words defined in the exclusion list. Next, the frequency of each word was counted, and an undirected graph

was constructed using the NetworkX library. Nodes were added to the graph, utilizing the most frequent words as labels and excluding those present in the exclusion list. Edges were established based on the frequency of similarity between words. Finally, the most relevant nodes were identified and highlighted, emphasizing significant connections, and the graph was visualized using matplotlib. This process allows the observation of which words could be included in a search to make it more meaningful.

The words related to the study topic are presented in light blue, while the most important term or word, which centralizes related concepts, is highlighted in orange. These words are interconnected by lines representing conceptual distance, calculated based on frequency and relevance. This visual representation aims to illustrate the connections and thematic proximity among the elements, providing a graphical insight into how concepts relate to each other based on their importance and frequency within the study context.

Table 3. Control group studies.

Title	Authors' Abstract	Keywords
Exploring creative pedagogical practices in secondary visual arts programmes in Ghana [26].	Secondary visual arts education provides learners with opportunities to develop critical thinking, and their creative potential, as part of their personal growth. This development happens when visual arts teachers actively integrate creative pedagogies to target creative thinking in learners. Ghana's 2019 National Pre-tertiary Curriculum Framework has added creativity as one goal for all learners. This research study explores teachers' perceptions and use of creative pedagogies as part of implementing this creativity into their teaching...	creative pedagogies; creativity; Ghana; policy; secondary visual arts
SCAMPER as a Creative Idea Generation Method: Case Study on Graphic Design Students [27].	...The study follows the descriptive approaches in its theoretical aspect, and the qualitative approach based on process of observation for its practical aspect. Finally, the study reflects the teacher's observation, and the development of students' knowledge and perception. The results of the study showed that using SCAMPER has positive effects and impacts on the graphic design students, provides them with a more direct method and systematic approach to ensure ideation, so it sped up the process in generating ideas. Also, it provides an enjoyable environment to practice creative thinking.	Creative thinking; SCAMPER technique; Idea generation techniques; Creative problem-solving; Graphicdesign
Cultivating Students' Creative Thinking Using Visual Narrative in an Agile Blended Learning Environment [28].	The purpose of this study is to examine the effectiveness of a course design to foster students' creative thinking using visual narrative. This research examined a course called "Thinking about the Past, Present and Future of a Locality" at K University in Japan as a case study. Through the analysis of data from students' reflection reports and artifacts, the authors identified that students improved their imagination, narrative creation skill and expressive skill through Visual Narrative (VN) during the course, "Thinking about the Past, Present and Future of the Locality"...	Blended learning environment; Creative thinking; Instructional design; Projected-based learning; Social Constructivism; Visual narrative

Table 3. *Cont.*

Title	Authors' Abstract	Keywords
Cultivating Creativity of Graphic Design and Multimedia Students: The Perceptions of Arab Faculty and Experts [29].	. . .The current investigation surveys a sample of experts as well as professors teaching across the Arab World concerning their perceptions on the most significant correlates of creative thinking among students. Results point to the importance of: (1) instructors' engagement; (2) appropriate use of instructional strategies, tools, and resources; (3) institutional support; (4) peer support; and (5) the removal of red-tape regulatory frameworks. Most importantly, this research highlights the need to move away from the rigid higher education creativity model assuming perfection, precision, accuracy, and optimal effectiveness to a more flexible creativity framework. . .	Arab world; creativity; graphic design; higher education; innovation; multimedia
Challenge-based learning as a tool for creativity and talent expression [30].	. . .In this short paper, as a case study one, we will outline the DigiEduHack initiative, focusing on the potential of a challenge-based approach in stimulating and strengthening introspection, creative thinking and talent's expression. Supported by a set of qualitative data collected before and after the event, this work reports an education case study.	challenge-based learning; creativity; digital education; hackathon; participatory learning
Enhancing the creative learning experience through harnessing the creative potential of digital and social media platforms in art and design educational contexts [31].	. . .The research analyses the potential role of digital and social media applications in enhancing the creativity of art and design students, and explores the benefits they bring to the creative process both for students and educators. It involves two experimental studies; the first study explores the use of a digital painting technique by 23 fine arts students, while the second study investigates the use of social media apps by 42 graphic design students. The study is undertaken in an experimental educational setting and aims to determine how digital media can be employed by educators to expand student's creative thinking. . .	Creativity; Education; Innovation; Repurposing; Social media
Fostering collaboration and creative thinking through extra-curricular challenges with primary and secondary students [32].	. . .The research employed a correlational design using quantitative ANOVA to explore relationships between thinking processes and collaboration in producing creative answers. The data (N = 1445 teams) was collected from the Australian and New Zealand teams of seven students participating in a five-minute spontaneous divergent thinking challenge in 2019. The data reported operational differences between the teams to generate creative outcomes. STEM teams saw enhanced collaborative thinking compared to other teams in a common challenge. The data has implications for teacher-initiated collaboration pedagogy in different learning areas.	21st century skills; Arts; Creativity; Critical thinking; Extra-curricular challenges; Problemsolving; School students; STEM; Teamwork
Global creativity: Intercultural "hands-on" workshops for pre-service primary art teachers [33].	This seminal paper is presented against the background of a "hands-off" approach to teaching visual arts in most of the Western world where visual arts education is often considered by the school community as peripheral to the real "mission" of education. Most scholars agree that the role of pre-service teachers in the twenty-first century is to develop creative thinking and action in children. However limited research has been conducted into this area of study. . .	Global creativity; The role of pre-service primary teachers; Visual arts education

The final search string configuration for Scopus, including inclusion and exclusion criteria, is as follows:

(TITLE-ABS-KEY ("Creative Thinking") AND TITLE-ABS-KEY ("art" OR "graphic design" OR "visual") AND TITLE-ABS-KEY ("education" OR "teaching" OR "academic" OR "students" OR "teacher" OR "learning") AND TITLE-ABS-KEY ("skill" OR "strategies" OR "tools" OR "technique" OR "practice")) AND PUBYEAR > 2012 AND PUBYEAR < 2024 AND PUBYEAR > 2012 AND PUBYEAR < 2024 AND (LIMIT-TO (LANGUAGE, "English") OR LIMIT-TO (LANGUAGE, "Spanish")) AND (EXCLUDE (DOCTYPE, "bk") OR EXCLUDE (DOCTYPE, "tb") OR EXCLUDE (DOCTYPE, "er") OR EXCLUDE (DOCTYPE, "cr")).

2.3. Study Selection and Data Collection Process

The first filter entailed reviewing the title, abstract, and keywords of each retrieved publication to exclude research works that deviate from the formulated research questions. The objective of this process was to identify whether a study focused on the development of creative thinking, had a clear emphasis on the educational domain, and had any relation to arts or design. Additionally, an assessment followed to determine if the study provided answers to at least one of the research questions posed. In cases where doubts arose among any of the authors regarding the suitability of a study, a comprehensive search and review of the specific article were undertaken to gain a more detailed understanding of its relevance and contribution to the study's subject. For the second filter, all articles were downloaded as full texts [24,25], and a similar screening process was employed using content analysis techniques.

For the listing, classification, and organization of the extracted data, Excel spreadsheets were employed, enabling an efficient and structured handling of the gathered information. Collaboration among the authors, an equitable distribution of the workload, and the use of appropriate tools all contributed to a coherent and rigorous data extraction process for the subsequent analysis.

2.4. Study Risk of Bias Assessment

The review and arbitration for the selection of studies were carried out collaboratively by the four authors of this work. Each author has a background in brand design and management, literature, graphic design, and architecture, with postgraduate qualifications in innovation and educational technologies. Twenty-five percent of the studies were analyzed by each investigator, and each served as a peer reviewer for the decisions of at least 25% of the studies. In cases where opposing decisions arose, a third participant among the authors of this work conducted a review to resolve the discrepancy. This process was applied to both the selected studies (first filter) and the primary ones (second filter).

To analyze potential biases in the results of each research question, the authors implemented arbitration processes. During these stages, the data obtained in each study were reviewed and validated. The complete details of the systematic review and the methods employed to mitigate bias risks are outlined in the supporting documents [23].

This arbitration process enables effective management of the bias risk arising from the absence of results in a synthesis. The involvement of more than one investigator in reviewing the content of a manuscript ensures the reliability of the evidence presented in this article.

2.5. Effect Measures

The classification and counting of studies were conducted based on the responses to each question. From these results, a percentage was determined relative to the total number of primary studies and the total number of studies that addressed each research question. Data on the mean and median were obtained, as well as the upper and lower limits. Subsequently, three confidence intervals—high, medium, or low—were created

based on the latter. These intervals serve as an indicator for readers regarding which response items can provide greater confidence for application in their educational settings.

2.6. Synthesis Methods

To carry out the collection, organization, and synthesis of data in the primary studies, Excel 2019 software was utilized. A structure consisting of 9 columns was designed: the identification code of each study, the country of implementation or application, the pedagogical methods applied or proposed, the specific techniques or activities suggested for the development of creative thinking, the digital tools used or recommended in these practices, and the classification of the creative thinking skills presented in each study. This was carried out to identify the disciplines or subjects in which these studies were applied, noting that some were conducted in multidisciplinary fields, including art or design, and the educational level at which each study was conducted. In the data preparation process, categories were created, and within these categories, the data found in each study were listed. Subsequently, using these data listings, a classification was carried out to identify and count the number of studies that provided each type of data.

To synthesize the information and data sets, they were organized by classes, assigning the corresponding study code and totaling the number of studies in each class. This methodology facilitates the identification of the most recurrent data in the analyzed studies. In this way, a clear and concise presentation of results related to the research questions is achieved, identifying countries with the highest production of studies on the topic, highlighting the most used methods, techniques, and educational tools, indicating the creative thinking skills that experts consider priorities, and identifying the subjects and educational levels in which studies were most frequently applied.

