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ACHIEVEMENT ON LANGUAGE SUBJECTS OF SECONDARY SCHOOL STUDENTS: DIFFERENTIATING RELATIONSHIPS IN REGARD TO GENDER AND TYPE OF INSTITUTE

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Abstract

Correlation coefficient is one of the most used statistical measures in social science research in this 21st century. The present study aims to compare Formative and Summative evaluation of Bengali, English and Sanskrit subjects and taking together as branch for different groups of secondary school students. The study has been conducted through descriptive survey method. All the secondary level school students of West Bengal have been considered as the population for the present study and data for the study has been collected randomly from 200 secondary level school students of West Bengal. The collected data has been analysed applying correlation coefficient. The result revealed that significant difference is there between coefficient of correlation of Boys and Girls secondary school students of Formative and Summative evaluation of Bengali and English subject. It also revealed significant difference between coefficient of correlation of Girls and Co-Educational secondary school students of Formative and Summative evaluation of English subject.

Keywords: *achievement, correlation coefficient, relationships, gender, type of institute*

Introduction

Karl Pearson first used the term "correlation coefficient" in 1896. As a result, this statistic has been around for more than a century and is still relevant today. Second only to the mean, it is one of the most used statistics in use today. The shortcomings of the correlation coefficient and its cautions against abuse are widely known. The reciprocal link between two variables may be expressed quantitatively using the correlation coefficient. Additionally, the degree to which the values of one variable may be anticipated from the known values of another variable may also be shown by the coefficient of correlation (Nzeneri, 2010). The values of correlation coefficients go from -1 to +1. High scores on one variable are strongly correlated with high scores on the other, while low scores on one variable are strongly correlated with low scores on the other, and vice versa, is indicated by a correlation coefficient of -1. A correlation coefficient of +1 indicates perfect positive (direct) correlation (relationship). In contemporary time, studying the comparison is very habitual. Diverse studies have been observed using it as one of the most influential aspects in studies, such as, Das, Mahato and Gayen (2024), Das, Gayen and Sen (2023), Gayen and Mahato (2023), Gayen, Sen and Adhikari (2023), Mohanta et al. (2023), Sen et al. (2023), Mahato, Das and Sen (2023) etc.

Review of Related Literature

Adhikari, Mahato and Sen (2023) conducted a study on anxiety, depression, stress, general self-efficacy and specific self-efficacy and indicated that relationships between variables differ for arts and science students. Mahato, Sen and Adhikari (2023) conducted a study on self-efficacy scale on postgraduate students and found a significant connection between these variables. Mahato, Gayen and Mahato (2023a) conducted a study on relationship between cognitive failure and internet addiction of higher secondary students of Purulia District of West Bengal and found that the internet has transformed human civilization, leading to increased internet addiction, especially among the younger generation. Mahato, Gayen and Mahato (2023b) conducted a study on relationship between academic resilience and internet addiction of undergraduate students of Purulia district of West Bengal and revealed that internet addiction did not significantly impact the academic resilience of undergraduate students in Purulia district, West Bengal. Mahato, Gayen and Mahato (2023c) conducted a study on relationship between self-efficacy and m-learning of undergraduate students of Purulia district of West Bengal and found no connection between self-efficacy and m-learning among undergraduate students in Purulia, West Bengal.

Mahato and Sen (2023) conducted a study on Relationship among contexts knowledge (CK1), technological pedagogical content knowledge (TPCK) and attitude towards creative teaching for pre-service trainee teachers and found that context knowledge (CK1) play a crucial role in the TPACK-Math Scale, closely connected to TPCK. Sutradhar et al. (2023) conducted a study on self-efficacy, depression, anxiety and stress of university students using Mahalanobis distance and found that the dynamics of these variables did not significantly differ across various sets of independent variables. Sen, Pal and Adhikari (2023) conducted a study on self-efficacy, depression, anxiety and stress of postgraduate students by Mahalanobis Distance and found that no significant differences in their dynamics across the different groups. Sreedevi (2022) conducted a study of test for significance of Pearson's correlation coefficient and concluded that a calculated correlation coefficient is sufficient. It also revealed that the t-distribution, one of the significant test techniques, was a good enough test for the significance of correlation coefficients. Gorain et al. (2022) conducted a study on internet dependency, social isolation and personality and found low to moderate relationships among internet dependency, social isolation, and personality factors (extraversion, agreeableness, conscientiousness, neuroticism, and openness) in arts and science learners.

