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Effect of Gender and Nationality on Mathematics Achievement of Public and Private School Students of India, Pakistan and Zimbabwe

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Abstract: This paper aims to investigate the effect of gender and nationality of 9th and 10th grade students in public and private schools of India, Pakistan and Zimbabwe on their achievement in mathematics based upon achievement data (n=5996) for session 2012-2013 which was gathered manually in 2013 from the participated schools of all the countries (India, Pakistan & Zimbabwe) where each country contributed 2000 sample of students collected from 20 schools and data of four students from Zimbabwe was lost, so total sample of the study was 5996 students. The influence of public and private schools was also examined on students' achievement for the total sample. Data was analyzed by using t-test, analysis of variance and results of the study indicated that significant differences existed on the mathematics achievement of public and private school students of all the three countries and private school students achieved better in mathematics than public school students indicating private school students still achieve better than students of public schools. Besides, male and female students in public and private schools of each country achieved equal in mathematics indicating no gender disparity even in public and private schools which provides new insight that male and female students achieve equal in public schools as well as in private schools, although, private school students achieve more scores in mathematics than public school students. In addition, analysis of variance indicated that Indian public school and private school students achieve more than students of other two countries. Indian male students of public schools achieved more than public school students of Pakistan and Zimbabwe. Similarly, performance of Indian female students of public schools in mathematics was better than Pakistan and Zimbabwe public school students. Furthermore, both male and female students of private schools of India achieved better in mathematics than male and female private school students of Pakistan and Zimbabwe. Findings show that there was no gender disparity in public and private schools of the examined countries while nationality had significant effect on mathematics achievement of students as Indian students achieved highest in public and private schools than students of other two countries.
Keywords: gender, nationality, Mathematics Achievement, school students

INTRODUCTION

The differences in gender in terms of achievement particularly in mathematics are not a new thing to consider again. As generally it is observed that male students perform better in mathematics than their female counterparts, however, in my previous study, it was found that male and female students achieved equal in mathematics and science. Does gender disparity exist in private and public schools or not? It is imperative to solve this question.

It has always been said by researchers as per the previous studies that private school students get more scores than public school students. There is an important difference between private and public schools and it is on account of the origin of funding they obtain as public schools receive grant from public while private schools do not get such type of grant. Therefore, private schools are dependent on student fees solely to run it. Children who desire to take admission in private school have to spend far more money comparatively public schools. Private schools are beyond the reach of children who belong to low socio-economic status. This is one of the factors which may influence differences in the achievement outcomes of public and private school students. Apart from socio-economic status, various other variables such as characteristics of students, school environment, methodologies used for teaching-learning, and resources available in the school may affect students' achievement outcomes. Frennet and Chan [1] said that private schools, many times, specifically select wealthier families to get the grant

because these schools are solely dependent on the tuition fees they get from students, so in this way they are self-selecting wealthier students from rich families. It means these children belong to the families who are well educated and have all the resources which are required for their growth in academics. Also, educated parents, their achievements set an example and motivate child to achieve better. Besides, admission criteria in private schools is also difficult relatively public schools, thus, students of low level of intelligence are filtered out by private schools and majority of their students are bright mind who perform well in academic examinations.

Researchers have many times discussed the effects of private and public schools on achievement of students. Besides, some studies indicated that private school students perform better than public school students. Lubienski and Lubienski [2] found that private school students performed better in mathematics, besides, when they controlled the factor (socio-economic status), results were again same. However, when they compared students of high socio-economic status from both private and public schools, it was observed that public school students slightly outperformed than private school students. Also, Frenette and Chan [1] concluded from their findings that socio-economic status of private school students is positively related with success in their academics. Thus, previous research indicates it is because of certain other factors such as socio-economic status, students of private schools might have gained more scores those public school students. Apart from the factors which influence achievement outcomes of private and public school students, there is a need to examine the effect of gender and nationality of students in private and public schools on students' achievement. As in the previous research, I analyzed the influence of gender and nationality on students' achievement, however, in the present study, gender and nationality differences were examined in terms of private and public schools. Besides, the effect of public and private schools was also scrutinized to determine any significant differences if exists on achievement of students in mathematics.