For the synthesis of the results, tables were created to effectively manage the variety of classes and studies and to provide a clear and organized classification, thus facilitating the understanding of the information. Excel software was employed to further automatize the counting of studies.

To classify data corresponding to the research questions, several classes did not exactly share the same name, although they referred to the same methodology, practice, or tool. The identification of this similarity was carried out through a careful analysis of the context associated with each word and the practices associated with the questions. In the case of RQ4, characterized by the diversity of tools, a grouping approach was implemented where these tools were categorized to include various variants. This process not only allowed the consolidation of classes with different nomenclatures and similar concepts but also facilitated the creation of broad categories capable of involving multiple existing tools, thus contributing to a more precise and understandable classification of the data.

In the context of this research, sensitivity analyses were not conducted, and this is attributed to the nature of the RQs, which focused exclusively on obtaining qualitative responses. Given this qualitative orientation, the adopted methodology involved grouping responses into relevant classes to facilitate interpretation and analysis. In this scenario, quantitative variability, which is typically addressed with sensitivity analyses in quantitative studies, was not a central element in the evaluation of the results. Therefore, the absence of a sensitivity analysis aligns with the nature and specific objectives of the research, which focused on capturing and understanding the qualitative complexities inherent in the collected responses.

2.7. Results of Syntheses

The results of the synthesis presented below are based on a rigorous and detailed process of review and arbitration. Each study included in this analysis has undergone comprehensive reviews, as reflected in Tables 4 and 5, detailing the distribution and thorough examination conducted by each researcher. The transparency and rigor of the procedure stand out, as evidenced by the need for a third review and final approval in some cases. These additional instances were particularly relevant when disagreements

arose between the reviewer and the arbitrator, emphasizing the commitment to quality and objectivity in the evaluation of each study. This methodical and transparent approach ensures the solidity and reliability of the synthesis results, providing a robust foundation for the interpretation and application of the findings.

Table 4. Quality assessment of the selected studies.

Selected Studies (SS)					
Range	**Review 1**	**Peer-Review**	**Studies in Discrepancy**	**Final Decision**	**Total**
CS1 to CS73	Researcher 1	Researcher 2	CS3, CS24, CS31 Total = 3	Researcher 3	56
CS74 to CS146	Researcher 2	Researcher 3	CS75, CS96, CS104, CS113, CS138, CS144 Total = 6	Researcher 4	53
CS147 to E219	Researcher 3	Researcher 4	CS156, CS187, CS191, CS205, Total = 4	Researcher 1	52
CS220 to CS292	Researcher 4	Researcher 1	CS227, CS230, CS253, CS270, CS290, Total = 5	Researcher 2	61
			Total = 18	Total	222

CS = candidate studies.

Table 5. Quality assessment of the primary studies.

Primary Studies (PS)					
Range	**Review 1**	**Peer-Review**	**Studies in Discrepancy**	**Final Decision**	**Total**
RS1 to RS47	Researcher 4	Researcher 1	RS23	Researcher 2	46
RS48 to RS95	Researcher 3	Researcher 2	RS57	Researcher 1	47
RS96 to RS143	Researcher 2	Researcher 3	-	Researcher 4	48
RS144 to RS191	Researcher 1	Researcher 4	RS172, RS182	Researcher 3	46
			Total = 4	Total	187

RS = retrieved studies.

Likewise, the process of selecting primary studies was carried out by all four investigators, who were involved in the stages of review, arbitration, and final decision making. During the review and arbitration process, four studies were identified that, due to particularities or divergences in the initial assessment, required additional review for their final inclusion. To ensure quality and coherence in the selection of these primary studies, a third investigator conducted an independent review. This additional measure ensured a comprehensive and objective evaluation, thereby strengthening the reliability and validity of the primary studies included in the final synthesis.

In Table 6, an overview of the number and percentage of studies at each stage of the process is provided, starting with the total number of candidate studies retrieved from the Scopus database using the specified search string. This initial count establishes the foundation for the selection process. Subsequently, the number and percentage of studies identified as primary are presented, marking the beginning of the review phase to address the research questions. Figure 2 offers a visual and quantitative representation of the flow of studies throughout each stage of the process.

Table 6. Number and percentage of studies in all processes.

Studies	Number	Percentage	Description
Candidate studies	292	100%	Studies resulting from the application of the search chain.
Candidate studies depurated	292	100%	Unique studies without duplicates.
Selected studies	222	76%	Studies after title, abstract, and keyword review.
Retrieved studies	191	65%	Studies downloaded in full text.
Primary studies	187	64%	Studies reviewed in full text and selected.

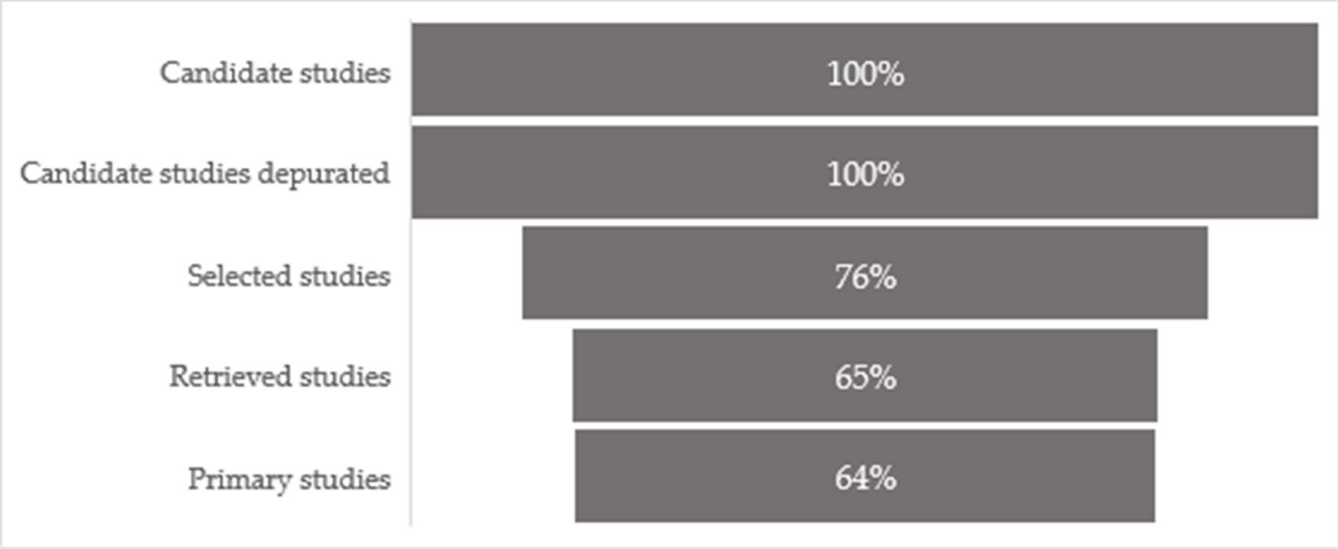

Figure 2. Percentage of studies from candidate to primary studies.

The results underscore that from the total number of candidate studies to the final number of primary studies, there is a relatively low decrease in the number, indicating that the initial search strategy was accurately focused. This finding suggests that the search strategy was effective in identifying relevant studies aligned with the research objectives. The consistency in the number of studies throughout the stages of the process indicates precise selection and a well-defined search chain, thereby strengthening the validity and relevance of the studies included in the research.

3. Results

3.1. Study Selection

The search string yielded a total of 292 studies, regarded as candidate studies. After the first filter, a set of 222 studies was obtained for use in the retrieval process. A total of 191 studies were retrieved from the web for a comprehensive content review. In the second filter, four studies were discarded, as, upon closer analysis, it was determined that they had no relevance to the field of art or design and did not contribute to any research questions. The final number of primary studies was 187, from which responses were extracted for each research question, confirming the validity of the created search string. This process is depicted graphically in Figure 3.

During the analysis of the recovered studies, four investigations were identified that, initially, upon undergoing the first review and selection based on titles, abstracts, and keywords, appeared to meet the inclusion criteria. However, upon thorough examination of the entire content of these studies, aspects were identified that did not significantly contribute to the scope of our research. The titles of these studies, along with specific problems related to each, are presented below:

1. Creativity and innovation programs offered by AACSB-accredited U.S. colleges of business: A Web mining study [34]: this study is solely focused on the business and sales areas and does not contribute to any of the research questions.
2. Posthumanist Stylistics [35]: this study is focused on philosophical analysis and review related to posthumanism and does not contribute to any of the research questions.
3. Integrating Entrepreneurship and Art to Improve Creative Problem Solving in Fisheries Education [36]: the study is focused on fisheries education and does not contribute to any of the research questions.

4. Launching a solidarity campaign: Technology-enhanced project-based language learning to promote entrepreneurial education and social awareness [37]. This study is focused on the business and language areas and does not contribute to any of the research questions.