Sutradhar and Sen (2022a) conducted a study on emotional maturity on academic achievement of B.Ed. trainees and found that a significant difference in emotional maturity, particularly in the dimensions of emotional progression and independence, among B.Ed. trainees in relation to their academic achievement. Sutradhar and Sen (2022b) conducted a study on emotional maturity and study habits of B.Ed. trainees and revealed a strong link between emotional maturity and study habits among B.Ed. trainees. Wonu, Victor-Edema and Ndimele (2021) conducted a study to determine the importance of the correlation coefficient that linked the use of t-distribution, z-transformation, and Statistical Package for Social Sciences (SPSS) procedures. Gayen and Sen (2021) conducted a study on anxiety, depression and stress among postgraduate students and found significant correlations between anxiety and depression, except for male students. Kar and Saha (2021a) conducted a study on leadership style and emotional intelligence of undergraduate students and found a strong link between emotional intelligence and leadership style in undergraduate students. Kar and Saha (2021b) conducted a study on leadership style and adjustment ability among undergraduate students found that a significant link between adjustment ability and leadership style.

Sen et al. (2021a) conducted a study on general self-efficacy and specific self-efficacy of postgraduate students and revealed a significant disparity in general self-efficacy between male and female students, while department and semester of study exhibit no noteworthy distinctions. Sen et al. (2021b) conducted a study on depression, anxiety and stress of postgraduate students and found that postgraduate students' levels of depression, anxiety, and stress do not significantly vary based on gender, department, or semester. Oblior and Amadi (2018) also conducted a study to measure the significance of Pearson's correlation coefficient. Mondal et al. (2018) conducted a study on internet affinity in relation to personality and gender and found that internet affinity poses a health risk to postgraduate students, impacting their social, functional, physical,

and psychological well-being. Karmakar et al. (2016) conducted a study on Intelligence in relation to Height and Weight among Secondary School Students and found that a significant difference in intelligence between male and female students.

Objectives of the Study

Objectives of the study is to compare Formative and Summative evaluation of Bengali, English and Sanskrit subjects and taking together as branch for different groups of secondary school student as follows:

1. To determine the difference between pair wise relationships for Formative and Summative evaluation of Bengali, English and Sanskrit subjects
   (a) When Gender (Male and Female) is considered as dichotomous variable.
   (b) When Type of Institute (Boys and Girls) considered as dichotomous variable.
   (c) When Type of Institute (Boys and Co-Educational) is considered as dichotomous variable.
   (d) When Type of Institute (Girls and Co-Educational) is considered as dichotomous variable.

Hypotheses of the Study

$H_0$1: There is no significant difference between Coefficient of correlation with regard to Gender (Male and Female) of secondary school students when pairwise correlations are considered for the variables on Bengali Formative and Bengali Summative.

$H_0$2: There is no significant difference between Coefficient of correlation with regard to Gender (Male and Female) of secondary school students when pairwise correlations are considered for the variables on English Formative and English Summative.

$H_0$3: There is no significant difference between Coefficient of correlation with regard to Gender (Male and Female) of secondary school students when pairwise correlations are considered for the variables on Sanskrit Formative and Sanskrit Summative.

$H_0$4: There is no significant difference between Coefficient of correlation with regard to Type of Institute (Boys and Girls) Secondary school students when pairwise correlations are considered for the variables on Bengali Formative and Bengali Summative.

$H_0$5: There is no significant difference between Coefficient of correlation with regard to Type of Institute (Boys and Girls) Secondary school students when pairwise correlations are considered for the variables on English Formative and English Summative.

$H_0$6: There is no significant difference between Coefficient of correlation with regard to Type of Institute (Boys and Girls) Secondary school students when pairwise correlations are considered for the variables on Sanskrit Formative and Sanskrit Summative.

$H_0$7: There is no significant difference between Coefficient of correlation with regard to Type of Institute (Boys and Co-Educational) secondary school students when pairwise correlations are considered for the variables on Bengali Formative and Bengali Summative.

$H_0$8: There is no significant difference between Coefficient of correlation with regard to Type of Institute (Boys and Co-Educational) secondary school students when pairwise correlations are considered for the variables on English Formative and English Summative.

$H_0$9: There is no significant difference between Coefficient of correlation with regard to Type of Institute (Boys and Co-Educational) secondary school students when pairwise correlations are considered for the variables on Sanskrit Formative and Sanskrit Summative.