OBJECTIVES OF THE STUDY

The present study was done to achieve the following ten objectives:

1. To study and compare mathematics achievement of public and private school students (total sample) of all countries (India, Pakistan & Zimbabwe).
2. To study and compare mathematics achievement of male and female students of Zimbabwe studying in public schools.
3. To study and compare mathematics achievement of male and female students of Zimbabwe studying in private schools.
4. To study and compare mathematics achievement of male and female students of India studying in public schools.
5. To study and compare mathematics achievement of male and female students of India studying in private schools.
6. To study and compare mathematics achievement of male and female students of Pakistan studying in public schools.
7. To study and compare mathematics achievement of male and female students of Pakistan studying in private schools.
8. To study and compare mathematics achievement of students of India, Pakistan and Zimbabwe studying in public schools.
9. To study and compare mathematics achievement of students of India, Pakistan and Zimbabwe studying in private schools.
10. To study and compare mathematics achievement of female students of India, Pakistan and Zimbabwe studying in public schools.
11. To study and compare mathematics achievement of female students of India, Pakistan and Zimbabwe studying in private schools.
12. To study and compare mathematics achievement of male students of India, Pakistan and Zimbabwe studying in public schools.
13. To study and compare mathematics achievement of male students of India, Pakistan and Zimbabwe studying in private school.

REVIEW OF THE RELATED LITERATURE

Public/Private schools and Students' achievement

Dronkers and Robert [3] gathered 2011 achievement data of 22 countries from the Program for International Student Assessment and found that private public dependent school students had higher achievement than private independent or public schools. However, both private and public schools had equal net achievement differences across all of the countries. Hahn, Kim and Seo [4] indicated that students of private schools had better performance than students of public schools. Frenette and Chan (2015) showed that private high school students had good performance in mathematics than students of public schools. The studies reviewed above signify that private school students' performance was more than public school students. On the contrary, Dronkers and Robert [3] have also indicated that private and public school students' achievement was equal. On the other hand, Lubienski and Lubienski [2] gave opposite results by stating that public school students were slight better in achieving than private school students when students of only high socio-economic students were compared. These studies give mix results which authenticate investigator to scrutinize it again. In addition, total sample of private and public school students of India, Pakistan and

Zimbabwe was compared to observe any significant differences between type of school (private & public) on students' achievement in mathematics.

Gender/Nationality and Students' achievement

Weis, Heikamp and Trommsdorff [5] found no gender differences in mathematics achievement Eshetu [6] found that male students achieved more in mathematics than female students. Likewise, Baye and Monseur [7] also reported that male students performed better in mathematics than their female counterparts. Above results of the previous studies show male to be better performers than females in mathematics with exceptions where both gender performed equal in a study done in Germany by Weis, Heikamp and Trommsdorff [5].

The present study is significant as it will fill the gap left by previous studies by analyzing gender differences of three countries, gender differences in public and private schools and influence of nationality as well as type of school (public & private) on students' achievement in mathematics. Besides, present study will corroborate the previous findings by examining this research afresh.

HYPOTHESES

The subsequent null hypotheses were tested:

1. There is no significant difference in mathematics achievement of public and private school students (total sample) of all countries (India, Pakistan & Zimbabwe).
2. There is no significant difference in mathematics achievement of male and female students of Zimbabwe studying in public schools.
3. There is no significant difference in mathematics achievement of male and female students of Zimbabwe studying in private schools.
4. There is no significant difference in mathematics achievement of male and female students of India studying in public schools.
5. There is no significant difference in mathematics achievement of male and female students of India studying in private schools.
6. There is no significant difference in mathematics achievement of male and female students of Pakistan studying in public schools.
7. There is no significant in mathematics achievement of male and female students of Pakistan studying in private schools.
8. There is no significant difference in mathematics achievement of students of India, Pakistan and Zimbabwe studying in public schools.
9. There is no significant difference in mathematics achievement of students of India, Pakistan and Zimbabwe studying in private schools.
10. There is no significant difference in mathematics achievement of female students of India, Pakistan and Zimbabwe studying in public schools.
11. There is no significant difference in mathematics achievement of female students of India, Pakistan and Zimbabwe studying in private schools.
12. There is no significant difference in mathematics achievement of male students of India, Pakistan and Zimbabwe studying in public schools.
13. There is no significant difference in mathematics achievement of male students of India, Pakistan and Zimbabwe studying in private schools

METHOD AND PROCEDURE

Research Design

The study employed ex-post facto research method where causal comparative design was utilized. The ex-post facto is a method where independent variables (gender, nationality, private/public school) have already occurred and investigator examined their influence on dependent variable (achievement in mathematics) of the study.

