Original Article

# Exploring the Interplay between Mathematical Creativity and Parallel Thinking: Insights from Edward de Bono's Theories

**Dr. Archana Shrivastava[1] Smt. Shruti Upadhyay[2]**
[1]Professor, Maharaja College, Ujjain, MP [2]Research Scholar, Vikram University, Ujjain, MP

**Manuscript ID:** IJEESRD -2024-010102

ISSN: 3065-7865

Volume 1

Issue 1|

Pp. 6-10

October 2024

**Submitted:** 01 Aug. 2024

**Revised:** 11 Sept. 2024

**Accepted:** 13 Oct. 2024

**Published:** 31 Oct. 2024

**Abstract**

Mathematical creativity and parallel thinking are vital cognitive strategies that enhance problem-solving abilities across various domains. Mathematical creativity involves the ability to generate innovative solutions by making unique connections between existing concepts, fostering originality, flexibility, fluency, and insight. This form of creativity enables mathematicians to explore new patterns and relationships, thereby advancing both theoretical understanding and practical applications. Parallel thinking, introduced by Edward de Bono, encourages simultaneous exploration of multiple perspectives rather than traditional linear reasoning. By employing techniques like the Six Thinking Hats, parallel thinking fosters a collaborative environment that broadens the scope of problem-solving.

This article examines the interplay between mathematical creativity and parallel thinking, highlighting their complementary roles in education and professional settings. It outlines a structured creative process—comprising preparation, incubation, illumination, and verification—demonstrating how these stages facilitate innovative thinking. Practical classroom examples illustrate how integrating these strategies can enhance learning outcomes. For instance, students solving geometry problems can apply parallel thinking to evaluate various methods while utilizing their mathematical creativity to devise novel solutions.

The synergy between these cognitive approaches not only enriches the learning experience but also prepares students to tackle complex problems in mathematics and beyond. By fostering both mathematical creativity and parallel thinking, educators can equip learners with essential skills for success in an increasingly complex world, ultimately driving innovation and efficiency in numerous fields.

**Key words:** Mathematical Creativity, Edward de Bono, Six Thinking Hats, Parallel Thinking, Problem Solving in Mathematics, Cognitive approaches

## 1.1.0 INTRODUCTION

Mathematical creativity is often viewed as the ability to think in unconventional ways to solve complex problems, involving a unique combination of logical reasoning and imaginative insight. Parallel thinking, a concept popularized by Edward de Bono, emphasizes the simultaneous consideration of multiple perspectives or approaches to a problem, allowing for a broader range of possible solutions. This article delves into how these two cognitive strategies interact and how they can be leveraged to enhance problem-solving in mathematics and other domains.

### 1.2.0 Understanding Mathematical Creativity

Mathematical creativity is not just about generating new ideas; it's about finding new connections between existing ideas and applying them in innovative ways. It involves thinking beyond standard algorithms and procedures, embracing ambiguity, and often taking intellectual risks and also involves original thinking, the discovery of new patterns, and the ability to see connections that others might overlook. Creative mathematicians often explore uncharted territories, seeking patterns and relationships that others may overlook. This form of creativity is crucial in advancing mathematical theory and finding novel applications in real-world problems.Mathematical creativity can be characterized by several key attributes:



Quick Response Code:

Website: https://bnir.us

DOI: 10.5281/zenodo.14538622

Access this article online

**Address for correspondence:**

*Dr. Archana Shrivastava, Professor, Maharaja College, Ujjain, MP, E-mail: archanashri27@gmail.com*

**How to cite this article:**

*Shrivastava, A., & Upadhyay, S. (2024). Exploring the Interplay between Mathematical Creativity and Parallel Thinking: Insights from Edward de Bono's Theories. Bulletin of Nexus:journal of Multidisciplinary International Research Studies, 1(1), 6–10.* https://doi.org/10.5281/zenodo.14538622

**1. Originality:** The ability to produce ideas or solutions that are new and unique. In mathematics, this might involve devising a new proof, discovering a previously unknown relationship between numbers, or creating a novel mathematical model.
**2. Flexibility:** The capacity to approach a problem from multiple angles and to shift between different strategies or perspectives. A flexible thinker might consider various methods for solving a problem, such as algebraic, geometric, or computational approaches.
**3. Fluency:** The ability to generate a large number of ideas or solutions in response to a problem. This involves not just the production of ideas, but also the refinement and elaboration of those ideas to make them viable.
**4. Insight:** The capacity to see the underlying structure of a problem and to make connections between seemingly unrelated concepts. Insight often leads to breakthroughs in understanding, where a complex problem suddenly becomes clear.

Intuition plays a significant role in mathematical creativity. It involves a sense of "knowing" or an ability to predict outcomes without relying solely on logical steps. Intuitive thinkers often arrive at solutions that they cannot immediately justify through formal reasoning, but which are later proven correct. This intuitive leap is often where the most creative aspects of mathematical thinking occur, as it allows mathematicians to explore uncharted territories of thought.

