



## Didactic strategies for creative thinking in high school students: a systematic review

*Estrategias didácticas para el pensamiento creativo en estudiantes de secundaria: una revisión sistemática*

*Estratégias didáticas para o pensamento criativo em alunos do ensino médio: uma revisão sistemática*

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### KEYWORDS

competences, creativity, teaching strategies, students, creative thinking

**ABSTRACT.** Creative thinking is the key to adapting to rapidly changing living conditions and providing innovative solutions to various problems, especially in science and technology. The objective of this study was to provide a conceptual basis on didactic strategies and creative thinking, as well as to visualize the implication of the application of various systems in the development of creativity of students in secondary education. The methodology used was the documentary review of 50 articles published in various reliable databases. In addition, the axes of the study proposed as conceptual definitions and didactic strategies for developing creative thinking were taken into account. Finally, it is concluded that if we properly apply didactic methods that develop higher-order skills, there will be more options to increase students' creative thinking

### PALABRAS CLAVE

competencias, creatividad, estrategias didácticas, estudiantes, pensamiento creativo

**RESUMEN.** El pensamiento creativo es la clave para adaptarse a las condiciones de vida rápidamente cambiantes y proporcionar soluciones creativas a diversos problemas, especialmente en los campos de la ciencia y la tecnología. El objetivo de este estudio fue proporcionar una base conceptual sobre estrategias didácticas y pensamiento creativo, así como visualizar la implicancia de la aplicación de diversas estrategias en el desarrollo de la creatividad de los estudiantes en educación secundaria. La metodología utilizada fue la revisión documental de 50 artículos publicados en diversas bases de datos confiables. Se tuvo en cuenta los ejes de estudio propuestos como definiciones conceptuales, y estrategias didácticas para el desarrollo del pensamiento creativo. Finalmente se concluye que si aplicamos adecuadamente estrategias didácticas que desarrollen habilidades de orden superior habrá más opciones para aumentar el pensamiento creativo de los estudiantes.

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**PALAVRAS-CHAVE**

competências,  
criatividade, estratégias  
de ensino, alunos,  
pensamento criativo

**RESUMO.** O pensamento criativo é a chave para se adaptar às condições de vida em rápida mudança e fornecer soluções criativas para vários problemas, especialmente nos campos da ciência e tecnologia. O objetivo deste estudo foi fornecer uma base conceitual sobre estratégias didáticas e pensamento criativo, bem como visualizar as implicações da aplicação de várias estratégias no desenvolvimento da criatividade de alunos do ensino médio. A metodologia utilizada foi a revisão documental de 50 artigos publicados em diversas bases de dados confiáveis. Foram considerados os eixos de estudo propostos como definições conceituais e estratégias didáticas para o desenvolvimento do pensamento criativo. Por fim, conclui-se que se aplicarmos adequadamente estratégias didáticas que desenvolvam habilidades de alto nível, haverá mais opções para aumentar o pensamento criativo dos alunos.

**1. INTRODUCTION**

The combination of creativity and critical thinking, collaboration, communication, computational thinking, technical literacy, and social-emotional development has been recognized as a significant skill in 21st-century learning (Scott, 2015). Unfortunately, the current school system invalidates students' creativity, so it is necessary to transform the school, considered a standardized educational system, into an innovative educational approach based on creativity (Robinson, 2014).

Creativity demands permanent interaction with higher cognitive functions, such as working memory, sustained attention, cognitive flexibility, and the ability to adapt actions carried out in real-time (I. Sánchez et al., 2021). Some basic skills are part of how people cope with problems: for example, divergent thinking skills that develop creativity through analogies, metaphors, and visual thinking (Azzam, 2019).

Many authors have devoted themselves to investigating this topic and essentially agree that creativity is a problem-solving procedure, which allows facing situations and seeing events differently than usual (Morin, 2019). Creative processes can favor individuals to generate ideas or innovations, starting from something genuinely original or scratch (A. García, 2018). The realization of creative tasks is only considered in art, literature, and design. Still, they are not planned informal fields: mathematics, physics, chemistry, because people think that they do not contribute to the integral development of the subject without. However, there is a subtle approach to problems in the context (Torres, 2018).

Creativity is one of the most elementary processes in the person, so establishing its configuration is challenging (Mareque & De Prada, 2017). Nevertheless, creativity can be specified as producing new and valuable ideas (Beaty et al., 2018). The key to creativity requires three things: First, you must understand the obstacles to creativity. The second is to find out what methods can encourage me to increase my creativity as an individual or a group member. The third thing is to train your creative muscles to keep them at their best (Castilleja, 1997). The development of human potentialities, intelligence, creativity, and talent forms one of the significant global issues related to the culture of the individual (Ortiz, 2008).