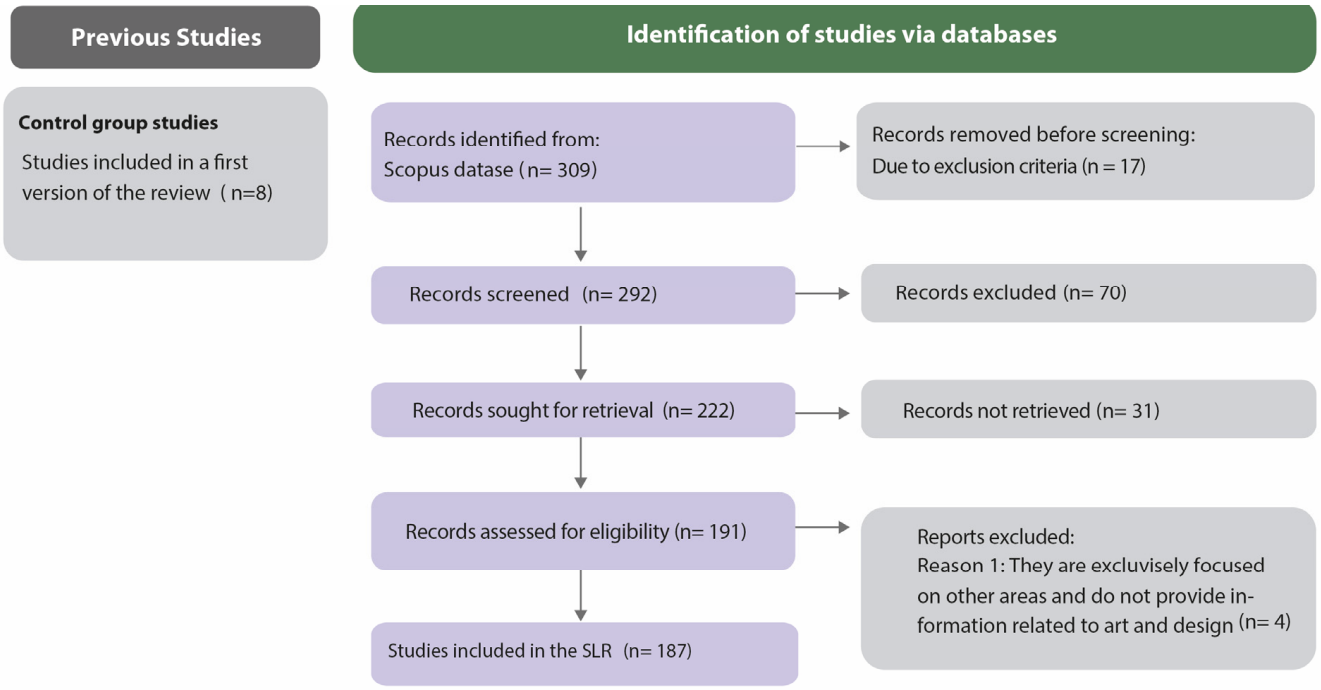

Figure 3. PRISMA flow diagram of the study selection process.

These studies were excluded from the comprehensive review due to their lack of relevance to the specific objectives of the research.

3.2. Study Characteristics

In order to compile the characteristics of each study and provide answers to the research questions, a matrix was created. In this matrix, each response corresponding to the research questions was meticulously classified. Given the robustness of the number of primary studies, amounting to 187, the graphical representation of the matrix addressing a sample of the first 20 studies is included in Table 7. The remaining studies can be found in the research backup files [23].

Table 7. Studies, characteristics, and responses to the research questions (RQs).

Title	Year	Country	RQ1	RQ2	RQ3	RQ4	RQ5
PS-1: Project-based learning-oriented STEAM: the case of micro–bit paper-cutting lamp [38]	2022	Taiwan	STEAM learning Project-based learning	Interdisciplinary projects	–	Fluency Openness Flexibility Originality Elaboration	Elementary school
PS-2: Effectiveness of STEAM-based blended learning on students' critical and creative thinking skills [39]	2023	Indonesia	STEAM learning Hybrid learning	Experimental classes	–	Fluency Flexibility Originality	High school
PS-3: Research on STEAM Maker Education Mode to Improve Children's Innovation Ability in Shenzhen [40]	2023	China	STEAM learning, 5E Model (Engage, Explore, Explain, Elaborate, and Evaluate)	Debates, asking questions, collaborative hands-on activities	–	–	All educational levels
PS-4: Building STEAM: Creating a Culture of Art in an Engineering Education [41]	2021	USA	STEAM learning	Interdisciplinary projects: proposing alternative approaches to problem solving, pedagogical excursions to nature, museums, and buildings	–	–	University
PS-5: Art, sustainability and partnerships [42]	2023	Malta	–	Interdisciplinary projects, collaborative hands-on activities Reflexive activities	–	–	–
PS-6: The Aesthetics between Us: Lifelong Learning from Learning to Do [43]	2022	Taiwan	Reflective learning	Reflexive activities Audiovisual experiences	–	–	–
PS-7: Cultivating Students' Creative Thinking Using Visual Narrative in an Agile Blended Learning Environment [28]	2023	Japan	Project-based learning	Drawing diagrams, proposing alternative approaches to problem solving, creating a concept map, collaborative hands-on activities Reflexive activities	–	–	University

Table 7. *Cont.*

Title	Year	Country	RQ1	RQ2	RQ3	RQ4	RQ5
PS-8: Image as a Vehicle of Cultural Expression Between Education and Society [44]	2023	Italy	Practical learning	Reflexive activities Analysis of art works Creating charcoal paintings Crafting with paper mache	–	–	University
PS-9: The Role of the Art of Chinese Calligraphy and Music in Developing Creative Thinking Skills in Preschoolers Using Flipped Technology [45]	2023	China	–	Music practices Calligraphy practices of poems with pen and ink Association exercises	–	Fluency Flexibility Originality Imagination	Preschool
PS-10: Creating Creative Educational Opportunities among Engineering and Arts Students [46]	2023	Qatar	Project-based learning	Interdisciplinary projects Creation of scenarios Brainstorming Origami	TrussFab Sketchup	–	University
PS-11: Innovative Practice of Sustainable Landscape Architecture Education—Parametric-Aided Design and Application [47]	2022	Taiwan	BOPPPS teaching	Virtual reality 3D Printing	–	–	University
PS-12: Understanding teachers' cross-disciplinary collaboration for STEAM education: Building a digital community of practice [48]	2022	Australia	STEAM learning	Interdisciplinary projects Collaborative hands-on activities	Digital-CoP	–	University
PS-13: Challenge-based learning as a tool for creativity and talent expression [30]	2022	Italy	Challenge-based learning	Interdisciplinary projects Creating prototypes, scenarios	DigiEduHack	–	University
PS-14: Teaching Innovation and Practice of Mind Mapping Applied to Engineering Drawing Course [49]	2023	China	Practical learning	Mind maps Three-dimensional drawings Brainstorming	–	–	University
PS-15: Thai undergraduate science, technology, engineering, arts, and math (STEAM) creative thinking and innovation skill development: a conceptual model using a digital virtual classroom learning environment [50]	2022	Thailand	STEAM learning Gamification	Activities with game dynamics (objectives, points, levels, badges, leaderboards, rewards, achievements, challenges, and competition)	Virtual learning environments Moodle or Schoology Social networks	–	University

Table 7. *Cont.*

Title	Year	Country	RQ1	RQ2	RQ3	RQ4	RQ5
PS-16: Promoting students' artwork appreciation: An experiential learning-based virtual reality approach [51]	2022	Taiwan	Experiential earning	Virtual reality	Wisdom Master Pro, Photopea	–	University
PS-17: Student experience of online international design studio participation [52]	2022	Russia, Turkey, Brazil, Italy, China, Spain	Project-based learning	Appreciation of art works	–	–	Elementary school
PS-18: Learning and innovation skills in making contexts: a comprehensive analytical framework and coding scheme [10]	2021	Cyprus	Practical learning	Makerspace Brainstorming Character creation	Tablet Robot Edison	–	University
PS-19: Application of Immersive Virtual Reality Interactive Technology in Art Design Teaching [53]	2022	China	Interactive learning	Virtual reality	–	–	Elementary school
PS-20: Prompt Aloud!: Incorporating image-generative AI into STEAM class with learning analytics using prompt data [54]	2023	South Korea	STEAM learning	Practices using Generative Artificial Intelligence Practice and creation of artistic works, writing imaginative journals	ChatGPT Dream Studio	Flexibility, originality	University

Note: PS = Primary study.

3.3. Results of Individual Studies

In presenting the research results, a rigorous methodological approach is adopted by providing not only the answers to the posed questions but also the total number of studies supporting each specific response. This strategy offers a precise and quantitative measure of the relevance of each aspect addressed in relation to the total set of research. Including the total number of studies supporting each response provides valuable insight into the consistency and breadth of the compiled evidence, allowing readers to be more informed when assessing the robustness of the presented findings. This methodological practice strengthens the validity and reliability of the results.

RQ1. What are the predominant educational methods for the development of creative thinking?

Table 8 succinctly and systematically presents the various educational methods identified for fostering creative thinking. It is important to note that some studies addressed the development of creative thinking through the implementation of multidisciplinary educational approaches, using a combination of pedagogical methods to maximize effectiveness. By adopting multiple educational methods, these studies sought to create a more comprehensive and diversified educational environment that stimulates creativity from various perspectives. The convergence of pedagogical approaches provided educators with a versatile toolkit to address the complexities of creative thinking development, recognizing the need to adapt to the diversity of learning styles and creative abilities of students. This analysis not only highlights the diversity of approaches present in the literature but also offers a quantitative insight that allows for evaluating the breadth and depth of research in the field of cognitive creativity in an educational context.

The most prevalent or recommended educational method in the analyzed studies for cultivating creative thinking is hands-on learning. Close behind are project-based learning, STEAM learning, and challenge-based learning, as well as interdisciplinary and collaborative approaches. These methodologies share the fundamental characteristic of prioritizing practical experience in learning, a crucial aspect in the context of creative thinking. Consistent practice is perceived as essential for the creation and development of mental habits as well as for the application of knowledge in real-world situations that facilitate the generation of new ideas and the search for solutions. Moreover, these methods incorporate collaborative work, where sharing ideas and solutions, analyzing diverse perspectives, and contributing to solving specific problems are fundamental elements. Interaction with the thinking of others, characterized by diverse qualities, backgrounds, and ideologies, not only enriches knowledge and thinking but also contributes to the generation of new ideas. These methodological approaches promote a dynamic and participative educational environment, driving creative thinking through a combination of consistent practice, real-world application, and interdisciplinary collaboration.

RQ2. Which techniques or activities are most frequently applied to cultivate creative thinking?

