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# THE INFLUENCE OF GENDER ON FLUENCY AND FLEXIBILITY COMPONENTS OF CREATIVITY IN PREPARATORY STAGE STUDENTS

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*Abstract:* This study investigated the influence of gender on two core components of creativity-fluency (the capacity to generate a high volume of ideas) and flexibility (the capacity to shift between different categories of ideas)-among preparatory stage students (aged 8–12, N=30). Employing a Descriptive Survey design, the research utilized a newly developed interactive digital tool to assess these divergent thinking abilities. The Independent Samples T-Test was used to compare the mean scores of 15 boys and 15 girls. Descriptive analysis showed marginal, non-significant differences: boys scored slightly higher in Fluency ($M = 9.73$ vs. $M = 9.07$), while girls scored slightly higher in Flexibility ($M = 4.27$ vs. $M = 4.13$). Crucially, the T-Test results indicated no statistically significant difference for either Fluency ($p = 0.365$) or Flexibility ($p = 0.721$). The findings support the null hypotheses, concluding that gender does not significantly influence these foundational aspects of creative potential in this population. The study underscores the importance of equitable educational practices that foster uninhibited experimentation for all children.

***Index Terms*** **-** Creativity, Fluency, Flexibility, Gender, Preparatory Stage.

## I. INTRODUCTION

The creativity of young children is a fundamental and often spontaneous expression of their developing minds, marked by an innate curiosity, imaginative play, and a fearless approach to exploration and problem-solving. It's not limited to artistic endeavours but encompasses novel thinking in language, social interaction, and material manipulation. Children's creativity thrives in supportive environments that encourage divergent thinking and risk-taking, allowing them to construct unique meanings and solutions. For instance, research highlights that a lack of fear of making mistakes in a creative atmosphere is a key facilitator of this development, as it allows for uninhibited experimentation and the generation of novel ideas. This developmental stage is particularly crucial because, as some research suggests, creativity is at its peak before the age of six (as cited in Tok, 2023), emphasizing the importance of promoting it in early childhood education.

The application of fluency (the ability to generate a high volume of ideas) and flexibility (the capacity to shift between different categories or perspectives) represents two foundational components of creativity in young children. These two measures are cornerstones of divergent thinking, a critical cognitive process where a child explores multiple potential solutions rather than seeking a single correct answer. In a preschool setting, this manifests when a child uses a cardboard box not just as storage (fluency: one idea), but then as a drum, a boat, and a hat (flexibility: changing categories of use). Studies using tools like the Alternative Uses Task confirm that children demonstrate notable growth in these areas over time. For instance, Bai et al. (2023) observed substantial growth in both the number and variety of generated ideas as children progress through the early

childhood years, highlighting that this unconstrained cognitive exploration is essential for developing full creative potential.

Building upon this foundational understanding, it's important to consider factors that may influence these developing creative capacities, particularly gender. Research suggests that gender does influence the expression and specific domain of creativity in young children and adolescents, though it rarely indicates a difference in overall creative potential. Instead, differences often manifest in the type of creativity measured. For example, some studies find that boys may score higher on tests of overall creativity or in visual-spatial tasks, while girls are sometimes suggested to excel in imaginative or verbal creativity. Other findings, however, show boys scoring higher even on verbal tasks in adolescence (Susanti & Ramdani, 2022).

These domain-specific differences are likely shaped less by inherent factors and more by social, cultural, and environmental influences that reinforce traditional gender roles. The environments that foster a lack of fear and encourage divergent thinking for all children are crucial for mitigating these learned differences. For instance, a study of school students, although focused on an older age group than early childhood, demonstrated that boys were more creative than girls based on a specific standardized test (Ghosh, 2013). Such results emphasize that the gender differences observed in creative output are complex and often linked to the specific instrument used to measure creativity, underscoring the need for supportive and equitable learning environments that promote all aspects of fluency and flexibility across genders.

### 1.1 Objectives of the Study

- To assess the influence of gender on fluency component of Creativity of preparatory stage School students.
- To assess the influence of gender on flexibility component of Creativity of preparatory stage School students.

### 1.2 Hypotheses

$H_{01}$: There is no significant difference between Boys and Girls in relation their Fluency Score.

$H_{02}$: There is no significant difference between Boys and Girls in relation their Flexibility Score.

