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Impact of Scientific Creativity on Academic Performance in Science and English Subjects among Junior High School Students

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Abstract:
The present research paper examines the impact of scientific creativity on academic performance in Science and English subjects among Junior High School Students. Adopting a quantitative approach, the study utilized the Descriptive Survey Method integrated with a comparative and correlational research design. A representative sample of 120 Junior High School Students (60 boys and 60 girls) studying in grades 7 to 9 was drawn from various schools in the Delhi region using the Stratified Random Sampling technique. The Scientific Creativity Test constructed by Baqer Mehdi was administered to measure scientific creativity, while academic performance was assessed through students' annual achievement scores in Science and English. The organized quantitative data was statistically treated using Mean, Standard Deviation, independent t-test, and Pearson's Product-Moment Correlation Coefficient. The empirical findings revealed: (1) No statistically significant difference exists between male and female students regarding scientific creativity ($t = 1.10$, $p > 0.05$). (2) A statistically significant positive correlation ($r = 0.52$, $p < 0.01$) was found between scientific creativity and academic performance in Science. (3) A statistically significant positive correlation ($r = 0.34$, $p < 0.01$) was found between scientific creativity and academic performance in English. (4) A statistically highly significant difference ($t = 6.15$, $p < 0.01$) was confirmed between high and low scientific creativity groups, proving that students with high scientific creativity achieve markedly superior academic performance. In conclusion, scientific creativity emerges as a strong psychological predictor of academic performance, with a comparatively stronger association observed with Science than with English.

Keywords: *Scientific Creativity, Academic Performance, Science, English, Junior High School Students.*

1. Introduction

Creativity has long been recognized as one of the most valuable human faculties, enabling individuals to generate novel ideas, solve problems innovatively, and adapt effectively to changing environments. Within the domain of science education, this faculty manifests as

scientific creativity — the capacity to formulate original hypotheses, design inventive experiments, and arrive at unconventional yet logically sound explanations for natural phenomena. Junior High School represents a formative stage of cognitive development during which students transition from concrete to more abstract and analytical modes of thinking, making it a crucial period for nurturing creative scientific temperament.

Academic performance, particularly in subjects such as Science and English, is traditionally measured through rote memorization and reproduction of textbook content. However, contemporary educational research increasingly suggests that students who exhibit higher levels of scientific creativity are better equipped to comprehend complex concepts, apply knowledge to unfamiliar situations, and articulate their understanding coherently — skills that are equally valuable in language subjects like English, where interpretation, expression, and original thought are essential.

Despite the growing emphasis on creativity in curricular frameworks such as the National Education Policy (NEP) 2020, classroom practices in Indian schools continue to prioritize examination-oriented learning over creative and exploratory engagement. This creates a pressing need to empirically investigate whether scientific creativity meaningfully contributes to academic performance, not only in Science but also in a seemingly unrelated subject such as English. The present study was undertaken to examine this relationship among Junior High School Students, with the aim of generating evidence that can inform pedagogical practices sensitive to the cultivation of creative thinking.

2. Need and Significance of the Study

This research draws its significance from several foundational needs:

- To evaluate the baseline level of scientific creativity among Junior High School Students.
- To diagnose whether scientific creativity extends its influence beyond Science into language subjects such as English.
- To assist teachers and curriculum designers in integrating creativity-based pedagogy into Science and language classrooms.
- To explore whether gender differences exist in the scientific creativity of adolescents at the junior high level.
- To provide parents and school administrators with empirical insights into fostering creative thinking as a means of improving overall academic outcomes.
- To generate reliable, localized data regarding junior high school students in the Delhi region, offering a useful reference frame for Indian educational policymakers.

3. Operational Definitions of Key Terms Used

1. Scientific Creativity: It refers to the mental ability of an individual to generate original, useful, and unconventional ideas, hypotheses, or solutions within the domain of science, encompassing components such as fluency, flexibility, and originality of thought.

2. Academic Performance: It represents the measurable level of a student's achievement in a subject, as reflected in scores obtained in annual or term-end examinations conducted by the school.

3. Junior High School Students: It strictly refers to adolescent students currently enrolled in grades 7, 8, and 9 within recognized educational institutions.

4. Review of Related Literature

The present chapter presents findings from various researchers from India and abroad (e.g., Torrance, 1972; Mehdi, 1985; Renzulli, 1978; Sharma & Gupta, 2019; and Kaur, 2020) who have examined creativity in relation to academic achievement. The findings of most studies indicate that creative thinking abilities, particularly in the domain of science, are positively associated with higher academic attainment, as creative students display greater curiosity, persistence, and problem-solving orientation in their studies.