**1.2.1 THE PROCESS OF MATHEMATICAL CREATIVITY**

Mathematical creativity often follows a process that mirrors the stages of creative thinking in general:
**1. Preparation:** In this stage, the thinker gathers information, studies the problem, and immerses themselves in the relevant mathematical concepts. This stage often involves a lot of background work, including studying existing theories, solving related problems, and understanding the context of the problem.
**2. Incubation:** During the incubation period, the thinker steps away from the problem, allowing their subconscious mind to process the information. This stage is crucial for allowing creative ideas to form, often leading to sudden insights.
**3. Illumination:** The illumination stage is where the "aha" moment occurs—when the thinker suddenly sees the solution or a new approach to the problem. This moment of clarity is often described as the most exhilarating part of the creative process.
**4. Verification:** After the creative insight, the thinker must verify that the solution is correct. This stage involves rigorous logical reasoning, checking the work, and possibly refining the original idea to ensure it holds up under scrutiny.

**1.3.0 PARALLEL THINKING: AN OVERVIEW**

Parallel thinking is a cognitive approach developed by Edward de Bono, a pioneer in the field of creative thinking and innovation. Unlike traditional adversarial thinking, where the goal is to prove one viewpoint right and others wrong, parallel thinking encourages the exploration of multiple perspectives simultaneously. This method fosters a collaborative rather than combative environment, where different ideas are considered side by side, leading to more comprehensive and innovative solutions.De Bono's concept of Six Thinking Hats is a practical application of parallel thinking, where different "hats" represent different modes of thinking—ranging from emotional to logical to creative. By donning different hats, thinkers can systematically approach a problem from different perspectives, ultimately leading to more comprehensive and innovative solutions.

At its core, parallel thinking is about moving away from confrontational debate and instead using a structured approach to explore various aspects of a problem or situation. De Bono argues that traditional Western thinking is often linear and adversarial, focusing on analysis, judgment, and argumentation. While this can be effective in certain contexts, it can also limit creativity and the exploration of alternative solutions.

Parallel thinking, on the other hand, is designed to broaden the scope of thinking by allowing multiple thoughts to coexist without direct conflict. It encourages thinkers to approach a problem from different angles, considering all possibilities before reaching a conclusion. This method is particularly useful in complex situations where there are multiple factors to consider and where creative solutions are needed.

**1.3.1 The Six Thinking Hats**

One of the most famous applications of parallel thinking is de Bono's Six Thinking Hats method. This technique provides a structured way to think in parallel by assigning different "hats" that represent different modes of thinking. By metaphorically "wearing" one hat at a time, individuals or groups can

**ISSN: 3065-7865**
Bulletin of Nexus, Volume 1| Issue 1 |Pp. 6-10 | October 2024

systematically explore all aspects of a problem. The six hats are:


1. White Hat: Focuses on data, facts, and information. When wearing the White Hat, the thinker is concerned with what is known, what needs to be known, and how it can be discovered.


2. Red Hat: Represents emotions, feelings, and intuition. The Red Hat allows for the expression of emotional responses and gut feelings without the need for justification.


3. Black Hat: Involves critical judgment and caution. The Black Hat is used to identify potential problems, risks, and drawbacks, ensuring that the ideas being considered are robust.


4. Yellow Hat: Stands for optimism and positive thinking. The Yellow Hat focuses on the benefits, value, and potential of an idea, looking for the best possible outcomes.


5. Green Hat: Represents creativity and new ideas. When wearing the Green Hat, thinkers are encouraged to explore alternative solutions, possibilities, and creative approaches.


6. Blue Hat: Focuses on process control and organization. The Blue Hat is used to manage the thinking process, decide on the sequence of thinking, and ensure that all aspects are covered.

By rotating through these hats, a group or individual can ensure that they have thoroughly explored all aspects of a problem, leading to more balanced and innovative decisions.

## 1.4.0 THE SYNERGY BETWEEN MATHEMATICAL CREATIVITY AND PARALLEL THINKING

While mathematical creativity thrives on the ability to think differently and innovate, parallel thinking provides the structure and discipline needed to explore multiple solutions without being confined to a single line of thought. When combined, these approaches can lead to breakthroughs in problem-solving. For instance, a mathematician might use parallel thinking to explore various hypotheses or methods for solving a problem, while simultaneously employing creativity to discover new connections between ideas.

This synergy is particularly powerful in fields where traditional methods have reached their limits. In such cases, the creative aspect of mathematical thinking pushes boundaries, while parallel thinking ensures that all possible avenues are explored systematically. Together, they create a fertile ground for innovation.

Mathematical creativity and parallel thinking are both essential for fostering innovative problem-solving skills in students. Mathematical creativity involves the ability to think divergently and explore novel solutions to problems, while parallel thinking—an approach developed by Edward de Bono—encourages considering multiple perspectives simultaneously. Combining these two cognitive strategies can enhance the learning experience and lead to more effective and inventive problem-solving.When integrated; these approaches allow students to approach problems from multiple angles while also thinking creatively about potential solutions. This combination helps develop a more robust understanding of mathematical concepts and enhances problem-solving skills.