Obradors (2007) defines it as the ability to formulate problems and ask questions to solve them. While for Sanz (2010) creative thinking is the ability to conceive unique and ingenious ideas, combine them with them in another positive way, and find excellent relationships with modes of thought.

In Colombia, through research on problem-based learning (PBL), it was specified that teachers perceive it as a strategy to promote meaningful understanding, which is beneficial for the teaching of students. Consequently, it becomes a necessary link for the development of abilities, fundamentally creative (Ramírez, 2014).

On the other hand, in Spain, Ayllón et al. (2016) proposed a new way of conceptualizing problem solving and creativity and the theoretical and operational principle of variable types of teaching in science learning. In addition, they analyzed the interaction and context of the acquisition process of metacognitive components in student learning.

Similarly, in Indonesia, Hanafi et al. (2021) proposed to analyze the application of the Steam method in the development of activities carried out by students and allow them to participate in a changing study, justified in five interrelated forms of knowledge: cultural knowledge, relational knowledge, critical knowledge, vision, and moral knowledge, as well like knowledge in action.

Finally, Monroe and Samamé (2013) developed an investigation to assess students' creativity in primary and higher education. The tool they used was a direct indicator of the invention (EIBC-RM). The results show that there are no differences between the variables of creativity and its verbal fluency, flexibility, and organizational indicators, but there are inequalities in originality.

Faced with this situation, the objective of this study was to explore a diversity of articles related to creative thinking and the didactic strategies used in secondary education to strengthen their development.

## 2. METHOD

The research is documentary, so a systematic review was used in various databases such as Scopus, academic Google, EBSCO, Dialnet, Eric, Science direct. The keywords for the search in Spanish and English were “creative thinking,” “secondary education,” as well as the connectors “AND”, “ALL” and “OR”.

The methodology used was the inquiry of information. Therefore, duplicity and not finding adequate information for the topic of interest were considered exclusion criteria. Likewise, within the inclusion criteria, the article's name, the abstract, and methodology were taken into account, and secondary education students were considered participants.

Table 1.

Universe, axes and sub axes of study

Study universe	Study axes	Study sub axes
Didactic strategies of creative thinking in high school students: a systematic review	Conceptual bases of didactic strategies.	<ul style="list-style-type: none"> <li>- Technique</li> <li>- Activities</li> <li>- Actions</li> <li>- Process</li> <li>- Procedures</li> </ul>
	Conceptual bases of creative thinking.	<ul style="list-style-type: none"> <li>- Capacity</li> <li>- phenomenon</li> <li>- Process</li> </ul>
	Didactic strategies for the development of creative thinking in secondary education.	<ul style="list-style-type: none"> <li>- Resultados de traducción</li> <li>- Rhetorical Figures</li> <li>- ICT tool for 3D CAD modeling</li> <li>- GO_KAR model</li> <li>- Problem Based Learning</li> <li>- Cognitive strategies based on divergent thinking</li> <li>- Metacognitive strategies</li> <li>- The math</li> <li>- Cooperative learning.</li> <li>- Mind mapping</li> <li>- Experimentation</li> </ul>

### 3. RESULTS

#### 3.1. Conceptual bases of didactic strategies

Table 2

Systematization of information on teaching strategies

Author / authors	Key considerations
Tobón (2010)	Conglomerate of techniques and activities that allow the achievement of learning goals.
Quintá et al. (2014)	Teaching techniques used during learning sessions.

A. Jiménez and Robles (2016)	Set of actions that are projected and launched.
De la Torre (2009)	Reflective, discursive and thoughtful process that aims to determine a set of necessary norms and prescriptions.
Gonzales and Triviño (2018)	Set of procedures or resources, used by teachers.
Castellano and Arboleda (2013)	Set of procedures that, supported by teaching techniques and means, orient to established goals.
Bixio (2001)	Set of actions carried out by the teacher with a defined pedagogical goal.

As seen in the systematization on the conceptual basis of didactic strategies, we can argue that these are understood as techniques, procedures, and activities necessary in the teaching-learning process.

### 3.2. Conceptual bases of creative thinking

Table 3.

