

## **Unleashing creative potential: exploring the synergistic impact of educational innovation and open science on fostering creativity and innovation mindset in students**

Liberar el potencial creativo: exploración del impacto sinérgico de la innovación educativa y la ciencia abierta en el fomento de la creatividad y la mentalidad innovadora de los estudiantes

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### **Abstract**

This empirical study investigates the synergistic impact of educational innovation and open science on fostering creativity and innovation mindset in students. A mixed-methods approach was employed, combining surveys, interviews, and case studies. The results show a significant positive correlation between educational innovation, open science, and creativity/innovation mindset. The study highlights the importance of integrating open educational resources, participatory research, and industry-academia partnerships to unleash students' creative potential.

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**Keywords:** educational innovation, open science, creativity, innovation mindset, student development

## **Resumen**

Este estudio empírico investiga el impacto sinérgico de la innovación educativa y la ciencia abierta en el fomento de la creatividad y la mentalidad innovadora de los estudiantes. Se empleó un enfoque de métodos mixtos, combinando encuestas, entrevistas y estudios de casos. Los resultados muestran una correlación positiva significativa entre la innovación educativa, la ciencia abierta y la creatividad y la mentalidad innovadora. El estudio destaca la importancia de integrar los recursos educativos abiertos, la investigación participativa y las asociaciones entre la industria y el mundo académico para liberar el potencial creativo de los estudiantes.

**Palabras clave:** innovación educativa, ciencia abierta, creatividad, mentalidad innovadora, desarrollo de los estudiantes

## **Introduction**

The 21st century demands innovative and creative thinkers (Trilling & Fadel, 2009). Research highlights the importance of creativity and innovation in education (Robinson, 2011). Educational innovation involves restructuring teaching and learning processes (Hargreaves & Fullan, 2012). Open science promotes transparency, reproducibility, and global collaboration (Vicente-Saez & Martinez-Fuentes, 2018).

Educational innovation and open science offer promising solutions to foster creativity and innovation mindset in students. This study explores the synergistic impact of these two concepts on student creativity.

## **1. Literature Review**

### **1.1 Educational Innovation**

Educational innovation has emerged as a vital catalyst for transforming the learning landscape, enabling students to thrive in an increasingly complex and interconnected world (Hargreaves & Fullan, 2012). By redefining traditional teaching and learning paradigms, educational innovation fosters creative problem-solving, critical thinking, and collaboration, essential skills for the 21st century (Trilling & Fadel, 2009). Through the integration of cutting-edge technologies, pedagogical designs, and inclusive practices, educational innovation has the potential to enhance student engagement, motivation, and academic achievement (Robinson, 2011). Moreover, innovative educational approaches prioritize student-centered learning, diversity, and social responsibility, ultimately preparing learners to navigate and shape a rapidly changing global society (Vicente-Saez & Martinez-Fuentes, 2018). This study explores the synergistic impact of educational innovation and open science on fostering creativity and innovation mindset in students.

### **1.2 Open science**

Open science has revolutionized the scientific landscape by promoting transparency, reproducibility, and global collaboration, thereby accelerating discovery and innovation (Vicente-Saez & Martinez-Fuentes, 2018). By making research accessible, open science fosters a culture of sharing, critique, and collective progress, ultimately advancing the quality and impact of scientific inquiry (Nielsen, 2011). Through open-access publishing, data sharing, and participatory research, open science empowers researchers, educators, and students to engage in collaborative knowledge creation, bridge disciplinary boundaries, and address complex societal challenges (Royal Society, 2012). Moreover, open science promotes equity, diversity, and inclusivity by democratizing access to knowledge and providing opportunities for global participation (UNESCO, 2017). This study explores the synergistic

impact of open science and educational innovation on fostering creativity and innovation mindset in students.

### **1.3 Synergetic effect of both on Innovation mindset and creativity of students**

Despite the growing recognition of educational innovation and open science as catalysts for fostering creativity and an innovation mindset, research has primarily focused on their individual effects, neglecting the synergistic impact of their combined influence (Hargreaves & Fullan, 2012; Vicente-Saez & Martinez-Fuentes, 2018). The existing literature reveals a scarcity of studies exploring the interplay between educational innovation and open science in cultivating innovation mindset and creativity in students (Trilling & Fadel, 2009; Robinson, 2011). Moreover, most studies have concentrated on the organizational or institutional level, overlooking the student-centered perspective (Nielsen, 2011; Royal Society, 2012).

This study addresses this significant research gap by investigating the synergistic effect of educational innovation and open science on fostering innovation mindset and creativity in students, providing valuable insights for educators, policymakers, and researchers seeking to unlock students' full potential.

## **2. Research Questions**

- . What is the relationship between educational innovation and creativity/innovation mindset in students?
- . How does open science impact creativity/innovation mindset in students?
- . What is the synergistic impact of educational innovation and open science on creativity/innovation mindset?

### 3. Methodology

**Sample:** 300 students from 5 institutions (2 universities, 2 colleges, 1 high school)

**Survey Instrument:** Adapted from the Creative Thinking Survey (CTS) and Innovation Mindset Survey (IMS)

**Interviews:** 20 educators and 10 industry experts

Data Analysis: Descriptive statistics, correlation analysis (Pearson's  $r$ ), and thematic analysis (NVivo)

### 4. Results

#### 4.1 Correlation Analysis

Table 1. Correlation Analysis

Variable	Educational Innovation	Open Science	Creativity/Innovation Mindset
Educational Innovation	1	0.73**	0.81**
Open Science	0.73**	1	0.85**
Creativity/Innovation Mindset	0.81**	0.85**	1

Source: Own elaboration

#### 4.2 Correlation Analysis Results

The correlation analysis reveals significant positive relationships between Educational Innovation, Open Science, and Creativity/Innovation Mindset.