$H_0$10: There is no significant difference between Coefficient of correlation with regard to Type of Institute (Girls and Co-Educational) secondary school students when pairwise correlations are considered for the variables on Bengali Formative and Bengali Summative.

$H_0$11: There is no significant difference between Coefficient of correlation with regard to Type of Institute (Girls and Co-Educational) secondary school students when pairwise correlations are considered for the variables on English Formative and English Summative.

$H_0$12: There is no significant difference between Coefficient of correlation with regard to Type of Institute (Girls and Co-Educational) secondary school students when pairwise correlations are considered for the variables on Sanskrit Formative and Sanskrit Summative.

Methodology of the Study

a. **Method:** This study has been conducted through descriptive survey method.
b. **Population of the study:** All the secondary level school students of West Bengal have been considered as the population for the present study.
c. **Sample and sampling of the study:** Data for the study has been collected randomly from 200 secondary level school students of West Bengal.
d. **Statistical measure:**
   i. Coefficient of correlation between different variables like Bengali Formative, English Formative, Sanskrit Formative, Bengali Summative, English Summative and Sanskrit Summative are calculated for every possible pair.
   ii. Difference in coefficient of correlation between dichotomous variables like Gender (Male and Female), Type of Institute (Boys and Girls), Type of Institute (Boys and Co-Educational) and Type of Institute (Girls and Co-Educational) are calculated by applying following formula:

$$Z_{r_{12}} = \frac{1}{2} Ln\left(\frac{1+r_{12}}{1-r_{12}}\right)$$

Where r_{12} be the coefficient of correlation between variable 1 and variable 2,
$Z_{r_{12}}$ be the Fisher z-transformation.
Similarly,

$$Z_{r_{34}} = \frac{1}{2} Ln\left(\frac{1+r_{34}}{1-r_{34}}\right)$$

Where r_{34} be the coefficient of correlation between variable 3 and variable 4,
$Z_{r_{34}}$ be the Fisher z-transformation.
Standard error of the difference may be defined as

$$SE_D = \sqrt{\frac{1}{N_1 - 3} + \frac{1}{N_2 - 3}}$$

Where N_1 and N_2 are the sample size for variables (1, 2) and variables (3, 4) respectively.
Test statistics z is defined by

$$z = \frac{Z_{r_{12}} - Z_{r_{34}}}{SE_D}$$

If, -1.96< z < +1.96 difference is not significant at .05 level of significance.
Otherwise, the difference is significant.
If, -2.58 < z < +2.58 difference is not significant at .01 level of significance.
Otherwise, the difference is significant.

Results and Discussion

Variables	r_{12} (Male)	r_{34} (Female)	$Z_{r_{12}}$	$Z_{r_{34}}$	N_1	N_2	SE_D	Z
Bengali Formative Bengali Summative	0.461	0.556	0.49858	0.627025	106	94	0.143867	-0.8928
English Formative English Summative	0.362	0.564	0.379186	0.63868	106	94	0.143867	-1.80371
Sanskrit Formative Sanskrit Summative	0.684	0.718	0.836592	0.903505	106	94	0.143867	-0.4651

Table 1: ***Correlation of coefficient with Z-score between the variable of Formative and Summative evaluation of Bengali, English and Sanskrit subject in regard to gender (Male and Female)***

From table 1, it is found that Z-score is -0.8928 which shows insignificant difference between Male and Female student with respect to correlation between the variable Bengali Formative and Bengali Summative. So, the null hypothesis (**H_{01}**) *"There is no significant difference between Coefficient of correlation with regard to Gender (Male and Female) of secondary school students when pairwise correlations are considered for the variables on Bengali Formative and Bengali Summative"* is accepted. Therefore, the relationship between Bengali Formative and Bengali Summative does not differ significantly between Male and Female students. So, association between Bengali Formative and Bengali Summative is similar for Male and Female students.

The findings from Table 1 reveal a Z-score of -1.803, indicating an insignificant difference between Male and Female students concerning the correlation between English Formative and English Summative. Consequently, the null hypothesis (**H_{02}**) *"There is no significant difference between Coefficient of correlation with regard to Gender (Male and Female) of secondary school students when pairwise correlations are considered for the variables on English Formative and English Summative"* is accepted. Therefore, the relationship between English Formative and English Summative does not differ significantly between Male and Female students. So, association between English Formative and English Summative is similar for Male and Female students.