Systematization of information on creative thinking

Author / authors	Key considerations
Pawlak (2000)	Set of spiritually interrelated ideological elements that produce ideas and knowledge.
Torres (2018)	Phenomenon that is born and grows in a favorable environment.
Obradors (2007)	Ability to formulate problems and ask questions to solve them.
Sanz (2010)	Ability to conceive unique and ingenious ideas.
Logroño and Romero (2011)	Ability to express themselves through attitudes, with a variety of learning skills.
Wallas (1946)	It is a four-stage process: preparation, incubation, illumination, and verification.
Ells Torrance (1966)	Procedure for sensitivity to problems, deficiencies, gaps in knowledge and disharmony.

H. Sánchez (2003)	competence that develops from the incorporation of cognitive and affective psychological processes
Ellis Torrance (1998)	Ability to discover problems or information gaps, form ideas or hypotheses, test them, modify them and communicate the results.
Dogan et al. (2020)	ability of the person who admits to create new, valuable and appropriate objects or ideas.
Psicocode (2018)	Sensitivity skills for problems, fluency, flexibility, novelty and originality.

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Considering the systematization on the conceptual bases of creative thinking, we can affirm that it can be understood as a necessary skill, capacity, and/or competence that allows discovering problems, forming ideas, and communicating results in a novel and original way.

### 3.3. Didactic strategies for the development of creative thinking in Secondary Education

#### Strategy 1

Ruiz et al. (2016) propose the “Rhetorical figures of thought” as a strategy in the teaching of the production of poems, inducing the student's imagination through the expression of feelings using infrequent words, allowing him to be responsible in the use of language in a pleasant and Elegant. For his part, Lausberg (1993) examines rhetorical figures based on classical rhetoric, divided into five parts: inventio, focused on finding ideas and arguments; device, focused on the organization of opinions, views or findings; elocutio, referring to the choice and arrangement of words or phrases; memory, as an evocation of the speech to pronounce it and finally action, understood as the declamation of it.

#### Strategy 2

C. García y Gómez (2020) state that the ICT tool for 3D CAD modeling is a creative strategy, which allows communicating messages using three-dimensional digital drawing as a medium, allowing the student to build knowledge and develop skills guided by the educator. In the same way, De la Torre (2009) points out that to understand the complex tasks that arise from the creative talent of the individual, in current educational settings that demand renewed teaching, it is essential to identify the aspects that enhance creativity accompanied by transdisciplinary nuances.

### Strategy 3

Handayani et al. (2020) establish that the innovation of the GO\_KAR learning model resides in the learning construction phase, where students must autonomously formulate research questions or problem formulations, design problem solutions, and creatively report their findings. Another originality evident in this strategy is the reflection that the students carry out independently and classically, ensuring participation in a democratic way.

### Strategy 4

Ramírez (2014) states that Problem-Based Learning (PBL) develops creative thinking in students, allowing them to examine alternative solutions to a problem, demonstrating their ingenuity, intelligence and knowledge worked collaboratively. For Morales (2017) the results of the PBL in learning can be manifested as the ease in understanding new knowledge, favors adequate capacity and motivation, generates cognitive conflicts in students, learning is the product of collaboration and cooperation, and empowers the restoration of the zone of proximal development.

### Strategy 5

According to Sánchez and Reyes 2003 (como se citó en Delgado, 2006) cognitive strategies are routines, processes, and operations that every individual expresses and increases when starting a problem situation, allowing them to achieve a more appropriate solution. Jeffrey (2010) says that divergent thinking constitutes the principle of inventions, whose capacity demands the perception of new situations for known elements. Likewise, Kennet and Eller (2000) consider that divergent thinking uses inductive reasoning, producing facultative forms in solving a problem, some of which turn out to be so unique and original that they are not feasibly supported.

### Strategy 6

Pesut (1990) establishes that the strategy with a metacognitive approach strengthens creative thinking in students, obtaining as a product a metacognitive self-regulatory process. In the same way O'Neil and Abedi (1996) consider metacognitive strategies as the conscious and systematic self-verification of the action concerning the objective and the choice and use of design when the circumstances require it.

### Strategy 7

Núñez (2015) considers that using mathematics as a strategy is the most profoundly rooted surprise. It favors sudden enlightenment in the student after an arduous conscious task to generate some element, which may be

novel, to leave impressions where it is believed is less unquestionable. For their part, C. Jiménez et al. (2001) express that the original idea arises in mind, whose mathematical concept demands interaction with others and the environment conceived with more significant adjustment to reality.

