Mis-allocation of student teacher ratio, class size and per student expenditure leads to the wastage of school resource inputs and lower academic achievement: an issue of resource management

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MIS-ALLOCATION OF STUDENT TEACHER RATIO, CLASS SIZE AND PER STUDENT EXPENDITURE LEADS TO THE WASTAGE OF SCHOOL RESOURCE INPUTS AND LOWER ACADEMIC ACHIEVEMENT: AN ISSUE OF RESOURCE MANAGEMENT

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Abstract

This study was conducted to find out the impact of student teacher ratio, class size and per student expenditure on the academic achievement of students at secondary stage in Punjab (Pakistan). Student teacher ratio, class size and per student expenditure are very important school resource inputs. The lesser student teacher ratio and class size, and the higher per student expenditure are very effective for producing higher level of academic achievement; however, it depends upon their proper allocation among schools. Population of the study comprised all secondary and higher secondary schools, secondary teachers and secondary students in Punjab. Overall, a total of 288 schools, then 20 students and 10 teachers from each school were randomly selected as the sample of the study. The study identified the student teacher ratio and class size through school profile proforma. The longitudinal data of academic achievement in the form of aggregate marks of the annual examinations of the Classes VI, VII, & VIII as prior achievement and that of the Class X as academic achievement of the same students through "Result Sheet". The data were summarized at school level and then analyzed collectively. Stepwise Regression analysis with linear function was used to find out the differential impact of student teacher ratio and class size on the academic achievement. The study found that there is much variation and misallocation in student teacher ratio, class size and per student expenditure among schools. The study found that misallocation of student teacher ratio, class size and per student expenditure leads to the wastage of resources and lower level of academic achievement. Reduction in student teacher ratio and class size, and addition in per student expenditure are very expensive; therefore, policy can be decided considering the funds constraints. However, allocation of student teacher ratio, class size and per student expenditure can be equalized within the scarce funds. This equal allocation of these resource inputs may lead to the effective use of school resource inputs and produce higher level of academic achievement.

Keywords: prior achievement, student teacher ratio, class size, per student expenditure, academic achievement

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Most of the governments of the world spend a significant amount of their budget on resource inputs in the education sector. They make decisions about providing resource inputs to enhance student achievement and performance. However, not all these decisions are easy to take, especially in the third world countries where mismanagement makes the problem more adverse. As Tan, Lane & Coustere (1997) remarked that:

> Resources are scarce, especially in low-income countries; policy makers can ill afford errors in the choice of allocations. To reduce the scope for mistakes, the true picture of the determinants of education outcome is desirable. (p. 857)

Resource inputs have a vital role in the education process. Student achievement at any point is a cumulative function of the current and the prior resource inputs such as family, SES, peers' effect and institutional resource inputs. However, all these factors are outside the direct control of an educationist. Therefore, an educationist directly deals with and controls the school specific resource inputs. Likewise, student teacher ratio and class size are very important school resource inputs.

The government has introduced Education Sector Reforms (ESR) and EFA National Plan of Action (2001-2015) for the improvement of quality of education at all levels of education through improving the status of various resource inputs like revision of curricula, teacher training, and provision of better facilities in the public sector schools.

Overall, quality of education has a declining trend in Pakistan; particularly science education that is reaching its lowest ebb. Furthermore, there is an acute shortage of teachers in schools, the laboratories are ill equipped and the curriculum is not relevant to the present day needs. In a nutshell, the schools are not doing well. Therefore, the need is to identify the factors responsible for the present state of affairs. (Government of Pakistan, 2002)

Literature Review

Related literature was reviewed separately for per student expenditure (PSEx), student teacher ratio (STR) and class size in the following paragraphs:

1. Per Student Expenditures

Discussion about school expenditures had been started with the Coleman report (1966). The report found that per student expenditures (PSEx) and the other school resource inputs (SRIs) showed very little relationship with student achievement. In this analysis, social background and attitudes of individual students and their schoolmates were held constant. (Coleman Report, 1966)

Hanushek (1989) found that there was no strong or systematic relationship between school expenditures and student performance. However, Ahmad (1993) found that scholastic factors including school finance were subjected to a significant correlation with the examination results. Therefore, school finance played a significant role in improving educational standards. The study also found that a positive effect on education standards might be obtained if the suitable conditions were created in relation to this factor.