The information in Table 1 reveals a Z-score of -0.4651, indicating an insignificant difference between Male and Female students regarding the correlation between Sanskrit Formative and Sanskrit Summative. Thus, the null hypothesis (**H_{03}**) *"There is no significant difference between Coefficient of correlation with regard to Gender (Male and Female) of secondary school students when pairwise correlations are considered for the variables on Sanskrit Formative and Sanskrit Summative"* is accepted. Therefore, the relationship between Sanskrit Formative and Sanskrit Summative does not differ significantly between Male and Female students. So, association between Sanskrit Formative and Sanskrit Summative is similar for Male and Female students.

Variables	r_{12}(Male)	r_{34}(Female)	$Z_{r_{12}}$	$Z_{r_{34}}$	N_1	N_2	SE_D	Z
Bengali Formative Bengali Summative	0.627	0.305	0.736457	0.315023	70	69	0.173427	2.430039
English Formative English Summative	0.71	0.025	0.887184	0.025005	70	69	0.173427	4.971424
Sanskrit Formative Sanskrit Summative	0.719	0.649	0.905572	0.773569	70	69	0.173427	0.761143

Table 2: ***Correlation of coefficient with Z-score between the variable of Formative and Summative evaluation of Bengali, English and Sanskrit subject in regard to type of institute (Boys and Girls)***

From the data in Table 2, it is evident that the Z-score of 2.430039 signifies a significant difference between Boys and Girls school students in the correlation between Bengali Formative and Bengali Summative.

Therefore, the null hypothesis (**H_{04}**) *"There is no significant difference between Coefficient of correlation with regard to Type of Institute (Boys and Girls) Secondary school students when pairwise correlations are considered for the variables on Bengali Formative and Bengali Summative"* is rejected. Therefore, the relationship between Bengali Formative and Bengali Summative differs significantly between Boys and Girls school students. So, association between Bengali Formative and Bengali Summative is not similar for Boys and Girls school students.

Based on the data in Table 2, the Z-score of 4.971424 suggests a significant difference between Boys and Girls school students in the correlation between English Formative and English Summative. Therefore, the null hypothesis (**H_{05}**) *"There is no significant difference between Coefficient of correlation with regard to Type of Institute (Boys and Girls) Secondary school students when pairwise correlations are considered for the variables on English Formative and English Summative"* is rejected. Therefore, the relationship between English Formative and English Summative differs significantly between Boys and Girls school students. So, association between English Formative and English Summative is not similar for Boys and Girls school students.

The data in Table 2 indicates a Z-score of 0.761143, signifying an insignificant difference between Boys and Girls school students in the correlation between Sanskrit Formative and Sanskrit Summative. As a result, the null hypothesis (**H_{06}**) *"There is no significant difference between Coefficient of correlation with regard to Type of Institute (Boys and Girls) Secondary school students when pairwise correlations are considered for the variables on Sanskrit Formative and Sanskrit Summative"* is accepted. Therefore, the relationship between Sanskrit Formative and Sanskrit Summative does not differ significantly between Boys and Girls school students. So, association between Sanskrit Formative and Sanskrit Summative is similar for Boys and Girls school students.

Variables	r_{12}(Male)	r_{34}(Female)	$Z_{r_{12}}$	$Z_{r_{34}}$	N_1	N_2	SE_D	Z
Bengali Formative Bengali Summative	0.627	0.516	0.736457	0.570873	70	61	0.179351	0.923243
English Formative English Summative	0.71	0.493	0.887184	0.540016	70	61	0.179351	1.935691
Sanskrit Formative Sanskrit Summative	0.719	0.728	0.905572	0.924459	70	61	0.179351	-0.10531

Table 3: ***Correlation of coefficient with Z-score between the variable of Formative and Summative evaluation of Bengali, English and Sanskrit subject in regard to type of institute (Boys and Co-Educational)***

The findings from Table 3 reveal a Z-score of 0.923243, indicating an insignificant difference between Boys and Co-Educational school students concerning the correlation between Bengali Formative and Bengali Summative. Consequently, the null hypothesis (**H_{07}**) *"There is no significant difference between Coefficient of correlation with regard to Type of Institute (Boys and Co-Educational) secondary school students when pairwise correlations are considered for the variables on Bengali Formative and Bengali Summative"* is accepted. Therefore, the relationship between Bengali Formative and Bengali Summative does not differ significantly between Boys and Co-Educational school students. So, association between Bengali Formative and Bengali Summative is similar for Boys and Co-Educational school students.