### **Strategy 8**

Merchán and Rodríguez (2016) declare cooperative learning as a work methodology that will structure the activities within the classroom to transform it into a social and academic learning practice with principles or bases that focus on equality, creativity, self-esteem, and cooperation. Specifically, Johnson et al. (1999) consider cooperative learning as a didactic strategy of small groups where students work together, making their teaching and their classmates effective. In this sense Lopez and Acuña (2011) mention that cooperative learning constitutes one of the resources that causes important expectations in problem-solving in different educational contexts. Also, P. García (2019) recommends using collaborative learning, the dynamics group, and group management to achieve better learning.

### **Strategy 9**

Rodríguez (2011) determines that the mind map becomes a strategy with easy access to the brain's enormous potential through the observation of information with keywords and conceptual ramifications. Likewise, Buzan (1996) states that it is an organized procedure that allows locating knowledge in a visual system of branches, concepts associated with each other, and that grow in every sense starting from a central theme. Similarly, Guilford (1986) considers the mind map to develop creative thinking since it uses all the competencies commonly related to creativity, specifically imagination, the evocation of ideas, and flexibility.

### **Strategy 10**

Villacres (2017) establishes that pedagogical experimentation implies the understanding of natural sciences and environmental education problems, recognizing all the current existing ideas and the erroneous conceptions that one has, intensifying in the problematic situations and the generation of significant learning. For his part, Perkins (2003) specifies it as an ability and disposition to design, whose characteristic suggests a model understand the creative process more clearly. Likewise, Zambrano et al., (2008) establish that the experiments allow the researcher to create experimental conditions, where students, teachers, and teaching technicians choose those that best suit their objectives from the present reality.

According to these findings, we can mention that didactic strategies for developing creative thinking in secondary education are vital since they are considered techniques and activities that allow the achievement of learning



goals (Tobón, 2010). They also enable understanding the complex tasks that arise from the creative talent of the individual (De la Torre, 2009).

#### 4. DISCUSSION

The teaching-learning process requires a change in its methodology to promote meaningful learning. From the pedagogical and teaching point of view, didactic strategies are activities that teachers use to guide the development of educational work to promote the achievement of basic general skills, with significant learning that allows students to make associations (A. Jiménez & Robles, 2016; Quintá et al., 2014; Tobón, 2010). According to De la Torre (2009) teaching requires a didactic reorientation, where the emphasis is placed on developing skills using creativity.

Creative thinking is a competence that develops in the human being from incorporating cognitive and affective psychological processes with a variety of learning skills that contribute to the creation of new and original ideas (Logroño & Romero, 2011; H. Sánchez, 2003; Sanz, 2010). It can then be inferred that the development of creative thinking in students is fundamental and can be promoted from any curriculum area using various didactic strategies that obey classifications with criteria such as technology, cognitive, metacognitive, problem-solving: visual thinking, poetry production and experimentation.

According to Torres (2018) the application of creative thinking allows us to show unconventional alternatives that achieve an adequate transmission of knowledge. Various didactic strategies as tools to develop creative thinking in secondary education will enable students to be autonomous, formulate research questions, examine different alternative solutions to a problem, manifest their ingenuity, intelligence, and knowledge necessary to achieve better learning (C. García & Gómez, 2020; Handayani et al., 2020; Ramírez, 2014). Teachers must responsibly use these tools to develop creativity in individuals in the production of knowledge and difficulty presented to them according to the context.

The didactic strategies that are part of this study require elementary knowledge from the teachers about technology, experimentation, problem-solving, and didactics, which allows, analyze, describe and creatively explain the teaching-learning process leaving aside traditional teaching. Otherwise, it becomes a limitation to develop creative thinking efficiently and effectively. Therefore, national curricula must significantly develop creative thinking in students in all curricular areas, contributing to their integral formation.

## 5. CONCLUSIONES

Creative thinking must be present in the performance of all our activities. In the professional, artistic and cultural field, we must be creative and innovative, achieving positive results that decompose established model schemes that lead to repetition.

Encouraging creative thinking in students allows them to conceive unique and ingenious ideas, formulate problems and ask questions to solve them, structure original and novel answers that solve a problem, with new alternative solutions that show new results, which express the use of order skills higher.

The use of didactic strategies to develop creative thinking in education is essential. It should be considered a vital tool for the teaching-learning process, which depends on the cognitive and didactic capacity of the teacher to achieve meaningful learning that contributes to the integral development of the individual, allowing him to think beyond the conventional.

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