Table 9 presents various techniques and activities identified for the purpose of fostering creative thinking. This analysis provides an overview of the specific strategies that have been the subject of study and application in the field of cognitive creativity. Each technique or activity is presented with key information, including its frequency of mention in the research literature, enabling an assessment not only of diversity but also of the relative relevance of each approach. Some studies addressed the development of creative thinking by incorporating and applying various pedagogical techniques and activities, so the same study number may appear more than once. These multifaceted approaches highlighted the complexity of creative thinking and recognized the need to employ a variety of strategies to enhance this aspect in students. This analysis contributes to the understanding of current and emerging trends in the field, serving as a comprehensive guide for future research and educational practices focused on creativity development.

Table 8. Identified educational methods for fostering creative thinking.

Methods	Study ID	Total	Representativity Percentage Total Studies RQ1 = 174
Practical learning	PS-14, PS-18, PS-22, PS-35, PS-72, PS-82, PS-86, PS-91, PS-102, PS-118, PS-120, PS-121, PS-123, PS-127, PS-129, PS-144, PS-150, PS-152, PS-154, PS-155, PS-160, PS-161, PS-165, PS-169, PS-173, PS-180, PS-183, PS-186, PS-187	29	16.67%
Project-based learning	PS-1, PS-7, PS-10, PS-17, PS-23, PS-39, PS-40, PS-43, PS-46, PS-47, PS-49, PS-54, PS-164, PS-58, PS-59, PS-62, PS-70, PS-71, PS-77, PS-87, PS-88, PS-90, PS-96, PS-100, PS-103, PS-128, PS-137, PS-185	28	16.09%
STEAM learning	PS-1, PS-2, PS-3, PS-4, PS-12, PS-15, PS-20, PS-31, PS-40, PS-58, PS-84, PS-85, PS-99, PS-108, PS-115, PS-134, PS-138, PS-146, PS-177, PS-184	20	11.49%
Challenge-based learning	PS-13, PS-31, PS-38, PS-44, PS-74, PS-98, PS-115, PS-131, PS-142, PS-148, PS-149, PS-153, PS-158, PS-162, PS-182	15	8.62%
Interdisciplinary learning	PS-56, PS-67, PS-92, PS-93, PS-97, PS-107, PS-109, PS-112, PS-114, PS-125, PS-136, PS-141, PS-142, PS-176, PS-181,	15	8.62%
Collaborative learning	PS-36, PS-41, PS-70, PS-71, PS-79, PS-97, PS-106, PS-111, PS-137, PS-145, PS-154, PS-169, PS-177, PS-181	14	8.05%
Gamification	PS-15, PS-21, PS-35, PS-41, PS-45, PS-53, PS-57, PS-91, PS-101, PS-104, PS-106, PS-144, PS-174	13	7.47%
Problem-based learning	PS-30, PS-45, PS-56, PS-64, PS-75, PS-77, PS-89, PS-111, PS-116, PS-126,	10	5.75%
Interactive learning	PS-19, PS-27, PS-32, PS-78, PS-83, PS-114, PS-130, PS-139, PS-159, PS-167	10	5.75%
E-learning	PS-41, PS-51, PS-66, PS-71, PS-75, PS-79, PS-96, PS-122,	8	4.60%
Cooperative learning	PS-57, PS-76, PS-93, PS-94, PS-96	5	2.87%
Experiential learning	PS-16, PS-88, PS-98, PS-149, PS-168	5	2.87%
Reflective learning	PS-6, PS-81, PS-125, PS-140, PS-175	5	2.87%
Design thinking	PS-105, PS-115, PS-163, PS-166, PS-170	5	2.87%
Flipped Classroom	PS-52, PS-94, PS-143, PS-172	4	2.30%
Multimedia learning	PS-68, PS-69, PS-171	3	1.72%
Multisensory learning	PS-53, PS-95, PS-143	3	1.72%
CPS Model (Creative Problem Solving)	PS-33, PS-45, PS-116	3	1.72%
Active learning	PS-128, PS-135	2	1.15%
Hybrid learning	PS-2, PS-172	2	1.15%
Integrative learning	PS-61, PS-62	2	1.15%
Mobile learning	PS-42, PS-66	2	1.15%
Extracurricular course	PS-50, PS-90	2	1.15%
SCAMPER method (Substitute, Combine, Adapt, Modify, Purpose, Eliminate, Rearrange)	PS-25, PS-45	2	1.15%
Self-directed learning	PS-110	1	0.57%
Music-based learning	PS-145	1	0.57%
BOPPPS Learning	PS-11	1	0.57%
Object-centered learning	PS-132	1	0.57%
4C Model (Connect, Construct, Contemplate, Continue)	PS-130	1	0.57%
Observational learning	PS-26	1	0.57%
Relational learning	PS-92	1	0.57%

Table 8. *Cont.*

Methods	Study ID	Total	Representativity Percentage Total Studies RQ1 = 174
Ubiquitous learning	PS-124	1	0.57%
Artful Thinking	PS-150	1	0.57%
From Inspiration to Sketches (Fits)	PS-156	1	0.57%
CAPE Teaching (Exploration, Cooperation, Records, Reflection)	PS-179	1	0.57%
Emotion-driven innovation	PS-65	1	0.57%
Role-playing	PS-77	1	0.57%
Technical Artistic Design Lab	PS-8	1	0.57%
Abstraction method	PS-80	1	0.57%
Decomposition method (Principle, Structure, Function, Purpose)	PS-88	1	0.57%
FITA method: Pre-design, Design, Research, Communication	PS-60	1	0.57%
Reggio Emilia method	PS-34	1	0.57%
5E Model (Engage, Explore, Explain, Elaborate, Evaluate)	PS-3	1	0.57%
CREATE Model	PS-85	1	0.57%
Dramatic pedagogy	PS-28	1	0.57%
ION Thinking fostering 4 types of attitudes	PS-63	1	0.57%
Creative Reversion (CREACT)	PS-178	1	0.57%

Note: PS = primary study.

The most commonly employed educational techniques and practices for fostering the development of creative thinking center around interdisciplinary projects. As mentioned, these activities are fundamental for applying knowledge, practicing skills, and sharing ideas, thereby contributing to the construction of new perspectives. Other strategies focus on the creation and practice of activities that develop both cognitive and physical skills. These include drawing practices with various techniques, musical exercises, singing, playing instruments, dance, theater, writing, and the creation of objects or multimedia content. These practices not only enhance students' mental abilities but also enrich their creativity. Additionally, the integration of nature experiences and audiovisual activities, such as watching films, listening to music, and reading, is recommended. These experiences enable individuals to acquire new knowledge and relate ideas and experiences, thereby providing a solid foundation for the ability to create and innovate. These techniques and practices encompass a broad spectrum of activities that stimulate both the mind and body, fostering a holistic approach to the development of creative thinking.

RQ3. What technological tools are used to support activities for the development of creative thinking?

Table 10 constitutes a fundamental informational resource detailing technological tools used as support in activities aimed at developing creative thinking. Some studies provided a variety of digital tools, acknowledging the positive influence these can have on educational processes, so the same study number may appear more than once. Given the diversity and breadth of the mentioned digital tools, a classification organized into groups was chosen. This categorization facilitates the understanding and application of these tools, as they are intended for different educational processes. Each group reflects a categorization that makes it easier to identify and select the most suitable tools to address specific aspects of fostering creative thinking. This analysis not only illustrates the richness and variety of available technological resources but also provides educators, researchers, and professionals with a strategic vision to effectively integrate technology into their practices, thus promoting an environment conducive to the development of creative skills.

Table 9. Techniques or activities identified to foster creative thinking.