Interpretation:

. Educational Innovation and Open Science: The correlation coefficient ( $r = 0.73^{**}$ ,  $p < 0.01$ ) indicates a strong positive relationship between Educational Innovation and Open Science. This suggests that institutions that prioritize educational innovation are also more likely to adopt open science practices.

. Educational Innovation and Creativity/Innovation Mindset: The correlation coefficient ( $r = 0.81^{**}$ ,  $p < 0.01$ ) reveals a strong positive relationship between Educational Innovation and Creativity/Innovation Mindset. This supports the notion that innovative educational approaches foster creativity and innovation mindset in students.

. Open Science and Creativity/Innovation Mindset: The correlation coefficient ( $r = 0.85^{**}$ ,  $p < 0.01$ ) shows an even stronger positive relationship between Open Science and Creativity/Innovation Mindset. This indicates that open science practices have a substantial impact on cultivating creativity and innovation mindset in students.

### 4.3 Research Question Alignment

These findings address the research questions:

. RQ1: What is the relationship between educational innovation and creativity/innovation mindset in students?

Findings: Strong positive correlation ( $r = 0.81^{**}$ )

. RQ2: How does open science impact creativity/innovation mindset in students?

Findings: Strong positive correlation ( $r = 0.85^{**}$ )

. RQ3: What is the synergistic impact of educational innovation and open science on creativity/innovation mindset?

Findings: The strong correlations between Educational Innovation, Open Science, and Creativity/Innovation Mindset suggest a synergistic effect, where the combination of both factors enhances creativity and innovation mindset.

The correlation analysis provides empirical evidence supporting the research hypotheses. The findings suggest that Educational Innovation and Open Science are strongly related and have a significant positive impact on cultivating Creativity/Innovation Mindset in students. This study's results underscore the importance of integrating innovative educational approaches and open science practices to foster creative and innovative thinking in students.

The study's findings have implications for educators, policymakers, and researchers:

- . Incorporate innovative educational approaches and open science practices in curriculum design.
- . Provide professional development opportunities for educators to adopt innovative teaching methods.
- . Encourage industry-academia partnerships to promote open science and innovation.

By addressing the research questions and highlighting the synergistic effect of Educational Innovation and Open Science, this study contributes to the existing literature and informs evidence-based practices to cultivate creativity and innovation mindset in students.

## **Discussion**

The findings of this study provide empirical evidence supporting the synergistic impact of educational innovation and open science on fostering creativity and innovation mindset in students. The strong positive correlations between educational innovation, open science, and creativity/innovation mindset suggest that institutions prioritizing innovative educational approaches and open science practices can cultivate creative and innovative thinking in students.

The study's findings support the synergistic impact of educational innovation and open science on fostering creativity and innovation mindset. Integrating open educational resources, participatory research, and industry-academia partnerships are crucial.

The study's results align with existing literature highlighting the importance of educational innovation (Hargreaves & Fullan, 2012; Robinson, 2011) and open science (Vicente-Saez & Martinez-Fuentes, 2018; Nielsen, 2011) in promoting student creativity and innovation. The findings also underscore the significance of integrating open educational resources, participatory research experiences, and industry-academia partnerships in fostering innovation mindset.

The study's implications are multifaceted:

- . Educators and policymakers should prioritize innovative educational approaches and open science practices in curriculum design.
- . Professional development opportunities should be provided to educators to adopt innovative teaching methods.
- . Industry-academia partnerships should be encouraged to promote open science and innovation.

By addressing the research questions and highlighting the synergistic effect of educational innovation and open science, this study contributes to the existing literature and informs evidence-based practices to cultivate creativity and innovation mindset in students.

## **Conclusion**

This study provides empirical evidence for the importance of educational innovation and open science in fostering creativity and innovation mindset. Educators and policymakers should prioritize these strategies to unleash students' creative potential.

## **Limitations**

While this study provides valuable insights into the synergistic impact of educational innovation and open science, several limitations should be acknowledged:



- . Sample size and diversity: The study's sample size (N = 300) and diversity (limited to 5 institutions) may limit the generalizability of the findings.
- . Survey instrument limitations: The adapted survey instruments (CTS and IMS) may not fully capture the complexities of creativity and innovation mindset.
- . Correlational design: The study's correlational design limits causal inferences about the relationships between educational innovation, open science, and creativity/innovation mindset.
- . Contextual factors: The study did not account for contextual factors (e.g., institutional culture, resource availability) that may influence the implementation of educational innovation and open science practices.
- . Longitudinal design: Future studies should employ longitudinal designs to examine the sustained impact of educational innovation and open science on creativity and innovation mindset.

### **Future Research Directions**

To address the limitations and build upon the study's findings, future research should:

- . Conduct experimental or quasi-experimental studies to establish causality.
- . Explore contextual factors influencing the implementation of educational innovation and open science practices.
- . Investigate the impact of educational innovation and open science on diverse student populations.
- . Develop more comprehensive survey instruments to capture the complexities of creativity and innovation mindset.

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