## 2. METHODOLOGY

The study employed a Descriptive Survey design to gather detailed information about the characteristics (Fluency and Flexibility scores) of the sample (Boys and Girls) as they naturally existed, without manipulating any variables. It also incorporated a Statistical Analysis Design component, which involved using inferential statistics like the Independent Samples T-Test, guided by the descriptive data, to formally test the specified hypotheses about the differences between the two groups.

### 2.1 Tool Used in the Study

The researcher developed an interactive digital tool to assess the 2fs (Fluency and Flexibility) of preparatory stage students using artificial intelligence. The tool is not a group test it is the individual test to measure 2fs of Creativity.

### 2.2 Sample of the Study

The sample for this study consists of 30 students enrolled at PM Shri A D Nagar English Medium School in Agartala, Tripura, India. The students are equally distributed across three academic levels: Class III, Class IV, and Class V, with 10 students selected from each class. Their ages span from 8 to 12 years. The precise age breakdown includes four 8-year-olds, six 9-year-olds, eleven 10-year-olds, seven 11-year-olds, and two 12-year-olds.

The total sample exhibits an equal gender distribution, comprising 15 Girls and 15 Boys. The distribution of genders varies slightly by class: Class III has five Girls and five Boys; Class IV has five Girls and five Boys; and Class V has five Girls and five Boys. This diverse sample of students, balanced by gender and distributed across three primary grades, provides a base for studying various characteristics and factors within this specific school environment in Agartala.

### 2.3 Statistical Analysis Used in the Study

The primary statistical tools used were Descriptive Analysis and the Independent Samples T-Test. Descriptive statistics, including the Mean, Median, and Standard Deviation, were calculated first to summarize and understand the central tendency and dispersion of the Fluency and Flexibility scores for both Boys and Girls. Descriptive Analysis: Mean, Medien and Standard Deviation.

The study primarily used the Independent Samples T-Test to address its hypotheses, which sought to determine if there were significant differences in Fluency Score (H01) and Flexibility Score (H02) between Boys and Girls. This inferential test is appropriate for comparing the means of two distinct, unrelated groups. Before proceeding with the T-test, the researchers performed essential Assumption Tests. The Shapiro-Wilk Test was used to check the normality of the data distribution, ensuring the scores for both groups on Fluency and Flexibility were approximately normally distributed. Simultaneously, the Levene's Test was used to assess the homogeneity of variances, which verifies if the variability in scores is roughly equal across the boys and girls' groups, a critical assumption for the standard Independent Samples T-Test. The calculations and plots for these analysis were performed using the software jamovi (Version 2.6).

