

REPORT OF STUDY OF CORRELATION BETWEEN SCHOOL INFRASTRUCTURE AND TEACHER VARIABLES AND PERFORMANCE OF STUDENTS IN BOARD EXAMINATIONS

CHAPTER 1 INTRODUCTION

The Council of Boards of School Education (COBSE) undertook this project under the Rashtriya Madhyamik Shiksha Abhiyan with the support of the Ministry of HRD, Government of India. Most Boards have norms relating to facilities in school; schools are given affiliation only when they fulfill the minimum requirements of space, classrooms, library, laboratory, playground etc. But many schools do not satisfy all the conditions laid down in the norms. There is generally considerable variation across schools in the facilities that they have. It was of interest to find out to what extent the facilities affect the learning outcomes.

The main purpose of this study, therefore, was to find out how the quality of education in secondary schools as indicated by the results of students in the Board examinations, is related with the facilities in the school and teachers' qualifications and experience. It was decided to conduct this study in 5 states, one from each major region of the country. The selected states were Assam, Bihar, Gujarat, Punjab and Tamil Nadu. Also it was decided to cover only secondary schools up to class X that were affiliated to the Boards of School Education of these states. The specific objectives of the study were

- (1) To find out which of the infrastructure variables have significant correlation with the average achievement of students in class X Board examination as indicated by pass percentage, percentage of students getting first division and average marks of the students in the in the examination.
- (2) To find out whether the qualification and experience of teachers is correlated with achievement of students as indicated by the variables mentioned under Objective (1).
- (3) To find out whether such variables as number of working days in a year, holding extra classes for weak students, has any correlation with achievement of students in the Board examination.
- (4) To make recommendations about infrastructure variables that should be given more attention for improving the result of any school in the Board examinations.

COBSE designed the study and in collaboration with the Boards of different states, got the required data collected through a questionnaire from the sampled schools. It was decided to collect the data from 120 schools under each Board to compute the correlations but the actual sample was very much reduced as many schools did not respond.

The questionnaire included questions on school building, various types of facilities, qualification and experience of teachers and results of the Board examination at the end of class X. The data was collected using this questionnaire from each sampled school. The school heads were responsible for answering all the questions and providing correct information about the facilities in the school, teachers and results of students in the Board examination of class X.

CHAPTER 2

METHODOLOGY

2.1 Sampling of Schools and Data Collection

A random sample of 120 schools was drawn from the list of secondary schools which was available from the 8th all India Survey of School Education conducted by NCERT in 2009. The schools which were not affiliated to the State Board were excluded. Initially a sample of only size 100 was proposed but 20 extra schools were added for replacement of schools that may not be able to supply the data due to any practical difficulty.

It was decided to collect the data by sending the questionnaires to schools and requesting the Principals to send back the completed questionnaires back to the Board headquarters within two weeks. Each Board designated one of its officers to be Coordinator of the study at the state level. The Coordinator was made responsible for getting all the data collected from the sampled schools and to send the same after thorough checking to COBSE office for analysis.

COBSE organized a workshop for the State Coordinators of the study on 15 June 2014 in Delhi in which they were briefed about the objective of the study and their role in getting the data collected from schools. The questionnaire and the method adopted for data collection were discussed in detail with them. Also they were given the list of sampled schools and guidelines about what they had to do to get the data collected in time, and also about checking of the data and sending the same to COBSE.

2.2 Data Analysis

After receiving all the data, transcription of data was arranged in Delhi after checking all the data once again and doing coding of responses where it was felt necessary. But the total data that was received was from less number of schools and not all the sampled schools. Even after extending the date of submission of the filled in questionnaires, the response rate did not improve much. The number of schools from which data was received was 59 in Assam, 68 in Bihar, 68 in Gujarat, 24 in Punjab and 37 in Tamil Nadu, the total being 256 in 5 states. Some schools did not provide data on all the items, but it was not possible to get the missing data from schools at the stage of data analysis. It was decided to analyze whatever data was available due to non-response from some schools despite repeated reminders. The correlation between any two variables was computed by using the data that was provided for both the variables. As a result the sample size varies from item to item.

There were 18 variables relating to infrastructure and 5 variables relating to teachers' experience and qualification, all of which were derived from the data. In addition, two more variables - teaching days in a year and extra classes held for weak students, were also used for studying their correlation with performance of students in Board examinations. The students' performance was measured in terms of (a) pass percentage, i.e. percentage of students who passed the class X Board examination, (b) percentage of students who got 1st division and (c) average marks obtained by the students in the Board examination. All the correlations were determined separately for each state, but the samples were rather small, particularly in Punjab and Tamil

Nadu, for giving reliable estimates of correlation. It was, therefore decided that in addition to the state level correlations, the average correlation based on the state level correlations of all the 5 states, should also be determined. For deriving the average correlation, the following z-transformation was used to transform the all the state level correlations (r) into z as follows and then determining their average.

$$z = \frac{1}{2} \log_e [(1 + r) / (1 - r)]$$

It is known that z is approximately normally distributed with variance $1 / (n - 3)$, where n is the sample size. Treating the 5 samples of schools of the 5 states as independent samples drawn for the common purpose of estimating the correlation between school infrastructure variables and performance of students in Board examinations, we can get the estimate of average correlation by first finding the average of z as

$$\text{Average } z = \sum (n_i - 3) z_i / N$$

where n_i is the size of the i^{th} sample and z_i is the z value obtained from the value of r of the i^{th} sample, $i = 1, 2, 3, 4$ and 5 for the 5 states and N is $\sum n_i$. The next step was to convert this average z into r by using the formula $r = \tanh z$. The average r from the pooled data of all the 5 states was determined in this manner for reporting along with the state level correlations.