On the basis of the same meta-analysis of a sub sample of the same data used by Hanushek (1989), Hedges et al. (1994a) rejected that conclusion. This study concluded that there was a strong evidence of at least some positive effects of PSEx on outcome. Afterwards, Hanushek (1994) criticized Hedges et al. (1994) and their method of eliminating equations from the meta-analysis. Hanushek (1994) concluded that this had the effect of completely ignoring 30% to 40% of the estimates.

Hedges et al. (1994b) defended their criteria for eliminating equations from Hanushek's sample. Hedges et al (1994b) also proved that by eliminating equations from the meta-analysis, the results still showed strong evidence of positive effects and little evidence of the negative effects. Hanushek (1996a) again objected to the methodology, especially the sample selection procedures of Hedges et al (1994b). However, he admitted that resource inputs were used effectively only in certain circumstances when the coefficients were positive and significant. Hanushek & Hedges et al. agreed on "effective resource use," in Hanushek's (1996a) words, or "how money matters" in the words of Hedges et al (1994). On the two sides, both the researchers concluded that expenditures did matter somehow or sometimes. However, they did not agree on the direction, strength, or consistency of the relationship between expenditures and student achievement.

Furthermore, Greenwald et al., 1996) conducted a meta-analysis of studies of EPF equations. The study concluded that a wide series of resource inputs had positive influences on student achievement. The large effect sizes of resource inputs on student achievement were such that reasonable increases in expenditures might be linked with the significant increases in achievement.

The discussion on PSEx continued. Eide & Showalter (1998) conducted a research on this issue and used the quintile regressions in estimation. The study found larger effects of PSEx for the bottom end of score distribution than for the rest of distribution in math scores. Therefore, the study showed that SRIs had heterogeneous effects on students with different achievements. However, some experimental research suggested that a type of expenditures in the form of small class size had a significant effect on student achievement (Krueger 1999). Furthermore, Guryan (2000) used a quasi experimental research design. This study found that performance of the students in the elementary schools of Massachusetts increased with the increase in school funding.

The analysis of cross-country data leads to the conclusion that the correlation between expenditures and student performance was at best weak and sometimes non-existent (Hanushek, 2003; Pritchett, 2004; Wobmann, 2003). Likewise, Levacic et al, (2005) concluded that PSEx had not an impact on student achievement in KS3 English. However, the study showed it had a statistically significant positive effect on KS3 achievement in math and science. Similarly, Tow

(2006) found through the analysis of cross-sectional and panel data that, there was significant, though small, effect of school funds on student achievement.

Afterwards, Kang (2007) examined the effect of private educational expenditures on student achievement. The study implied that a 10 percent increase in expenditure on private tutoring lead to a 0.56 percentile point improvement in the test score. This amount of effect, evaluated at the mean value, was equivalent to a 1.1 percent increase in test score.

Lips, Watkins & Fleming (2008) also discussed the PSEx issue. The study described that it has been recognized that any effect of PSEx on academic achievement depends on how the money is spent, not on how much money is spent. In Hanushek's words, "Few people would recommend just dumping extra resources into existing schools. America has…followed that program for several decades, with no sign that student performance has improved…" (p. 4). The study stresses on the effective use of funds.

In summary, it can be said that some of the above studies treated the increased expenditures as an indicator of progress. These studies found a considerable relationship between expenditures and student achievement as more expenditure provided smaller class size and more qualified teachers (Ahmad, 1993; Hedges, Laine, & Greenwald, 1994; Greenwald, Hedges, & Laine, 1996; Hedges & Greenwald, 1996; Eide & Showalter, 1998; Krueger, 1999; Guryan, 2000; Tow, 2006; Kang, 2007). However, others insisted that the correlation between expenditures and the student achievement was weak or non-existent because schools did not effectively use the funds to improve the learning environment (Hanushek, 1989a; 1989b; 1994; 1996a; 1996b; 2003; Pritchett, 2004; Wobmann, 2003; Lips, Watkins & Fleming, 2008). Furthermore, some of the researchers found mixed results (Levacic et al., 2005). Therefore, it remains a controversy among educational researchers.

The main concern of many researchers and policy makers was to enlighten the mechanisms through which school expenditures could efficiently promote learning. However, the researchers of both types of the studies disagreed on the extent to which school expenditure improved student achievement.