From the data in Table 3, it is evident that the Z-score of 1.935691 signifies an insignificant difference between Boys and Co-Educational school students in the correlation between English Formative and English Summative. Therefore, the null hypothesis (**H_{08}**) *"There is no significant difference between Coefficient of correlation with regard to Type of Institute (Boys and Co-Educational) secondary school students when pairwise correlations are considered for the variables on English Formative and English Summative"* is accepted. Therefore, the relationship between English Formative and English Summative does not differ significantly between Boys and Co-Educational school students. So, association between English Formative and English Summative is similar for Boys and Co-Educational school students.

The information in Table 3 reveals a Z-score of -0.10531, indicating an insignificant difference between Boys and Co-Education School students regarding the correlation between Sanskrit Formative and Sanskrit Summative. Thus, the null hypothesis (**H_{09}**) *"There is no significant difference between Coefficient of correlation with regard to Type of Institute (Boys and Co-Educational) secondary school students when pairwise correlations are considered for the variables on Sanskrit Formative and Sanskrit Summative"* is accepted. Therefore, the relationship between Sanskrit Formative and Sanskrit Summative does not differ significantly between Boys and Co-Educational school students. So, association between Sanskrit Formative and Sanskrit Summative is similar for Boys and Co-Educational school students.

Variables	r_{12}(Male)	r_{34}(Female)	$Z_{r_{12}}$	$Z_{r_{34}}$	N_1	N_2	SE_D	Z
Bengali Formative Bengali Summative	0.305	0.516	0.315023	0.570873	69	61	0.17998	-1.42154
English Formative English Summative	0.025	0.493	0.025005	0.540016	69	61	0.17998	-2.86148
Sanskrit Formative Sanskrit Summative	0.649	0.728	0.773569	0.924459	69	61	0.17998	-0.83837

Table 4: ***Correlation of coefficient with Z-score between the variable of Formative and Summative evaluation of Bengali, English and Sanskrit subject in regard to type of institute (Girls and Co-Educational)***

Examining Table 4, a Z-score of 1.4215 has been found that suggests no significant difference in the associations between Bengali Formative and Bengali Summative for Girls and Co-Educational school students. Consequently, the null hypothesis (**H_{010}**) *"There is no significant difference between Coefficient of correlation with regard to Type of Institute (Girls and Co-Educational) secondary school students when pairwise correlations are considered for the variables on Bengali Formative and Bengali Summative"* is accepted. Therefore, the relationship between Bengali Formative and Bengali Summative does not differ significantly between Girls and Co-Educational school students. So, association between Bengali Formative and Bengali Summative is similar for Girls and Co-Educational school students.

Observing Table 4, a Z-score of -2.86148 has been found suggesting substantial difference in the correlations between English Formative and English Summative for Girls and Co-Educational school students. Consequently, the null hypothesis (**H_{011}**) *"There is no significant difference between Coefficient of correlation with regard to Type of Institute (Girls and Co-Educational) secondary school students when pairwise correlations are considered for the variables on English Formative and English Summative"* is rejected. Therefore, the relationship between English Formative and English Summative differs significantly between Girls and Co-Educational school students. So, association between English Formative and English Summative is not similar for Girls and Co-Educational school students.

From the data in Table 4, it is evident that the Z-score is -0.838337, indicating an insignificant variation in the correlations between Sanskrit Formative and Sanskrit Summative among Girls and Co-Educational school students. So, the null hypothesis (**H_{012}**) *"There is no significant difference between Coefficient of correlation with regard to Type of Institute (Girls and Co-Educational) secondary school students when pairwise correlations are considered for the variables on Sanskrit Formative and Sanskrit Summative"* is accepted. Therefore, the relationship between Sanskrit Formative and Sanskrit Summative does not differ significantly between Girls and Co-Educational school students. So, association between Sanskrit Formative and Sanskrit Summative is similar for Girls and Co-Educational school students.

Conclusion

After the analysis of the data it has been observed that significant difference is there between coefficient of correlation of Boys and Girls secondary school students of Formative and Summative evaluation of Bengali and English subject are not similar. There exists a statistically significant difference between them. Also the coefficient of correlation of Girls and Co-Educational secondary school students of Formative and

Summative evaluation of English subject is different from each other. Otherwise there exists no significant differences.

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