Techniques or Practices	Study ID	Total	Representativity Percentage Total Studies RQ2 = 187
Interdisciplinary projects	PS-1, PS-4, PS-5, PS-10, PS-11, PS-13, PS-21, PS-22, PS-29, PS-40, PS-47, PS-56, PS-58, PS-61, PS-62, PS-67, PS-71, PS-72, PS-79, PS-85, PS-92, PS-97, PS-99, PS-107, PS-112, PS-122, PS-138, PS-142, PS-163, PS-164 PS-173 PS-176 PS-181, PS-184, PS-185	35	19%
Drawing and painting practices with different techniques (charcoal, oil, colored pencils, etc.)	PS-8, PS-20, PS-35, PS-41, PS-44, PS-48, PS-54, PS-60, PS-68, PS-70, PS-99, PS-108, PS-183, PS-187, PS-123, PS-152, PS-154, PS-172, PS-177, PS-175, PS-178, PS-186, PS-187	23	12%
Brainstorming	PS-10, PS-14, PS-18, PS-25, PS-32, PS-33, PS-38, PS-39, PS-45, PS-50, PS-54, PS-57, PS-77, PS-79, PS-91, PS-105, PS-115, PS-116, PS-131, PS-135, PS-142, PS-150	22	12%
Collaborative hands-on activities	PS-3, PS-5, PS-7, PS-12, PS-38, PS-41, PS-63, PS-64, PS-66, PS-70, PS-71, PS-76, PS-101, PS-135, PS-136, PS-143, PS-154, PS-155, PS-167, PS-168, PS-169	20	11%
Music practices, singing, playing instruments	PS-9, PS-21, PS-48, PS-75, PS-86, PS-88, PS-98 PS-107, PS-119, PS-121, PS-136, PS-141, PS-145, PS-162, PS-167, PS-173, PS-174, PS-183, PS-184, PS-187	20	11%
Reflective activities (writing reports, journals, logs, managing emotions and qualities)	PS-5, PS-6, PS-7, PS-8, PS-40, PS-50, PS-63, PS-80, PS-81, PS-80, PS-103, PS-123, PS-117, PS-124 PS-125, PS-140, PS-154, PS-175, PS-182	19	10%
Creating multimedia content: digital images, videos, animations, music, websites	PS-21, PS-24, PS-47, PS-51, PS-59, PS-62, PS-68, PS-71, PS-96, PS-100, PS-114, PS-124, PS-154, PS-155, PS-166, PS-179, PS-185, PS-187	18	10%
Sketching or drawing rough drafts	PS-22, PS-24, PS-39, PS-41, PS-44, PS-54, PS-60, PS-79, PS-80, PS-102, PS-128, PS-131, PS-133, PS-135, PS-142, PS-146, PS-150, PS-156	17	9%
Associating, combining, substituting, and reorganizing figures or elements	PS-9, PS-25, PS-33, PS-45, PS-53, PS-55, PS-73, PS-85, PS-95, PS-96, PS-98, PS-103, PS-105, PS-107, PS-117, PS-131, PS-174	17	9%
Dance and theater practices	PS-28, PS-52, PS-53, PS-81, PS-86, PS-104, PS-109, PS-113, PS-119, PS-121, PS-125, PS-141, PS-151, PS-144, PS-160, PS-183, PS-187	17	9%
Writing poems, novels, fantasy stories	PS-9, PS-20, PS-55, PS-91, PS-92, PS-100, PS-101, PS-109, PS-118, PS-120, PS-133, PS-149, PS-175, PS-183, PS-185	15	8%
Creation, innovation, or improvement of products	PS-65, PS-71, PS-55, PS-74, PS-77, PS-99, PS-102, PS-156, PS-161, PS-163, PS-166, PS-177, PS-184, PS-68,	13	7%
Proposing alternative approaches to problem solving	PS-4, PS-7, PS-33, PS-64, PS-94, PS-108, PS-110, PS-112, PS-116 PS-125, PS-126, PS-128, PS-131, PS-182	13	7%
Use of virtual reality and augmented reality, simulation	PS-11, PS-16, PS-19, PS-33, PS-49, PS-54, PS-59, PS-66, PS-72, PS-78, PS-106, PS-137, PS-145	13	7%
Use of digital, interactive audiovisual media	PS-27, PS-32, PS-51, PS-67, PS-71, PS-83, PS-114, PS-139, PS-140, PS-143, PS-167, PS-171	12	6%
Taking photographs	PS-34, PS-39, PS-54, PS-57, PS-61, PS-68, PS-75, PS-90, PS-93, PS-150, PS-154, PS-187	12	6%
Pedagogical excursions to nature, museums, and buildings	PS-4, PS-34, PS-39, PS-55, PS-58, PS-82, PS-90, PS-118, PS-119, PS-128, PS-180	11	6%
Drawing diagrams, mind maps, and graphic organizers	PS-7, PS-14, PS-30, PS-33, PS-40, PS-44, PS-54, PS-60, PS-93, PS-131, PS-133	11	6%
Games with points, levels, rewards, and challenges	PS-9, PS-15, PS-35, PS-38, PS-50, PS-63, PS-74, PS-91, PS-101, PS-131, PS-144, PS-174	11	6%

Table 9. *Cont.*

Techniques or Practices	Study ID	Total	Representativity Percentage Total Studies RQ2 = 187
Reading	PS-78, PS-83, PS-120, PS-122, PS-125, PS-131, PS-132, PS-157, PS-161, PS-164, PS-167	11	6%
Analysis/appreciation of works of art	PS-8, PS-16, PS-31, PS-35, PS-57, PS-82, PS-84, PS-109, PS-125, PS-151	10	5%
Creating cards, infographics, collages, or portfolios	PS-7, PS-39, PS-43, PS-47, PS-53, PS-54, PS-123, PS-133, PS-150, PS-160, PS-175	10	5%
3D modeling and printing	PS-11, PS-46, PS-49, PS-56, PS-72, PS-106, PS-115, PS-128, PS-129, PS-130	10	5%
Audiovisual experiences (watching movies, videos, images, listening to music)	PS-6, PS-32, PS-48, PS-54, PS-75, PS-93, PS-94, PS-141, PS-148, PS-179	9	5%
Creating models, scenarios, montages, or prototypes	PS-10, PS-13, PS-46, PS-62, PS-77, PS-145, PS-160, PS-170, PS-184	9	5%
Visuospatial practices, three-dimensional drawing	PS-14, PS-37, PS-108, PS-129, PS-142, PS-152, PS-172, PS-186, PS-187,	9	5%
Crafting or arts and crafts	PS-8, PS-35, PS-85, PS-127, PS-151, PS-155, PS-161, PS-177	8	4%
Creating comics, manga, stories, or books	PS-24, PS-43, PS-79, PS-157, PS-100, PS-101, PS-146, PS-170	8	4%
Debates/discussions	PS-3, PS-57, PS-67, PS-79, PS-122, PS-142	6	3%
Use of metaphors and analogies	PS-22, PS-50, PS-102, PS-105, PS-129, PS-145	6	3%
Peer feedback practices	PS-42, PS-49, PS-75, PS-76, PS-128,	5	3%
Assembling pieces, puzzles	PS-53, PS-58, PS-106, PS-129, PS-155	5	3%
Project contests	PS-17, PS-31, PS-38, PS-74	4	2%
Asking questions	PS-3, PS-33 PS-102, PS-140	4	2%
Creating characters	PS-18, PS-78, PS-146, PS-161	4	2%
Seeking inspiration, creating, and sharing on social networks	PS-68, PS-69, PS-100, PS-124	4	2%
Workshops or conferences with experienced artists	PS-86, PS-111, PS-131, PS-169	4	2%
Origami	PS-10, PS-115, PS-134	3	2%
Physical exercise, gymnastics, or physical therapy	PS-55, PS-73, PS-104	3	2%
Experimental classes	PS-2, PS-23	2	1%
Makerspace	PS-18, PS-155	2	1%
Use of artificial intelligence	PS-20, PS-26	2	1%
Production of radio programs and podcasts	PS-31, PS-133	2	1%
Video games	PS-22, PS-67	2	1%
Creation of packaging, containers	PS-49, PS-85	2	1%
Extracurricular clubs	PS-29, PS-94	2	1%
Research and analysis on history	PS-23, PS-132	2	1%

Note: PS = primary study.

Within the established categories, tools in the category of game-based applications or Platforms stood out as the most mentioned in the studies. This can be attributed to the fact that these platforms, by incorporating interactive and didactic material, manage to engage, motivate, and facilitate learning by providing contexts rich in sensory stimuli. This thought-provoking environment fosters effective idea generation. Other tools that emerged frequently in the studies include virtual learning environments and platforms for collaborative work. These are particularly relevant in collaborative and interdisciplinary practices, facilitating project execution and remote communication, thus eliminating barriers of space and time. Platforms for digital product creation, encompassing the production of images, videos, animations, and 3D objects, were also highlighted. Lastly, social networks were

identified as sources of inspiration for generating new ideas. These tools not only diversify the forms of learning and creation but also underscore the importance of technology in fostering creative thinking in various educational contexts.

Table 10. Identified digital tools to foster creative thinking.

Tools	Study ID	Total	Representativity Percentage Total Studies RQ3 = 70
Playful Applications or Platforms: Story-Go-Round, Storycraft, Scratch, Kodu, WordWall, Hero Builder, Lego Education WeDo, Curious Whispers, CREACT, Hello Color Pencil, Sketches.	PS-10, PS-21, PS-29, PS-30, PS-42, PS-53, PS-62, PS-68, PS-74, PS-78, PS-93, PS-100, PS-106, PS-130, PS-161, PS-178, PS-185	17	24%
Virtual Learning Environments: Moodle, DigiEduHack, Wisdom Master Pro, Schoology, MOOC, Open Virtual Mobility Hub.	PS-12, PS-13, PS-15, PS-16, PS-26, PS-31, PS-41, PS-52, PS-59, PS-66, PS-71, PS-75, PS-79, PS-96, PS-172	15	21%
Collaborative Work Platforms: DigiEduHack, Digital-CoP, Zoom, WeTransfer, Trello, SyncMeet, Skype, PowerPoint, OpenAir, WhatsApp, Google Forms, Dropbox, Gmail, Microsoft Teams, Slack, Owela.	PS-12, PS-13, PS-27, PS-41, PS-42, PS-57, PS-68, PS-71, PS-79, PS-93, PS-97, PS-106, PS-110, PS-142, PS-174	15	21%
Video Creation or Editing Programs: GoPro, Windows Movie Maker, YouTube, Animal Logic.	PS-68, PS-69, PS-83, PS-100, PS-113, PS-114, PS-124, PS-137, PS-141, PS-149, PS-174	11	16%
Social Media: YouTube, Instagram, Facebook, Pinterest, Tumblr, Behance.	PS-15, PS-68, PS-69, PS-83, PS-100, PS-113, PS-114, PS-124, PS-141, PS-149	10	14%
Programming and Interface Design: Scratch, SIGGRAPH, Kodu, Mixly, AR Game Engine, Weebly.	PS-21, PS-30, PS-58, PS-68, PS-74, PS-78, PS-106, PS-124, PS-176, PS-185	10	14%
Mobile Devices: Smartphones, tablets, laptops.	PS-18, PS-32, PS-41, PS-42, PS-78, PS-94, PS-150, PS-159	8	11%
Image Creation or Editing Programs: Storyboard That, Adobe Photoshop, Photopea, Fresko Paint Light, ArtFlow, Corel Painter 2022, InDesign, ArtRage, Sketches, Prisma Photo Editor, Adobe Capture, Adobe Clip, Adobe Draw, Adobe Scan, Adobe Comp, AutoDraw, PaintCan, PicsArt, Layout, and CamScanner.	PS-16, PS-41, PS-68, PS-75, PS-90, PS-100, PS-110, PS-172	8	11%
Platforms for Creating 3D Objects: 3DMax, Autodesk Maya, Sketchup, TrussFab, Substance Painter, CoSpaces.	PS-10, PS-41, PS-46, PS-47, PS-49, PS-59, PS-72	7	10%
Augmented or Virtual Reality Programs: Google Cardboard, Samsung Gear VR, VR-OCKS, AR Game Engine, Unity, Leap Motion, Aurasma, CoSpaces.	PS-59, PS-72, PS-78, PS-106, PS-114, PS-184	6	9%
Artificial Intelligence Platforms: ChatGPT, Dream Studio.	PS-20	1	1%

Note: PS = primary study.