A thorough review of the literature also reveals that scientific creativity is not confined to the subject of Science alone. According to Verma and Joshi (2021), students who demonstrate strong scientific creativity often transfer their flexible and original thinking styles to language-based subjects as well, resulting in improved comprehension, argumentation, and written expression. However, this transfer effect has been reported as comparatively weaker than the direct influence observed within Science itself.

After reviewing the above literature, this 'research gap' emerges. Although there have been several individual studies on scientific creativity and general academic achievement, there is a lack of adequate and focused research examining the differential impact of scientific creativity on Science versus a non-science subject like English, particularly among Junior High School Students in the Indian context. These limited findings from previous research provide a solid foundation for the current study, which attempts to make an authentic contribution to this field by statistically examining the actual relationship between these variables.

5. Objectives of the Study

The empirical roadmap of this investigation was guided by the following four objectives:

1. To examine the gender-wise differences in scientific creativity among Junior High School Students.
2. To study the relationship between scientific creativity and academic performance in Science among Junior High School Students.
3. To study the relationship between scientific creativity and academic performance in English among Junior High School Students.
4. To compare the academic performance of Junior High School Students possessing different levels (High vs. Low) of scientific creativity.

6. Hypotheses of the Study

The corresponding research and null hypotheses formulated to test the variables were:

1. **Hypothesis 1 (H1):** There is a significant difference in scientific creativity between male and female Junior High School Students. **(Rejected)**

2. **Hypothesis 2 (H2):** There is a significant relationship between scientific creativity and academic performance in Science among Junior High School Students. **(Accepted)**

3. **Hypothesis 3 (H3):** There is a significant relationship between scientific creativity and academic performance in English among Junior High School Students. **(Accepted)**

4. **Hypothesis 4 (H4):** There is a significant difference in academic performance between students with high and low levels of scientific creativity. **(Accepted)**

7. Delimitations of the Study

The scope of this dissertation was structurally bounded by the following delimitations:

- The geographical scope of data collection was strictly localized and delimited to schools within the Delhi region.
- The sample was restricted exclusively to students studying at the Junior High School level (Grades 7, 8, and 9).
- The focus was strictly delimited to two academic subjects: Science and English, omitting other subjects from performance assessment.
- The investigation relied entirely on quantitative scores obtained through a standardized creativity test and school examination records, excluding qualitative interviews or observational methods.

8. Research Method

The present study adopted a quantitative approach using the Descriptive Survey Method to capture data regarding existing traits without manual manipulation. Additionally, a comparative and correlational research design was integrated to evaluate gender variations and the direction of relationships between scientific creativity and academic performance in Science and English.

9. Population

The target population consisted of all Junior High School Students (grades 7, 8, and 9) studying across various government and private schools located within the Delhi region.

10. Sample and Sampling Technique

A representative sample of 120 Junior High School Students was drawn from the target population using the Stratified Random Sampling technique. To ensure demographic balance, the sample was equally divided between male and female students (N = 60 Boys and N = 60 Girls).

10.1 Distribution of Sample

The structural layout of the 120 selected junior high school students is displayed below:

Gender Category	Number of Students (N)	Total Sample Size
Male Students (Boys)	60	120
Female Students (Girls)	60	

11. Variables Used

- Independent Variable: Scientific creativity.

- Dependent Variables: Academic performance in Science; Academic performance in English.
- Demographic Variable: Gender.

12. Tools Used

To secure highly reliable and valid primary data, the following standardized research instruments and records were used:

1. Scientific Creativity Test constructed and standardized by Baqer Mehdi, used to measure the fluency, flexibility, and originality of students' scientific thinking.
2. Academic Performance Records — students' annual/term-end examination scores in Science and English, obtained from official school records.

13. Data Collection and Organization

The researcher personally visited the selected Junior High Schools in the Delhi region after securing formal permission from the institutional heads. Students were given clear instructions regarding the purpose of the test and were assured of strict data confidentiality. The Scientific Creativity Test was administered in a controlled classroom setting, retrieved upon completion, and systematically scored based on the respective manual. Academic performance scores in Science and English were subsequently obtained from school records. The raw scores were carefully tabulated into a master sheet, dividing the values by gender and scientific creativity baselines to perform organized statistical testing.

14. Statistical Techniques Used

The organized quantitative data was statistically treated using the following analytical operations:

1. Mean (M): To calculate the central tendency of scores.
2. Standard Deviation (S.D.): To understand the variability and dispersion of scores.
3. t-test (Critical Ratio): To evaluate the significance of differences between group means.
4. Pearson's Product-Moment Correlation Coefficient (r): Used to identify the mutual relationship and direction between scientific creativity and academic performance.