Sample

The stratified random sampling technique was utilized for selecting the sample of study. The data was collected from three countries such as India, Pakistan and Zimbabwe and it was gathered from total sample of 5996 students of 9^{th} and 10^{th} class from 60 schools in the subject of mathematics from the year 2012 to 2013. Each sample of the country consisted of 1000 students from public school and 1000 students from private school (n=2000/country) and on the other hand, four students from the data of Zimbabwe were lost, so sample of students from this country was 1996. Therefore, total sample of the study was 5996 students where 3000 students were from public schools and 2996 students' data was gathered from private schools.

Location

The achievement data (2012-2013) was collected manually from Chandigarh, a union territory of India from 10 public and 10 private schools. The 9^{th} and 10^{th} grade students' achievement data was gathered at the end of session (2012-2013) after their final annual exams. Similar data was collected from Mashonaland West Province of Zimbabwe. Likewise, information was collected from 10 public and 10 private schools of Punjab district of Pakistan.

DISCUSSION OF RESULTS

The objective of the study was achieved and data was analyzed by applying t-test and analysis of variance using SPSS Software.

There is no significant difference in mathematics achievement of public and private school students (total sample) of all countries (India, Pakistan & Zimbabwe).

The first null hypothesis of the study was rejected as significant differences were observed in mathematics achievement of public and private school students (total sample) [t= 120.65, α = 0.00 < .05 level of significance, (Table 1)].

Table 1: Descriptive statistics and t-ratio of mathematics achievement of public and private school students (total sample)

Math Achievement	N	Mean	Standard Deviation	t-ratio	Sig.
Public	3000	52.16	19.17	120.65	0.00
Private	2996	61.97	17.58		
Total	1000				

Table 1 indicates that private school students achieved more in mathematics than public school students from the countries India, Pakistan and Zimbabwe.

There is no significant difference in mathematics achievement of male and female students of Zimbabwe studying in public schools.

The second null hypothesis of the study was accepted as no significant difference was observed in mathematics achievement of male and female students of Zimbabwe studying in public schools [t= 1.072, α = 0.284 > .05 level of significance, (Table 2)].

Table 2: Depicts descriptive statistics and t-ratio of mathematics achievement of male and female students of Zimbabwe studying in public school

Math Achievement	N	Mean	Standard Deviation	t-ratio	Sig.
Male	445	41.78	22.52	1.072	0.284
Female	555	40.25	22.46		
Total	1000				

Table 2 indicates that male and female students studying in public schools of Zimbabwe had equal achievement in the subject of mathematics.

There is no significant difference in mathematics achievement of male and female students of Zimbabwe studying in private schools

The third null hypothesis of the study was accepted as no significant difference was observed in mathematics achievement of male and female students of Zimbabwe studying in private schools [t = 0.332, α = 0.740 > .05 level of significance, (Table 3)].

Table 3: Depicts descriptive statistics and t-ratio of mathematics achievement of male and female students of Zimbabwe studying in private school

Math Achievement	N	Mean	Standard Deviation	t-ratio	Sig.
Male	435	55.25	21.06	0.332	0.740
Female	561	54.82	19.79		
Total	996				

Table 3 indicates that male and female students studying in private schools of Zimbabwe had equal achievement in the subject of mathematics.

There is no significant difference in mathematics achievement of male and female students of India studying in public schools

The fourth null hypothesis of the study was accepted as no significant difference was observed in mathematics achievement of male and female students of India studying in public schools [t= 0.104, α = 0.917 > .05 level of significance, (Table 4)].

Table 4: Depicts descriptive statistics and t-ratio of mathematics achievement of male and female students of India studying in public school

Math Achievement	N	Mean	Standard Deviation	t-ratio	Sig.
Male	454	62.02	14.375	0.104	0.917
Female	546	62.11	13.47		
Total	1000				

Table 4 indicates that male and female students studying in public schools of India had equal achievement in the subject of mathematics.

There is no significant difference in mathematics achievement of male and female students of India studying in private schools.

The fifth null hypothesis of the study was accepted as no significant difference was observed in mathematics achievement of male and female students of India studying in private schools [t = 1.223, α = 0.222 > .05 level of significance, (Table 5)].