2. Student Teacher Ratio

It is easy for a teacher to teach, evaluate and feedback if students are lesser in number in a classroom. It is considered that lower student teacher ratio (STR) gives better results than those of higher STR. However, there are many cases where higher STR results in higher scores. Likewise, there are also examples of lower STR achieving lower scores. Overall, STR is one of the most important variables in the teaching learning process.

Since 1985 when "The Student Teacher Achievement Ratio (STAR)" project in Tennessee started to conduct, research discussions and conclusions about STR and class size gave many different suggestions. The STAR project was conducted in grades K-3 with the sample of 6,829 students. Students were assigned randomly to either a regular class of 22-26 students with one teacher (STR), a class of 22-26 students with one teacher (STR) and an instructional aid, or a low-size class of 13-17 students with a teacher (STR). The study found that academic achievement was increased significantly in the smaller class size (lower STR) in the regular classes. However, there were no positive results found for the regular size classes with the additional instructional aid.

Many other research studies, particularly Tennessee's Project Challenge (Achilles, Nye, & Zaharias, 1995) and Wisconsin's SAGE program (Maier, Molnar, Percy, Smith, & Zahorik, 1997; Molnar, Smith, & Zahorik, 1998) were conducted. In the SAGE classrooms, analysis of the average performance of students in grade-1 during 1996-97 and 1997-98 recommended the lower STR. Likewise, the analysis found the negative student achievement because of the poverty. Although the SAGE classrooms enrolled more students and facilitated with subsidized lunch, yet these classrooms got a higher level of student achievement as compared to the other school classrooms.

Hanushek (1998) confused STR with class size. At the first place, the study stated that "First, STR's are not the same as class size" (Hanushek, 1998, p. 12). Then, Hanushek (1998) made ambiguous the boundary between class size and STR and described, "These econometric estimates relate class size or teacher intensity to measures of student performance" (p. 20). Furthermore, Hanushek made a summary of the findings of 377 econometric studies of the determination of student performance. He confused class size and STR differences, 277 studies reflected on STR. Hanushek (1998) found that if class size systematically matter, there was a 15% significant correlation between teacher strength and student performance. However, Lee & Barro (1998) concluded that more SRIs had a positive relationship with student performance while applying the strongest results to STR.

Alderman, Orazem & Paterno (2001) contributed to this discussion. The study concluded that higher STR had a consistent negative effect on student achievement particularly on language skills. However, Graddy and Stevens (2003) concluded that STR was the important determinant of fees and the parents, who chose schools with lower STR. Overall, schools achieve better results after controlling for other school and student characteristics. Levacic et al, (2005) conducted a study on KS 3 and found that reduction in the STR had a statistically significant positive effect on math achievement. However, science achievement had not any impact on student achievement in English.

The studies about the effects of STR on student achievement are summarized here. The discussion about STR started from the STAR project, 1985. This gigantic study found that smaller class size and the lower STR have impact on student achievement. Tennessee's Project Challenge (Achilles, Nye, & Zaharias, 1995) and Wisconsin's SAGE program (Maier, Molnar, Percy, Smith, & Zahorik, 1997; Molnar, Smith, & Zahorik, 1998) also recommended the lower STR. Many studies concluded that STR has some positive effects (Lee & Barro, 1998; Graddy and Stevens, 2003). However, Hanushek (1998) and Alderman, Orazem & Paterno (2001) concluded the negative effect of STR; whereas, Levacic et al, (2005) showed mixed results. The researchers have yet, not agreed upon a point of view that the lower STR have an impact on academic achievement.

Based on the above discussion, the policy decision about STR is not simple to decide because of scarce funds provisions.

3. Class Size

Discussion about the class size has developed to a considerable body of research on class size reduction because of expenditures it increases.

STAR project in Tennessee was conducted on the class size effect. It was a longitudinal study (1985-1989) of math and reading achievement. The study included 6,829 K-3 students as the sample of the study. Students and teachers were randomly assigned to the classes of different sizes from Kindergarten to Class III. Then students were randomly assigned to smaller and larger classes (Word et al., 1990). STAR recommended the positive achievement effect of small class size during the lower classes or early school years. However, there was no evidence about the class size effects in the later or higher classes.