RQ4. What are the skills of creative thinking?

Table 11 presents the main skills that researchers associate with creative thinking. This analysis provides a comprehensive overview of the skills considered fundamental in the context of cognitive creativity, highlighting recurring patterns and common approaches identified in the scientific literature. This emerges as an essential resource for educators, professionals, and program development designers, enabling them to incorporate specific strategies aimed at cultivating these skills in educational and professional environments. However, it is worth noting that synonyms and related terms were identified that broaden and enrich this set of skills. Among these are concepts such as novelty, sensitivity, quick thinking, openness, imagination, initiative, encoding ability, curiosity, autonomy, and abstraction. It is essential to highlight that not all studies exclusively categorize them as skills; many also mention them as intrinsic characteristics of creative thinking. This broader approach emphasizes the complexity and multidimensionality of creative thinking.

Table 11. Skills related to creative thinking.

Skills	Study ID	Total	Representativity Percentage Total Studies RQ4 = 61
Originality	PS-1, PS-2, PS-9, PS-20, PS-23, PS-25, PS-38, PS-40, PS-41, PS-43, PS-44, PS-45, PS-46, PS-50, PS-52, PS-57, PS-60, PS-63, PS-64, PS-73, PS-74, PS-77, PS-84, PS-91, PS-95, PS-99, PS-102, PS-104, PS-107, PS-109, PS-111, PS-114, PS-116, PS-117, PS-126, PS-127, PS-131, PS-134, PS-144, PS-147, PS-148, PS-150, PS-152, PS-153, PS-158, PS-162, PS-164, PS-169, PS-180, PS-187	50	82%
Fluency	PS-1, PS-2, PS-9, PS-23, PS-25, PS-37, PS-38, PS-40, PS-45, PS-48, PS-50, PS-52, PS-57, PS-60, PS-63, PS-73, PS-77, PS-84, PS-94, PS-95, PS-99, PS-102, PS-107, PS-108, PS-111, PS-114, PS-116, PS-126, PS-127, PS-131, PS-134, PS-144, PS-148, PS-150, PS-152, PS-153, PS-158, PS-162, PS-164, PS-169, PS-178, PS-180	42	69%
Flexibility	PS-1, PS-2, PS-9, PS-20, PS-23, PS-25, PS-37, PS-40, PS-41, PS-46, PS-52, PS-60, PS-63, PS-73, PS-74, PS-77, PS-84, PS-85, PS-94, PS-95, PS-102, PS-107, PS-108, PS-111, PS-112, PS-114, PS-116, PS-117, PS-124, PS-127, PS-128, PS-131, PS-134, PS-135, PS-144, PS-147, PS-150, PS-153, PS-158, PS-164, PS-178, PS-180	42	69%
Elaboration	PS-1, PS-23, PS-25, PS-38, PS-45, PS-57, PS-77, PS-84, PS-95, PS-102, PS-107, PS-126, PS-131, PS-134, PS-153, PS-164	16	26%
Novelty	PS-37, PS-85, PS-91, PS-108	4	7%
Sensitivity	PS-25, PS-85, PS-135	3	5%
Quick Thinking	PS-74, PS-117, PS-135	3	5%
Openness	PS-1, PS-25	2	3%
Imagination	PS-9, PS-162	2	3%
Initiative	PS-25, PS-109	2	3%
Coding Ability	PS-26	1	2%
Curiosity	PS-147	1	2%
Autonomy	PS-147	1	2%
Abstraction	PS-169	1	2%

Note: PS = primary study.

The central skills found to be associated with creative thinking are originality, fluency, flexibility, and elaboration. Each of these dimensions plays a crucial role in the manifestation and evaluation of creative thinking. Originality highlights the ability to generate unique and innovative ideas, while fluency refers to the skill of generating a significant quantity of ideas in a given period. Flexibility, on the other hand, focuses on the ability to adapt and change perspectives, allowing for a broad exploration of creative approaches. Finally, elaboration relates to the capacity to develop ideas in a detailed and enriched manner. Additionally, novelty and sensitivity emphasize the ability to generate novel ideas and the skill to perceive subtle nuances in the environment. These results enrich the overall understanding of creative thinking by recognizing that it goes beyond mere skills and encompasses a series of traits and dispositions that are fundamental in the creative process.

RQ5. At what educational levels have these studies related to this specific topic been carried out?

Table 12 presents the educational levels at which methods and techniques aimed at stimulating creative thinking have been implemented. This analysis provides a comprehensive view of the breadth and diversity of educational contexts in which the development of cognitive creativity has been actively addressed. The systematic presentation of this information reveals significant patterns.

Table 12. Educational levels where methods and techniques have been applied to promote creative thinking.

Educational Level	Study ID	Total	Representativity Percentage Total Studies RQ5 = 174
University	PS-4, PS-7, PS-8, PS-10, PS-11, PS-12, PS-13, PS-14, PS-15, PS-16, PS-18, PS-20, PS-23, PS-24, PS-25, PS-26, PS-30, PS-31, PS-36, PS-37, PS-38, PS-40, PS-41, PS-42, PS-43, PS-45, PS-48, PS-49, PS-50, PS-52, PS-54, PS-55, PS-56, PS-57, PS-59, PS-62, PS-63, PS-65, PS-69, PS-70, PS-73, PS-74, PS-77, PS-78, PS-79, PS-80, PS-81, PS-82, PS-84, PS-85, PS-86, PS-88, PS-89, PS-90, PS-93, PS-94, PS-95, PS-96, PS-98, PS-100, PS-102, PS-104, PS-107, PS-108, PS-109, PS-110, PS-111, PS-112, PS-113, PS-115, PS-116, PS-118, PS-119, PS-121, PS-123, PS-128, PS-133, PS-134, PS-135, PS-136, PS-139, PS-141, PS-142, PS-144, PS-146, PS-147, PS-148, PS-149, PS-150, PS-151, PS-152, PS-154, PS-155, PS-156, PS-157, PS-159, PS-161, PS-165, PS-170, PS-171, PS-172, PS-174, PS-175, PS-176, PS-178, PS-179, PS-181, PS-183, PS-184, PS-186, PS-187	111	64%
Elementary school	PS-1, PS-17, PS-19, PS-22, PS-27, PS-29, PS-34, PS-35, PS-39, PS-44, PS-46, PS-47, PS-53, PS-58, PS-64, PS-67, PS-72, PS-83, PS-87, PS-91, PS-92, PS-97, PS-103, PS-124, PS-125, PS-126, PS-127, PS-129, PS-137, PS-140, PS-145, PS-153, PS-167, PS-168, PS-180, PS-185	36	21%
High school	PS-2, PS-33, PS-35, PS-51, PS-66, PS-68, PS-87, PS-92, PS-99, PS-103, PS-106, PS-120, PS-126, PS-127, PS-131, PS-140, PS-160, PS-164, PS-166, PS-177	20	11%
All educational levels	PS-3, PS-32, PS-61, PS-101, PS-105, PS-143, PS-162, PS-163, PS-169, PS-182	10	6%
Preschool	PS-9, PS-75, PS-132, PS-138	4	2%

Note: PS = primary study.

It is evidenced that the majority of studies were conducted in higher education institutions, such as universities or institutes, followed by educational levels ranging from primary to high school and even preschool. These studies emphasized the importance of implementing practices that contribute to the development of creative thinking, especially at early ages, where children actively engage, show greater motivation, and absorb experiences and knowledge more effectively. There were also research efforts that did not limit themselves to a particular level but addressed education comprehensively. These broader approaches highlighted the relevance of creativity in various educational contexts, recognizing the importance of cultivating creative skills throughout the entire educational journey. This finding underscores the need for pedagogical strategies that transcend the boundaries of conventional educational levels, advocating for a holistic approach that promotes the development of creative thinking at all stages of the educational process.

Demographic data of the studies

Table 13 presents a detailed overview of the countries with the highest number of scientific studies related to creative thinking. This geographical analysis reveals the regions of the world where research in this field has thrived, providing a key insight into the global distribution of academic interest in the development of creative thinking. This geographic approach enriches the overall understanding of research in an area and underscores the global diversity of approaches and perspectives contributing to the advancement of knowledge.

Table 13. Countries where the most scientific studies related to the subject have been conducted.