**Table No.1.1: Some examples of the Synergy between Mathematical Creativity and Parallel Thinking**

EXAMPLE - 1

| | | |
|---|---|---|
| **EXAMPLE: Problem-Solving in Geometry** | | **APPLICATION OF PARALLEL THINKING:** The teacher implements the Six Thinking Hats method: |
| **SCENARIO:** | A teacher introduces a problem involving the calculation of the area of irregular shapes. Instead of providing a direct formula, the teacher asks students to come up with different methods to find the area. | White Hat: Students list the known data and facts about the shapes. |
| | | Red Hat: Students share their initial feelings and intuitions about the problem. |
| | | Black Hat: Students identify potential challenges or limitations with their methods. |
| **APPLICATION OF MATHEMATICAL CREATIVITY:** | Students use their creativity to decompose the irregular shape into simpler shapes like triangles and rectangles, apply different formulas, and explore unique approaches. | Yellow Hat: Students consider the benefits of each method and how it might simplify the problem. |
| | | Green Hat: Students brainstorm creative ways to combine or alter their methods for a more effective solution. |
| | | Blue Hat: The class organizes and evaluates the different approaches, deciding on the best strategy. |
| OUTCOMES: By using both mathematical creativity and parallel thinking, students explore various solutions and gain a deeper understanding of geometric principles | | |

**ISSN: 3065-7865**
Bulletin of Nexus, Volume 1| Issue 1 |Pp. 6-10 | October 2024

**EXAMPLE -2**

| **EXAMPLE: Exploring Algebraic Expressions** | | **APPLICATION OF PARALLEL THINKING:** The teacher divides the class into groups, each focusing on a different "thinking hat": |
|---|---|---|
| **SCENARIO:** | Students are asked to simplify and solve complex algebraic expressions. The goal is to find multiple ways to approach the problem. up with different methods to find the area. | White Hat: Groups focus on the mathematical rules and principles needed to simplify the expressions.<br>Red Hat: Groups discuss their feelings about the complexity of the expressions and their initial solutions.<br>Black Hat: Groups analyze potential pitfalls or mistakes in their methods. |
| **APPLICATION OF MATHEMATICAL CREATIVITY:** | Students experiment with different algebraic techniques, such as factoring, expanding, and using substitution, to solve the expressions. | Yellow Hat: Groups explore the advantages of each method and how it applies to different types of problems.<br>Green Hat: Groups innovate new techniques or combinations of methods for solving the expressions.<br>Blue Hat: The teacher coordinates the groups' findings and helps consolidate the most effective strategies. |
| OUTCOMES: Students develop a broader range of problem-solving techniques and learn to appreciate different algebraic methods. | | |

**EXAMPLE - 3**

| **EXAMPLE: Mathematical Games and Puzzles** | | **APPLICATION OF PARALLEL THINKING:** The teacher guides the class through a structured discussion using the Six Thinking Hats: |
|---|---|---|
| **SCENARIO:** | The teacher introduces a mathematical puzzle, such as a Sudoku variant or a logic problem, encouraging students to find solutions using their creativity. | White Hat: Students gather and share data about the puzzle, including rules and constraints.<br>Red Hat: Students express their initial emotional responses and hunches about potential solutions.<br>Black Hat: Students identify challenges and obstacles they face while solving the puzzle. |
| **APPLICATION OF MATHEMATICAL CREATIVITY:** | Students use creative thinking to devise novel strategies for solving the puzzle, experimenting with different approaches and patterns. | Yellow Hat: Students explore the benefits of various strategies and how they might lead to a solution.<br>Green Hat: Students brainstorm innovative methods or alternative approaches to solving the puzzle.<br>Blue Hat: The teacher helps synthesize the strategies and guides students in choosing the best approach to solve the puzzle. |
| OUTCOMES: Students engage with the puzzle in a multi-faceted way, enhancing their problem-solving skills and creative thinking. | | |

In education, fostering both mathematical creativity and parallel thinking can lead to more effective learning outcomes. Students trained in these approaches are better equipped to tackle complex problems, not just in mathematics, but across various disciplines. Moreover, in professional environments, these skills can drive innovation and efficiency, particularly in fields such as engineering, computer science, and economics.

The synergy between mathematical creativity and parallel thinking offers a powerful framework for enhancing problem-solving skills in the classroom. By encouraging students to think creatively and explore multiple perspectives simultaneously, educators can help them develop a more comprehensive understanding of mathematical concepts. Practical classroom examples, such as solving geometry problems, exploring algebraic expressions, and engaging with mathematical puzzles, illustrate how these approaches can be effectively integrated to foster a richer learning experience.

The integration of mathematical creativity and parallel thinking represents a powerful approach to problem-solving. Edward de Bono's theories on parallel thinking provide a valuable framework for systematically exploring multiple solutions, while the creativity inherent in mathematical thought allows for the discovery of new ideas and connections. Together, these cognitive strategies can enhance innovation, both in mathematics and in a wide range of other disciplines. By embracing both approaches, individuals and organizations can unlock new possibilities and achieve greater success in their problem-solving endeavors.

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