It was also decided to determine the correlation of the infrastructure variables with the learning outcome variables from the pooled sample of all the 5 states. Since the Board examinations of the 5 Boards were different, while pooling up the data of the 5 Boards it was assumed that the examinations of the five Boards could be treated at par. For example, the students passing the examination or the students getting first division in schools under any Board, would be comparable with the corresponding pass students or first division students in schools of another Board. This is, of course, not an entirely correct assumption but we felt that the correlations from the pooled sample would give better idea of the degree of relationship between infrastructure variables and examinations results as these would be based on a much larger sample.

In the next chapter, apart from the correlations in the samples of schools under each State Board, the average correlations derived using the z-transformation as described above, are also being reported. Further, the correlations derived from the pooled data of the total sample of all the Boards are also being reported along with the state level correlations and average correlations, for every infrastructure variable with each one of the three variables that indicate the achievement of students in the Board examination.

2.3 Students' Achievement Indicators

As mentioned above, the three indicators of achievement in the Board examination for any school were (a) pass percentage, i.e. percentage of students who passed the class X Board examination of 2014 from the school (b) percentage of students of the school who got 1st division in the examination and (c) average marks obtained by the students of the school in the Board examination Table 2.1, Table 2.2 and Table 2.3 respectively show the average values of

these indicators for the sampled schools of each of the five states and also for the total sample of schools of the five states.

The percentage of students who passed the class X Board examination from the sampled schools was between 72% and 78% in Assam, Bihar and Gujarat whereas this percentage was above 93% in Punjab and Tamil Nadu. The overall percentage in the total sample of all the 5 states was 79.3%. The variation between schools as indicated by the standard deviation was high (over 16) in the first three states and low (between 8 and 10) in the last two states.

Table 2.1 Mean and SD of Percentage of students who passed

Item	Assam	Bihar	Gujarat	Punjab	Tamil Nadu	All states
Mean	77.5	75.0	72.1	95.0	92.9	79.3
Std. Deviation	18.9	16.2	24.4	8.6	9.3	19.9

The percentage of students getting first division was quite low (below 20%) in Assam and Bihar and quite high (over 60%) in Punjab and Tamil Nadu the percentage in Gujarat being an average 34.4%. The variation between schools within each state and also between states is quite large.

Table 2.2 Mean and SD of Percentage of Students who passed with Ist Division

Item	Assam	Bihar	Gujarat	Punjab	Tamil Nadu	All states
Mean	9.8	16.9	34.4	60.1	68.1	31.2
Std. Deviation	9.8	10.6	30.0	30.6	30.4	30.8

The marks are actually not comparable across the Boards as their examinations are not the same. Whatever the examination, there is not much variation in average marks of students across the 5 Boards. The lowest mean is 42.1 in Bihar and the highest is 59.3 in Tamil Nadu.

Table 2.3 Mean and SD of Average Percentage of Marks obtained by the students

Item	Assam	Bihar	Gujarat	Punjab	Tamil Nadu	All states
Mean	42.8	42.1	51.5	49.1	59.3	48.1
Std. Deviation	20.9	26.2	19.5	29.1	25.3	24.3

CHAPTER 3

CORRELATION OF INFRASTRUCTURE VARIABLES WITH INDICATORS OF STUDENTS' ACHIEVEMENT IN BOARD EXAMINATIONS

We shall discuss the correlation of each infrastructure variable with the result of Board examination expressed in the form of (a) pass percentage of students taking class X examination (b) percentage of students who got first division and (c) average marks of students in the examination. To begin with we are also giving the mean and standard deviation of each variable for each one of the 5 states as well as the total of all the five states. If for any variable the information is not in the form of scores, scoring is first done on the basis of some assumption as only the information in quantified form could be used for determining meaningful correlation coefficients. For example in the case of type of building, score 3 is given if the school has pucca building for classes 9 and 10, score 2 is given if it has partly pucca building and score 1 is given if it has kuchha building for these classes. In this case the mean score of 2.24 for the type of building as in the case of Assam shows how far the buildings are short of the perfect score of 3, the ideal value when all the schools in the sample of Assam have pucca building.

3.1 Type of school building

We find that the average school building in Assam is generally semi-pucca as the mean score is only 2.24 out of 3 (see Table 1a); in other states the mean score is close to 3. For the total of schools of all the states, the average is between 2.5 and 3 indicating that both types of building are common. The relatively high standard deviations indicate that variation in type of building across the schools is large.

Table 1(a) : Mean and SD of 'Type of School Building'

State Board	Assam	Bihar	Gujarat	Punjab	Tamil Nadu	Total
Sample size	59	68	68	24	37	256
Mean	2.24	2.80	2.81	2.73	2.78	2.67
Std. Deviation	.678	.502	.648	.785	.698	.681

As regards the correlation of 'Type of building' with examination results, we find that there is no significant correlation except in Assam (see Table 1b). This is partly due to most of the buildings being pucca in all the states except Assam where the building quality appears to have some impact on pass percentage of students. But when all the samples are combined, there is significant correlation between 'Type of building' and 'number of first division students' as well as with the 'average marks of students'. Pass percentage is a crude indicator of quality and so we should give more importance to the correlation with the other two indicators. We can conclude that the quality as measured by examination results is to some extent affected by the type of school building but such effect is not clearly shown when the data of individual states are analyzed because of the samples not being sufficiently large.