Countries	Study ID	Total	Percentages Total Primary Studies = 187
USA	PS-4, PS-22, PS-59, PS-61, PS-62, PS-63, PS-71, PS-81, PS-90, PS-93, PS-97, PS-99, PS-105, PS-107, PS-110, PS-112, PS-115, PS-121, PS-124, PS-134, PS-138, PS-141 PS-142, PS-147, PS-149, PS-155, PS-176, PS-177, PS-182, PS-184, PS-187	31	16.58%
China	PS-3, PS-9, PS-14, PS-17, PS-19, PS-21, PS-26, PS-30, PS-32, PS-33, PS-35, PS-40, PS-44, PS-49, PS-51, PS-56, PS-57, PS-58, PS-118, PS-122, PS-139, PS-151, PS-171, PS-172, PS-186	25	13.37%
United Kingdom	PS-28, PS-53, PS-92, PS-96, PS-127, PS-132, PS-133, PS-144, PS-157, PS-180, PS-181, PS-183	12	6.42%
Taiwan	PS-1, PS-6, PS-11, PS-16, PS-42, PS-52, PS-87, PS-88, PS-94, PS-102, PS-114, PS-179	12	6.42%
Turkey	PS-17, PS-46, PS-91, PS-98, PS-101, PS-123, PS-126, PS-140 PS-152, PS-160, PS-164, PS-178	12	6.42%
Australia	PS-12, PS-23, PS-38, PS-48, PS-86, PS-137, PS-154, PS-162, PS-165, PS-174	10	5.35%
Spain	PS-17, PS-34, PS-43, PS-50, PS-67, PS-83, PS-106, PS-129, PS-130	9	4.81%
Indonesia	PS-2, PS-27, PS-37, PS-95, PS-108, PS-113, PS-170	7	3.74%
South Korea	PS-20, PS-39, PS-54, PS-116, PS-169	5	2.67%
Italy	PS-8, PS-13, PS-65, PS-73, PS-185	5	2.67%
Russia	PS-17, PS-41, PS-89, PS-104, PS-135	5	2.67%
Canada	PS-75, PS-138, PS-145, PS-175	4	2.14%
Egypt	PS-47, PS-78, PS-111, PS-158	4	2.14%
Malaysia	PS-45, PS-100, PS-129, PS-166	4	2.14%
Greece	PS-66, PS-136, PS-167	3	1.60%
Israel	PS-148, PS-156, PS-159	3	1.60%
Mexico	PS-31, PS-84, PS-109	3	1.60%
Poland	PS-60, PS-74, PS-129	3	1.60%
Qatar	PS-10, PS-111, PS-146	3	1.60%
Thailand	PS-15, PS-70, PS-85	3	1.60%
Saudi Arabia	PS-25, PS-120	2	1.07%
Bahrain	PS-68, PS-69	2	1.07%
Brazil	PS-17, PS-163	2	1.07%
Croatia	PS-24, PS-150	2	1.07%
France	PS-153, PS-173	2	1.07%
Ghana	PS-36, PS-131	2	1.07%
India	PS-72, PS-143	2	1.07%
Japan	PS-7, PS-79	2	1.07%
Kazakhstan	PS-64, PS-129	2	1.07%
Romania	PS-59, PS-129	2	1.07%
Uzbekistan	PS-82, PS-119	2	1.07%
Jordan	PS-103, PS-111	2	1.07%
Lebanon	PS-80, PS-111	2	1.07%
Ukraine	PS-55, PS-77	2	1.07%
Belgium	PS-125	1	0.53%
Belarus	PS-117	1	0.53%
Cyprus	PS-18	1	0.53%
United Arab Emirates	PS-111	1	0.53%
Finland	PS-161	1	0.53%
Iraq	PS-76	1	0.53%
Iran	PS-128	1	0.53%
Ireland	PS-168	1	0.53%
Malta	PS-5	1	0.53%
Morocco	PS-111	1	0.53%
Netherlands	PS-29	1	0.53%
Portugal	PS-77	1	0.53%

The research results reveal that the USA leads the list of countries with the highest number of studies related to creative thinking, followed by China and the United Kingdom. Additionally, significant contributions are noted from countries such as Turkey, Australia, Spain, and Indonesia, where the presence of several educational institutions dedicated to arts and design was identified. It is important to note that studies from Latin American countries are notably scarce in this research area. The leadership of the United States, China, and the United Kingdom in the number of studies on creative thinking can be largely explained by the size of their populations and the magnitude of their academic systems. These countries host a significant number of academics, a vast network of educational institutions, and high budgets, providing a solid foundation for research in various disciplines, including creative thinking. Moreover, with a long academic tradition and a high concentration of prestigious art and design institutions, they have the capacity to lead in the production of knowledge in this field. However, it is important to mention that the scarcity of Latin American studies highlights the need to increase efforts and resources dedicated to research in this region, perhaps by fostering international collaborations to strengthen the representation of Latin American perspectives in the study of creative thinking.

In the analysis of the publication years of studies related to the topic (see Figure 4), a notable increase in the number of research publications in the year 2021 was highlighted, closely followed by the year 2019. Conversely, a low number of studies were observed in the year 2017, followed by 2014. This temporal pattern reveals an upward trend in recent research, suggesting a growing interest in the topic over the last few years. This trend can be attributed to the increasing importance given to the development of 21st-century skills, where creativity has been identified as a fundamental element. These data not only offer a temporal insight into the evolution of research but also provide valuable information for future researchers, indicating the years and periods in which increased activity has been observed in this field, allowing for a more strategic and contextualized approach in future research.

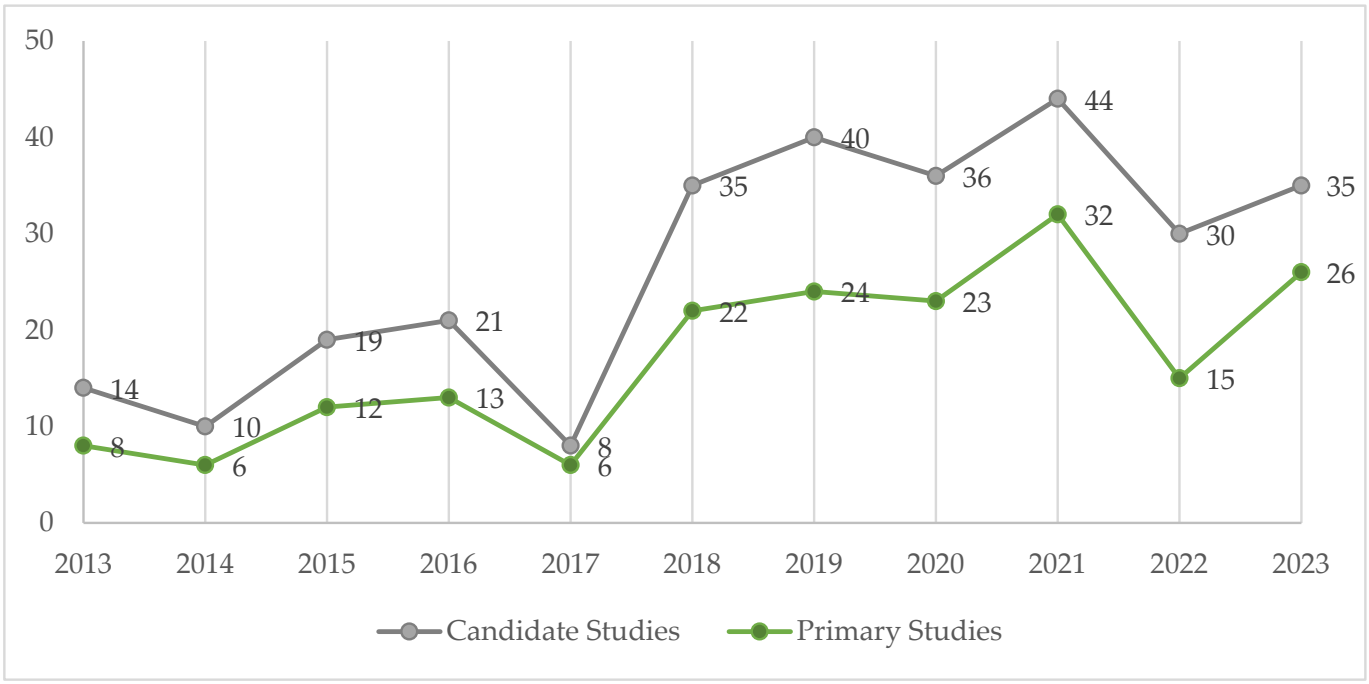

Figure 4. Number of publications of candidate and primary studies per year.

Table 14 constitutes a detailed assessment of the quality of responses to the research questions, addressing various statistical aspects that support the reliability of the results. This analysis focuses on the statistical robustness of the findings, providing a quantitative view of the consistency and reliability of the results obtained regarding the representativeness of each category that answers the research questions. To develop this table, an initial count of primary studies that addressed each RQ was conducted, representing these data as the number of studies (NS). As evidenced in the previous tables (Tables 8–12), a quantitative analysis was carried out for all the studies mentioning a feature or response related to the questions. Along with these data, the previous tables present percentages that reflect the representativeness of each response out of all the studies addressing that research question. Based on these percentages (see Table 14), categories such as high, medium, and low were established according to the frequency of responses identified in the studies. This process involved identifying frequencies by determining the maximum, minimum, mean, median, range, and amplitude in each RQ. Assigning percentages to the high, medium, and low categories allowed for defining reliability ranges for addressing the questions. This approach was adopted to provide readers with a transparent and robust tool for assessing the reliability of the responses presented in the SLR. Categorizing responses by their frequency in studies facilitates the identification of consistent and prominent patterns, thus contributing to strengthening the validity of the findings.

In certain study proposals, heterogeneity in responses was observed concerning questions about methods and techniques. In several instances, diversity in the terms used to refer to each method and technique was identified. However, a detailed contextual analysis was carried out within the framework of each study, and in many cases, it was determined that, despite using different names, the same activity or approach was being referred to. This phenomenon of terminological variation underscores the need for careful consideration and reconciliation of the terms used in the literature to ensure accurate and consistent understanding. The contextual analysis allowed for overcoming the apparent disparity in nomenclature, revealing fundamental similarities in accomplishing the mentioned methods and techniques. This last process contributed to establishing an explicit and more unified basis for interpreting the results and conclusions in the set of studies analyzed.

Table 14. Evaluation of the quality of responses to the research questions.