Many other studies analyzed the STAR data and drew conclusions. According to Mosteller (1995), the effect of class size on student achievement is very large in the STAR project experiment. Likewise, students out performed in the small classes in the regular and the regular with aid classes by a great margin. However, the students carried out and continued their better performance after returning to the regular classes. Their performance was better than those students who remained in a regular class size with or without a teacher's aid. Similarly, Krueger (1999) analyzed the STAR project experiment and found that smaller class size positively affected the standardized test scores. With the passage of time, this effect increased. However, this effect was larger for the beneficiaries of the free lunch program and the minority students. Similarly, Nye, Hedges, & Konstantopoulos (1999) concluded that the benefits of small classes remained significant for at least five years after the students enter regular classrooms.

Mitchell et al (1989) developed six models and six theories of how class size affects student achievement. Three of them emphasize on a direct correlation between larger class size and declining achievement test scores. Furthermore, these theories are "Greater Instructional Overhead," "Increased Student Interaction Time" and "Decreased Access to Fixed Instructional". These theories suggest that addition of more students to a class lessens the teacher effectiveness. However, the other three theories emphasize that the correlation between more students and the altered classroom performance is indirect. These theories are "Class Heterogeneity," "Instructional Pacing," and "Student Grouping or Achievement Modeling". There are some other factors rather than the number of students; those are the causes for effects. These factors are associated with the student assigning to large and small class sizes.

Most of the other studies of class size were also conducted at the lower grades including STAR. Finn & Achilles (1999) was conducted at the primary level. The study concluded that small class size increased the student math performance by about one third of a standard deviation. Many studies of class size reduction were carried out in Wisconsin (SAGE Program) and North Carolina. These studies described significantly higher achievement test scores in the smaller classes than in the larger classes of primary grades (Molnar, Smith, & Zahorik, 1998; Molnar et al., 2000). Likewise, Krueger & Whitmore (2001) conducted a follow up analysis of small class size in the lower grades and concluded positive effects in the later period. Small class size in the lower grades directed to take a college entrance exam with higher probability but to some extent higher test scores, especially for minority students.

Furthermore, Angrist and Lavy (1999) used a regression discontinuity design to analyze the effect of class size on student achievement. The class sizes was determined by the "Maimonides' rule" in Israel. According to that rule, the maximum class size is 40. Two classes are automatically created if the total enrollment is greater than 40. Likewise, there will be three classes if the numbers of students are greater than 80 and so on. The researchers exploited these irregular changes. This study found that class size has a positive and significant effect on student achievement in Reading comprehension and mathematics.

Some researchers exposed that students in the large classes desired to spend less time on class assignments (Blatchford & Mortimore, 1994; Klein, 1985). However, students in smaller classes desired to participate more time in addition to spending more time on schoolwork.

The class size is large in the developing countries and the Asian countries. Hanushek (1995) described that one of the biggest problems faced by large classrooms is the quantity and quality of learning material available to all the students, in the developing countries. According to Biggs (1999) and Jin & Cortazzi (1999), class size in the Asian countries is quite large. However, the students in these countries consistently get highest scores in international math achievement tests. In Singapore and China, students from elite classes get higher scores than the average. Similarly, class size is also larger in the TIMSS participant countries than the international average. However, the achievement levels are above the international average. Furthermore, the ethnographic studies show that Japanese and Chinese teachers note little relationship between class size and learning outcomes in schools. However, many researchers suggested that the success of large classes in China and Japan is due to the central role of groups in the Confuscian heritage. Likewise, Benbow, Mizrachi, Oliver & Said-Moshiro (2007) described that large class size is an inevitable feature of the developing countries. The study found that there is the substandard teaching and learning process in these countries. This process can be improved by enhancing the capability of teachers and school leaders to handle this setting and identifying ways for students to be successful.

Fuller & Clarke (1994) also contributed his part to this discussion. Fuller & Clarke (1994) described that class size effects in the upper grades were not evident from the data of many countries, including Botswana, Philippines, and Thailand. However, in Tanzania, there found a positive effect of class size on achievement. Furthermore, Bonesronning (2003) investigated the effects of class size on student achievement in Norway. Contrary to Fuller & Clarke (1994), Bonesronning (2003) found that effect varies among student sub-groups. This effect was larger in schools with a higher proportion of students from intact families; however, it was conditional on student effort.