Table 5: Depicts descriptive statistics and t-ratio of mathematics achievement of male and female students of India studying in private school

Math Achievement	N	Mean	Standard Deviation	t-ratio	Sig.
Male	450	66.61	13.34	1.223	0.222
Female	550	65.53	14.41		
Total	1000				

Table 5 indicates that male and female students studying in private schools of India had equal achievement in the subject of mathematics.

There is no significant difference in mathematics achievement of male and female students of Pakistan studying in public schools

The sixth null hypothesis of the study was accepted as no significant difference was observed in mathematics achievement of male and female students of Pakistan studying in public schools [t= 0.704, α = 0.482 > .05 level of significance, (Table 6)].

Table 6: Depicts descriptive statistics and t-ratio of mathematics achievement of male and female students of Pakistan studying in public school

Math Achievement	N	Mean	Standard Deviation	t-ratio	Sig.
Male	453	53.14	13.18	0.704	0.482
Female	547	53.74	13.50		
Total	1000				

Table 6 indicates that male and female students studying in public schools of Pakistan had equal achievement in the subject of mathematics.

There is no significant in mathematics achievement of male and female students of Pakistan studying in private schools

The seventh null hypothesis of the study was accepted as no significant difference was observed in mathematics achievement of male and female students of Pakistan studying in private schools [t= 0.459, α = 0.647 > .05 level of significance, (Table 7)].

Table 7: Depicts descriptive statistics and t-ratio of mathematics achievement of male and female students of Pakistan studying in private school

Math Achievement	N	Mean	Standard Deviation	t-ratio	Sig.
Male	436	65.11	15.77	0.459	0.647
Female	564	64.65	15.69		
Total	1000				

Table 7 indicates that male and female students studying in private schools of Pakistan had equal achievement in the subject of mathematics.

There is no significant difference in mathematics achievement of students of India, Pakistan and Zimbabwe studying in public schools

The eighth null hypothesis of the study that there is no significant difference in mathematics achievement of students of India, Pakistan and Zimbabwe studying in public schools was rejected as significant differences were found after testing hypothesis by analysis of variance [F= 381.389, α = 0.000 < .05 level of significance, (Table 8)].

Table 8: Descriptive statistics and F-ratio of mathematics achievement of India, Pakistan and Zimbabwe students studying in public schools

Variable	Country	N	Mean	S.D	D.F		Sum of Squares	Mean Squares	Value of F-ratio
Achievement in Mathematics	Zimbabwe	1000	40.93	22.49	Between Groups	2	224500.99	112250.50	381.39
	India	1000	62.00	14.10					
	Pakistan	1000	53.47	13.34	Within Groups	2997	882077.48	294.32	
	Total	3000	52.13	19.21	Total	2999			

After post hoc analysis, it was seen that students of public schools of India achieved more in mathematics than students of Pakistan and Zimbabwe.

There is no significant difference in mathematics achievement of students of India, Pakistan and Zimbabwe studying in private schools

The null hypothesis was rejected as significant differences were found on achievement of students after testing hypothesis by analysis of variance [F= 128.04, α = 0.00 < .05 level of significance, (Table 9)].

Table 9: Descriptive statistics and F-ratio of mathematics achievement of India, Pakistan and Zimbabwe students studying in private schools

Variable	Country	N	Mean	S.D	D.F		Sum of Squares	Mean Squares	Value of F-ratio
Achievement in Mathematics	India	1000	66.01	13.94	Between Groups	2	72974.40	36487.20	128.04
	Pakistan	1000	64.85	15.72					
	Zimbabwe	996	55.01	20.35	Within Groups	2993	852879.20	284.958	
	Total	2996			Total	2995			

Post hoc analysis reveals that Indian private school students achieved highest in mathematics while Zimbabwe private school students were the least achievers in the same subject.

There is no significant difference in mathematics achievement of female students of India, Pakistan and Zimbabwe studying in public schools

The null hypothesis was rejected as significant differences were found on achievement of female students after testing hypothesis by analysis of variance [F= 230.80, α = 0.00 < .05 level of significance, (Table 10)].

Table 10: Descriptive statistics and F-ratio of mathematics achievement of female students of India, Pakistan and Zimbabwe students studying in public schools

Variable	Country	N	Mean	S.D	D.F		Sum of Squares	Mean Squares	Value of F-ratio
Achievement in Mathematics	India	546	62.11	13.48	Between Groups	2	134117. 84	67058.92	230.80
	Pakistan	547	53.74	13.49					
	Zimbabwe	555	40.25	22.46	Within Groups	1645	477946.76	290.545	
	Total	1648			Total	1647			

Post hoc analysis shows that Indian female public school students achieved highest score in mathematics than female counterparts of Pakistan and Zimbabwe while Zimbabwe female public school students were the least achievers.