Research Question	NS	V_{Min}–V_{Max}	R, A	Mean	Median	Low Confidence			Medium Confidence			High Confidence		
						LL	UL	N (%)	LL	UL	N (%)	LL	UL	N (%)
RQ1. What are the predominant educational methods for the development of creative thinking?	174	0.57–16.67%	R = 16.10% A = 5.37%	3%	0.86%	0.57%	5.49%	41 (86%)	5.49%	11.30%	4 (8%)	11.30%	16.67%	3 (6%)
RQ2. Which techniques or activities are most frequently applied to cultivate creative thinking?	187	1.07–19.25%	R = 18.18% A = 6.06%	5%	4.81%	1.07%	7.13%	36 (77%)	7.13%	13.19%	10 (21%)	13.19%	19.25%	1 (2%)
RQ3. What technological tools are used to support activities for the development of creative thinking?	70	1–24%	R = 22.86% A = 7.62%	14%	14.29%	1%	9.05%	2 (18%)	9.05%	16.67%	6 (55%)	16.67%	24%	3 (27%)
RQ4. What are the skills of creative thinking?	61	2–82%	R = 80.36% A = 26.79%	20%	4.10%	2%	28.13%	11 (79%)	28.43%	55.21%	0 (0%)	55.21%	82%	3 (21%)
RQ5. At what educational levels have these studies related to this specific topic been carried out?	174	2–64%	R = 61.49% A = 20.50%	21%	11.49%	2%	22.80%	4 (80%)	22.80%	43.30%	0 (0%)	43.30%	64%	1 (20%)

LL = lower limit; UL = upper limit; N = number and percentage of results providing low, medium, and high confidence; V_{Min} = minimum value; V_{Max} = maximum value; A = amplitude; R = range; NS: number of studies.

4. Discussion and Conclusions

This research offers a valuable contribution to the educational field of arts and design by providing specific methods, techniques, and tools for fostering creative thinking in students. The results align with previous investigations, consolidating and expanding the existing knowledge in this domain. These contributions have the potential to significantly enhance educational processes by providing practical and applicable resources for educators in the field to effectively promote creative thinking in their students.

Regarding educational methodologies, there is an emphasis on hands-on learning, project-based learning, STEAM, and interdisciplinary approaches. These methods foster a dynamic and participatory environment that drives creative thinking through constant practice and collaboration. Educational methodologies centered on practical learning, projects, STEAM, and interdisciplinary approaches stand out for their ability to drive creative thinking. By fostering hands-on experiences, active collaboration, and a dynamic environment, these methodologies not only challenge students to apply knowledge tangibly but also cultivate essential 21st-century skills such as critical thinking and problem solving. These approaches benefit students by providing them with a more relevant and stimulating education, educators by offering more effective teaching methods, and educational institutions by meeting the demands of contemporary education. Additionally, they contribute to the formation of creative and adaptive individuals, benefiting industries and society at large by preparing future generations to provide innovative solutions to current and future challenges. As stated by Dietz et al. [20], developing the ability to think and collaborate across different disciplines has become crucial in the current era, both for organizations and individuals. Various studies present and support similar findings [55–57].

As for educational techniques, the importance of interdisciplinary projects and activities that develop cognitive and physical skills is emphasized. The integration of experiences in nature and audiovisual activities is recommended to enrich creative thinking [58–60]. Interdisciplinary projects allow students to address problems from various perspectives, integrating knowledge from different disciplines and fostering a holistic view. This approach not only stimulates creativity by connecting seemingly incongruent ideas but also reflects the interconnected nature of the real world [39]. Furthermore, the inclusion of activities that develop cognitive and physical skills provides a practical and experiential dimension to the educational process, allowing students to learn through action and experimentation. The recommendation to integrate experiences in nature adds a sensory and stimulating component, connecting students with their environment in a way that can inspire new ideas and perspectives. On the other hand, audiovisual activities offer a powerful tool for creative expression and effective communication.

This information can benefit students by providing them with a more comprehensive and practical educational approach, helping them develop cognitive, physical, and creative skills in an integrated manner. For educators, these techniques provide effective strategies for fostering creative thinking in the classroom and creating a dynamic and participatory learning environment. Educational institutions can benefit from adopting these techniques by attracting and retaining students seeking a more relevant and stimulating education. On a broader level, the application of these techniques contributes to the formation of creative and versatile individuals who can address the challenges of contemporary society. Additionally, the connection with nature and the use of audiovisual media expand the possibilities of learning, allowing education to transcend traditional barriers and adapt to various learning styles.

These findings align with the strategies presented by Delgado [16], highlighting the use of pedagogical games, problem-based learning, the integration of educational robotics, the application of brainstorming, the use of mind maps, the implementation of creative drama, and the adoption of interactive teaching platforms [27,61,62]. The challenge for educators lies in the need to transform their pedagogical methods by incorporating innovative practices.

The abundance of tools mainly focuses on playful applications, virtual learning environments, platforms for collaborative work, and social networks. These tools diversify learning methods and underscore the importance of technology in fostering creative thinking. According to Timotheou and Loannou [10], these tools are within the context of learning and innovation. The authors emphasize that students must conceive distinctive approaches to problem solving, collaborate with their peers, and effectively utilize both physical and digital environments. Consequently, it is crucial for educational institutions to adopt strategies and digital tools that promote the strengthening of these skills.

Concerning the core skills of creative thinking related to art and design, the identified abilities include originality, fluency, flexibility, and elaboration. It is crucial to emphasize that our research has a specific focus on identifying creative thinking skills, particularly within the realm of arts and design. Addressing creative thinking in this context establishes an intrinsic connection with divergent thinking, where skills such as originality, fluency, flexibility, and elaboration are widely recognized. Guilford [63] proposed that the most distinctive characteristic of creative thinking is the ability to think in a different and novel manner, namely, divergent thinking. For Guilford, divergent thinking involves fluency in ideas, mental flexibility, originality of thought, and elaboration, as assessed by the number of unnecessary details used to convey an idea. Consequently, this research adopts and presents these skills in line with the definitions established by experts in the field. However, synonyms and related terms are acknowledged, expanding the understanding of creative thinking as a set of intrinsic skills and characteristics. The capacity of art to enrich itself through its connection with diverse areas of knowledge is highlighted [57]. In an educational context, most studies focus on higher education institutions, but the importance of fostering creativity at early ages and across all educational levels is also recognized. This finding warns of the need for holistic pedagogical strategies that promote the development of creative thinking throughout the entire educational trajectory.

Regarding demographic characteristics, the research results reveal that the United States leads in studies on creative thinking, followed by China and the United Kingdom. This trend could be attributed to the prominence of these countries in STEAM education, where various disciplines are integrated to foster the development of 21st-century skills, including creative thinking. This aligns with the vision of educating students capable of contributing to development, innovation, and finding creative solutions to global problems. As mentioned by the United Nations Educational, Scientific and Cultural Organization (UNESCO) [64], between 2014 and 2018, global spending on science and the number of researchers experienced growth, but with marked disparities. The United States and China consolidated their leadership, accounting for almost two-thirds of this increase, while most countries invest less than 1% of their gross domestic product (GDP) in scientific research. Likewise, *Business Insider* [65] highlights that the quality of research is assessed through the frequency of citations by others, and in this regard, China stood out, representing 27.2% of the world's most-cited articles in the top 1%, surpassing the United States by 24.9%, and the United Kingdom ranking third with 5.5%. These research capabilities are crucial for determining future market shares in areas such as artificial intelligence and quantum technology and can also directly influence national security. The findings also suggest a significant gap in the academic literature on creative thinking in the Latin American context, which could be a focal point for future research and a call to action to promote and support research in this field in the region.

Limitations

The review presents limitations that need to be addressed to properly contextualize the results. One identified limitation lies in the variability in data availability among the included studies. Not all studies provided responses to each research question, affecting the robustness of the collected data in certain aspects. It was also observed that the applicability of studies to verifying the validity of their content was not uniform. Some studies were not specifically designed for content validation, raising considerations about the reliability and

relevance of certain findings. These limitations underscore the importance of interpreting the results with caution and acknowledging that the variability in the quality and methodological approach of the studies can influence the strength of the conclusions drawn from the review.

The predominant limitation of the employed review processes is related to the language factor. This restriction arises from the fact that the native language of the authors of this research is Spanish, while the majority of the analyzed works are written in English. To overcome this challenge, it was imperative to resort to automated translators during the reading and analysis of each study. This language obstacle may have introduced certain levels of inaccuracy in interpretation. Despite this challenge, rigorous measures were implemented to minimize possible distortions, such as a careful review of the translated texts.

The results of the review have significant implications for practice, policies, and future research in the development of creative thinking. The scarcity of Latin American studies highlights the need to promote research in the region. The preference for practical and project-based educational methods advocates for adjustments in pedagogical practice. In terms of educational policies, the importance of fostering creativity from an early age and at all educational levels is emphasized. For future research, the identification of specific tools and techniques suggests potential areas for deeper study, while the classification of core creative thinking skills indicates the need to investigate their complexity and manifestation in different contexts. Overall, the results inform and guide actions to improve educational practices, formulate more effective policies, and steer future research in the field of creative thinking.

Additionally, it is noteworthy to remark that this SLR aims to address the posed research questions through the analysis of the existing literature. The construction of the search string aimed to minimize the risk of bias. Nevertheless, the documents analyzed in this research represent a sample of all studies conducted worldwide, and there may be additional research in other countries not indicated in Table 13. It is also possible that certain journals not indexed in the SCOPUS database were overlooked. Concerning linguistic challenges, despite the fact that a significant number of highly relevant scientific documents are written in English, Spanish was included as it is the native language of the authors. Consequently, there is a possibility of finding studies in languages other than those analyzed in this SLR.

Furthermore, the authors emphasize that, despite dedicated efforts to minimize potential errors, there remains an inherent possibility of inaccuracies in the collection and analysis of the data. Additionally, it is important to acknowledge that the thorough bibliographic review, conducted with meticulousness, does not guarantee the identification of all relevant studies in the field of study.

Supplementary Materials: The following supporting information can be downloaded at https://www.mdpi.com/article/10.3390/educsci14020192/s1: The documents and files used in this systematic review are accessible through the following reference [21]. This resource includes control group documents, candidate studies in English and Spanish, the authors' study selection, the arbitration process, the matrix used for data extraction and the classification for each research question, and quality assessments.

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