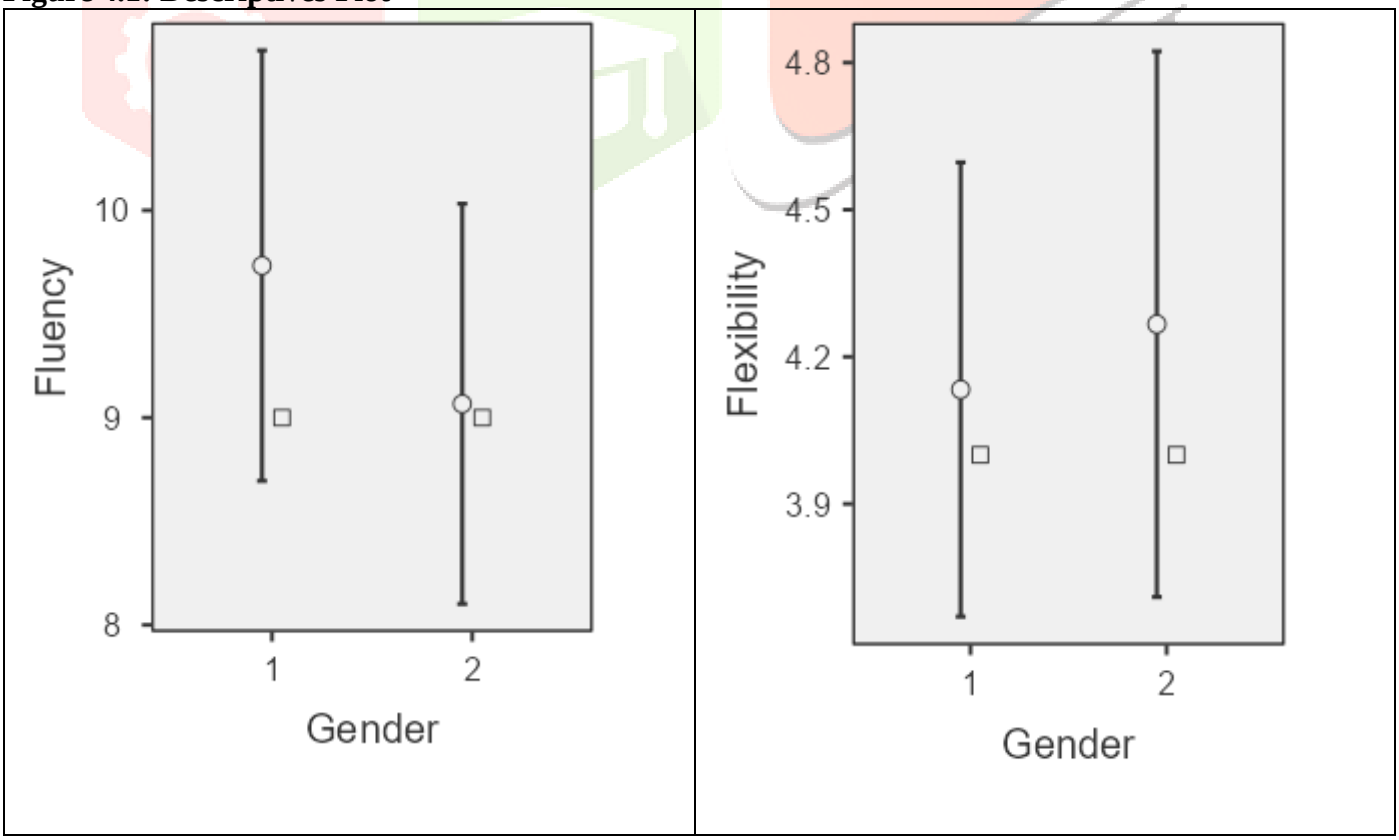
3. ANALYSIS AND INTERPRETATION OF THE DATA

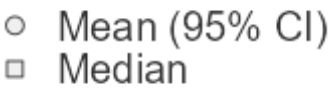
### 3.1 Descriptive Statistics.

**Table 3.1: Descriptive Statics**

| Component of the Creativity | Group | N | Mean | Median | SD |
|---|---|---|---|---|---|
| **Fluency** | **Boys** | 15 | 9.73 | 9.00 | 2.052 |
| | **Girls** | 15 | 9.07 | 9.00 | 1.91 |
| **Flexibility** | **Boys** | 15 | 4.13 | 4.00 | 0.915 |
| | **Girls** | 15 | 4.27 | 4.00 | 1.10 |

**Figure 4.1: Descriptives Plot**






Boys had a slightly higher mean score (9.73) in Fluency than Girls (9.07). The standard deviation (SD) indicates the Boys' scores were slightly more spread out (2.052) compared to the Girls (1.91). Both groups had the same median score (9.00). Girls had a slightly higher mean score (4.27) in Flexibility than Boys (4.13). The Girls' scores were more varied (SD = 1.10) compared to the Boys (SD = 0.915). Both groups had the same median score (4.00)

### 3.2 Assumption Tests

**Table 3.2: Normality Test (Shapiro-Wilk)**

| Normality Test (Shapiro-Wilk) | | |
|---|---|---|
| | **W** | **p** |
| **Fluency** | 0.957 | 0.258 |
| **Flexibility** | 0.942 | 0.103 |
| Note. A low p-value suggests a violation of the assumption of normality | | |

The p-value (0.258) is not low (it's greater than the conventional alpha 0.05. This suggests that the assumption of normality is met for the Fluency scores. The p-value (0.103) is not low (it's greater than the conventional alpha = 0.05. This suggests that the assumption of normality is met for the Flexibility scores.

**Table 3.3: Homogeneity of Variances Test (Levene's)**

| Homogeneity of Variances Test (Levene's) | | | | |
|---|---|---|---|---|
| | **F** | **df** | **df2** | **p** |
| **Fluency** | 0.0848 | 1 | 28 | 0.773 |
| **Flexibility** | 0.4181 | 1 | 28 | 0.523 |
| Note. A low p-value suggests a violation of the assumption of equal variances | | | | |

The p-value (0.773) is not low (it's greater than alpha = 0.05. This indicates that the assumption of homogeneity of variances is met for the Fluency scores.