15. Analysis and Interpretation of Data

The quantitative data processed via statistical treatments has been systematically tabulated and interpreted below:

15.1 Gender-wise Comparison of Scientific Creativity (Testing of H1)

Table 1: Comparison of Scientific Creativity Between Male and Female Students

Group	N	Mean (M)	S.D.	t-value	Significance Level
Male Students	60	42.60	8.10	1.10	Not Significant (p > 0.05)
Female Students	60	44.20	7.85		

Interpretation: As shown in Table 1, the mean scientific creativity score of male students is 42.60, while for female students, it is 44.20. The calculated t-value is 1.10, which is lower than

the standard table value (1.98) at the 0.05 significance level. Therefore, Hypothesis 1 (H1) is rejected. This indicates that gender does not play a significant role; both boys and girls exhibit comparable levels of scientific creativity.

15.2 Correlation Between Scientific Creativity and Academic Performance in Science (Testing of H2)

To compute the relationship across the entire sample (N = 120), Pearson's correlation coefficient (r) was calculated:

Pearson's Correlation Coefficient (r) = 0.52

Interpretation: The correlation coefficient r = 0.52 indicates a statistically significant positive relationship between the two variables. Thus, Hypothesis 2 (H2) is successfully accepted. This statistically clarifies that as a Junior High School Student's level of scientific creativity increases, their academic performance in Science also significantly improves.

15.3 Correlation Between Scientific Creativity and Academic Performance in English (Testing of H3)

Pearson's correlation coefficient (r) between scientific creativity and academic performance in English was calculated as follows:

Pearson's Correlation Coefficient (r) = 0.34

Interpretation: The correlation coefficient r = 0.34 indicates a statistically significant, though comparatively moderate, positive relationship between the two variables. Thus, Hypothesis 3 (H3) is accepted. This suggests that while scientific creativity does positively influence performance in English, its effect is less pronounced than its influence on Science, likely because the transfer of creative scientific thinking to a language subject is indirect in nature.

15.4 Comparison of Academic Performance Based on Scientific Creativity Levels (Testing of H4)

Table 2: Comparison of Composite Academic Performance Between High and Low Scientific Creativity Groups

Creativity Group	N	Mean (M)	S.D.	t-value	Significance Level
High Creativity Level	40	78.40	9.20	6.15	Highly Significant ($p < 0.01$)
Low Creativity Level	38	64.70	10.05		

Interpretation: Table 2 clearly highlights that students categorized within the high scientific creativity group have a considerably higher composite academic performance mean score (78.40) than those in the low scientific creativity group (64.70). The computed t-value is 6.15, which is highly significant at the 0.01 level. Hence, Hypothesis 4 (H4) is accepted. This proves that students with high scientific creativity achieve markedly superior academic performance due to their superior problem-solving orientation and originality of thought.

16. Main Findings of the Study

1. No statistically significant difference was found between male and female Junior High School Students regarding their scientific creativity (t = 1.10, not significant at the 0.05 level).
2. A statistically significant positive correlation (r = 0.52) was discovered between Junior High School Students' scientific creativity and their academic performance in Science.
3. A statistically significant positive correlation (r = 0.34) was discovered between Junior High School Students' scientific creativity and their academic performance in English.
4. A statistically highly significant difference (t = 6.15, significant at the 0.01 level) was established between high and low scientific creativity groups, confirming that students with high scientific creativity exhibit markedly superior academic performance.

17. Conclusion and Discussion

The study definitively concludes that gender is not a dividing variable in the scientific creativity of Junior High School Students, with both boys and girls displaying comparable levels of creative scientific thinking. This finding aligns with contemporary educational trends that emphasize equal exposure to creativity-fostering pedagogy across genders.

Crucially, scientific creativity stands out as a strong psychological predictor of academic performance, with a notably stronger association observed with Science (r = 0.52) than with English (r = 0.34). This differential strength of relationship suggests that while scientific creativity directly enhances performance in Science through improved conceptual understanding and problem-solving ability, its influence on English is more indirect, likely operating through generalized cognitive skills such as originality of expression and flexible thinking rather than domain-specific knowledge.

The practical recommendations derived from this study emphasize:

- For Teachers: Science instruction should move beyond rote memorization and incorporate open-ended experiments, hypothesis-generation tasks, and inventive problem-solving activities to actively nurture scientific creativity.
- For Curriculum Planners: Interdisciplinary assignments that connect scientific reasoning with language-based expression (such as science essay writing or creative scientific storytelling) should be integrated to strengthen the transfer of creative thinking across subjects.
- For Parents: Parents should encourage curiosity-driven activities, exploratory play, and open-ended questioning at home to support the development of creative thinking alongside academic study.

In conclusion, this study highlights that fostering scientific creativity among Junior High School Students can meaningfully enhance their academic performance, particularly in Science, while also offering measurable benefits in language subjects such as English. Ensuring that creativity is deliberately cultivated within the curriculum will automatically build a more innovative, adaptive, and academically competent student community.

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