There is no significant difference in mathematics achievement of female students of India, Pakistan and Zimbabwe studying in private schools

The null hypothesis was rejected as significant differences were found on achievement of female private school students after testing hypothesis by analysis of variance [F= 70.05, α = 0.00 < .05 level of significance, (Table 11)].

Table 11: Descriptive statistics and F-ratio of mathematics achievement of female students of India, Pakistan and Zimbabwe students studying in private schools

Variable	Country	N	Mean	S.D	D.F		Sum of Squares	Mean Squares	Value of F-ratio
Achievement in Mathematics	India	550	65.53	14.41	Between Groups	2	39542.52	19771.26	70.05
	Pakistan	564	64.65	15.69					
	Zimbabwe	561	54.82	19.79	Within Groups	1672	471907.11	282.241	
	Total	1675			Total	1674			

Post hoc analysis indicated female private school students of India achieved highest in mathematics than female private school students of other two countries.

There is no significant difference in mathematics achievement of male students of India, Pakistan and Zimbabwe studying in public schools

The null hypothesis was rejected as significant differences were found on achievement of male public school students after testing hypothesis by analysis of variance [F= 152.09, α = 0.00 < .05 level of significance, (Table 12)].

Table 12: Descriptive statistics and F-ratio of mathematics achievement of male students of India, Pakistan and Zimbabwe students studying in public schools

Variable	Country	N	Mean	S.D	D.F		Sum of Squares	Mean Squares	Value of F-ratio
Achievement in Mathematics	India	454	61.85	14.84	Between Groups	2	90973.88	45486. 94	152.09
	Pakistan	453	53.14	13.18					
	Zimbabwe	445	41.78	22.52	Within Groups	1349	403444.65	299.07	
	Total	1352			Total	1351			

Further analysis reveals that Indian male public school students were the highest achievers than the students of other two countries. Besides, male public school students of Zimbabwe were the least mathematics achievers

There is no significant difference in mathematics achievement of male students of India, Pakistan and Zimbabwe studying in private schools

The null hypothesis was rejected as significant differences were found on achievement of male private school students after testing hypothesis by analysis of variance [F= 152.09, α = 0.00 < .05 level of significance, (Table 13)].

Table 13: Descriptive statistics and F-ratio of mathematics achievement of male students of India, Pakistan and Zimbabwe students studying in private schools

Variable	Country	N	Mean	S.D	D.F		Sum of Squares	Mean Squares	Value of F-ratio
Achievement in Mathematics	India	450	66.1	13.34	Between Groups	2	33427.42	16713.71	152.09
	Pakistan	436	65.1	15.77					
	Zimbabwe	435	55.25	21.06	Within Groups	1318	380583.84	288.76	
	Total	1321			Total	1320			

Further post hoc analysis shows that Indian male private school students were the highest achievers than the students of other two countries, although, differences between Indian and Pakistan students seem to be negligible. Besides, male private school students of Zimbabwe were the least mathematics achievers.

CONCLUSION, LIMITATIONS AND SUGGESTIONS

Public and private schools of all the three countries (total sample) had not gained equal achievement in mathematics as private school students achieved more than their public counterparts [1, 2, 4]. Besides, there was no gender disparity in mathematics achievement of students [5] whether in public or private schools of each country of the present study.

Nationality had significant effect on mathematics achievement of students as Indian students achieved highest in public and private schools than

students of other two countries. In addition, it was concluded that both male and female students in public and private schools of India achieved better in mathematics than their counterparts of Pakistan and Zimbabwe. It means gender and type of school has not influenced higher achievement of Indian students. There may be some other factors which perhaps have led to the differences in terms of nationality. These may be socio-economic status of school or of students, effectiveness of teacher and principal or economic developmental differences of the countries. But these factors were not examined in this paper.

This paper inferred that gender is not the reason of differences in students' achievement not even in public school or private school. But, private school students achieved better than public school students and this study has not examined the differences between private and public schools of each country separately and it may give another clue on the better achievement of Indian students. The leadership style of principal can also be examined for the particular country and for both types of school which will provide new insights into the differences in students' achievement.

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