For both assumption tests, the researchers confirmed that the conditions for using the standard Independent Samples T-Test were met, as all p-values were above the typical significance level of 0.05, meaning the assumptions of normality and equal variances were not violated.

### 3.3 Testing of Hypotheses

**Table 3.4:** Independent Samples T-Test

| Independent Samples T-Test | | | | |
|---|---|---|---|---|
| | | **Statistic** | **df** | **p** |
| **Fluency** | **Student's t** | 0.922 | 28.0 | 0.365 |
| **Flexibility** | **Student's t** | -0.361 | 28.0 | 0.721 |
| Note. $H_a$ $\mu_1 \neq \mu_2$ | | | | |

Table 3.4 presents the results of the Independent Samples T-Test, which was used to determine if there were statistically significant differences in the mean Fluency and Flexibility scores between the two independent groups: Boys and Girls.

The significance of the difference is determined by comparing the p-value to the significance level alpha, typically set at 0.05.

- Fluency: The p-value for Fluency is 0.365. Since 0.365 > 0.05, the difference in the mean Fluency scores between Boys (9.73) and Girls (9.07) is not statistically significant.
- Flexibility: The p -value for Flexibility is 0.721. Since 0.721 > 0.05, the difference in the mean Flexibility scores between Boys (4.13) and Girls (4.27) is also not statistically significant.

### 3.4 Testing of Hypotheses

**Hypothesis 1 (Fluency)**

- $H_{01}$: There is no significant difference between Boys and Girls in relation to their Fluency Score.
- Test Result: The Independent Samples T-Test yielded a student 't' statistic of 0.922 with 28 degrees of freedom and a p-value of 0.3655.
- Conclusion: Since the 'p-value (0.365) is greater than the significance level of 0.05, the study failed to reject the null hypothesis ($H_{01}$). This indicates that the observed difference in mean Fluency scores between boys and girls is likely due to chance and is not statistically significant.

**Hypothesis 2 (Flexibility)**

- $H_{01}$: There is no significant difference between Boys and Girls in relation to their Flexibility Score.
- Test Result: The Independent Samples T-Test yielded a Student 't' statistic of -0.361 with 28 degrees of freedom and a 'p-value of 0.7217.
- Conclusion: Since the 'p-value (0.721) is greater than the significance level of 0.05, the study failed to reject the null hypothesis $H_{02}$. This indicates that the observed difference in mean Flexibility scores between boys and girls is also not statistically significant.

## 4. Finding and Discussion of the Study

The statistical analysis concludes that gender did not have a significant influence on either the Fluency or Flexibility components of creativity among the preparatory stage students in this sample.

While some studies suggest boys may score higher on overall creativity or in visual-spatial tasks, and girls in imaginative or verbal creativity, the current study's lack of significant difference in the foundational measures of fluency and flexibility aligns with the idea that the observed gender-based differences are often domain-specific or linked to social, cultural, and environmental influences rather than inherent factors. The results from other studies, such as Ghosh's (2013) finding that boys scored higher on a specific standardized test for an older age group, highlight that observed gender differences are often complex and linked to the specific measurement instrument. The current study, using its newly developed interactive digital tool for an early childhood-adjacent age group (8 to 12 years old), supports the crucial need for supportive and equitable learning environments that promote all aspects of fluency and flexibility across genders to mitigate learned differences.

The implication of this finding is significant: it supports the broader research notion that any gender differences in creativity are often domain-specific or culturally reinforced, rather than reflecting differences in overall creative potential. By demonstrating parity in these core measures of divergent thinking, the study underscores the importance of fostering supportive and equitable learning environments that encourage divergent thinking and risk-taking for all children , thereby promoting the full creative potential of both boys and girls without assuming inherent gender-based limitations on the ability to generate a high volume of ideas (fluency) or shift between categories (flexibility).

## 5. Conclusion

The conclusion of the study is that gender does not significantly influence the key components of creativity, namely Fluency (the ability to generate a high volume of ideas) and Flexibility (the capacity to shift between different categories or perspectives), in the preparatory stage students investigated. The analysis confirmed that the observed small differences in mean scores between boys and girls were likely due to chance and not statistically meaningful. By failing to reject the null hypotheses, the study's findings support the perspective that overall creative potential, as measured by these aspects of divergent thinking, is largely equivalent across genders at this age level. This result underscores the need for educational practices to equally encourage uninhibited experimentation and the generation of novel ideas in all children, without pre-assuming gender-based creative advantages or disadvantages.

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