The discussion continued whether small class size has an impact on student achievement. Rivkin et al, (2000) concluded that effects of class size were small. The study also concluded that it raised doubts whether more funds would raise achievement significantly. This seemed impossible under the existing organizational structures of institutions. However, Michaelowa

(2001) concluded an inverse correlation between class size and learning outcomes. It showed the decreased student learning with the increased class size; however, learning effectively stopped as once class size exceeded 62.

Furthermore, Finn (2003) concluded that the students became occupied in the small class size, both academically and socially. Therefore, their strong engagement caused academic achievement improved. Similarly, Lindahl (2005) found the significant effects of smaller class sizes on student achievement. The study examined the effect of class size in natural variation by using longitudinal approach. The study used a sample of a total of 556 students in 16 schools in Stockholm. The students were examined by a standardized test in mathematics on three occasions. The average student's percentile rank was between 0.37 and 0.98 units (depending on model specification) with a reduction in class size by one student. The study also showed more gains for immigrant students than native Swedes from the smaller class sizes.

Afterwards, Hanushek (2006) studied resource policies in the developing as well as the developed countries especially USA. The study concluded that policies, in general, concerning the resource inputs did not improve the student performance. However, small classes or additional resource inputs had an impact in some situations. Likewise, the use of resource inputs could be improved with the altered sets of incentives. However, Tow (2006) analyzed the cross-sectional and panel data of research study on the school funding and its effects on the student achievement. The study found that class size was found as one of the important indicators of student achievement.

Here is the summarized discussion about the studies of the effects of class size on student achievement. The discussion about the class size started from STAR project since 1985. The STAR project recommended lower STAR. Afterwards, most of the studies concluded that smaller class size has significant impact on student achievement (Klein, 1985; Mitchell et al, 1989; Blatchford & Mortimore, 1994; Mosteller, 1995; Angrist & Lavy, 1999; Finn & Achilles, 1999; Krueger, 1999; Nye, Hedges, & Konstantopoulos, 1999; Michaelowa, 2001; Bonesronning, 2003; Finn, 2003; Lindahl, 2005). However, some studies found very small or no effect of class size (Hanushek, 1995; Rivkin et al, 2000; Hanushek, 2006). Likewise, class size effects in upper grades were not evident (Fuller & Clarke, 1994). Contrary to the above, class size in the Asian countries is quite large; however, the students in these countries consistently get highest scores (Biggs, 1999; Jin & Cortazzi; 1999). The teaching and learning process in the developing countries is substandard. This is the key and real issue. However, this process can be improved by enhancing the capability of teachers and school leaders to handle this setting and identifying ways for students to be successful (Benbow, Mizrachi, Oliver & Said-Moshiro (2007).

The researchers are still not agreed on this issue. It is concluded that significant reductions in class sizes may have considerable and lasting positive effects on students, particularly in the developing countries and the low-income students.

Research Objectives

1. To identify student enrolment and numbers of teachers for calculating student teacher ratios and class sizes.

2. To identify recurring expenditures of the session 2006 to 2008 at the secondary stage.
3. To identify prior achievement of students
4. To identify academic achievement
5. To identify the simple relationship (association) between the independent variables i.e. student teacher ratio and class size, and the dependent variable academic achievement
6. To find out the causal-relationship between the independent variables and dependent variables.

Data Resource and Methodology

Population of the study comprised of all the 4801 secondary schools, all the secondary teachers and all the secondary students in Punjab. A total of 288 secondary and higher secondary schools, 10 teachers and 20 students from each school were the sample of the study. However, a total of 2460 teachers and 4860 students participated in the study. Two instruments "School Profile Proforma" and "Result Sheet" were developed. The study used the longitudinal data of academic achievement of the same students. Mean of the annual marks of the classes VI, VII & VIII (session 2003-06) was used as the prior achievement (PA) of the students. However, marks of class X (The Annual SSC Examination 2008) were used as academic achievement of the secondary stage (session 2006-08). This data were collected through the result sheet. Furthermore, other instrument "School Profile Proforma" was used to identify the student enrolment. Afterwards, the student teacher ratios and class sizes were calculated. The collected data were summarized at the school level. Then this summarized data showing the between school variation was carried into the SPSS data file to analyze the data. The Pearson Correlation Coefficient was used to analyze and find out the value of relationship between SRIs and academic achievement. However, the Stepwise Regression Analysis was used to analyze and find out the differential impact of SRIs on academic achievement.

Results and Discussion

There is much variation in the allocation of per student expenditures, student teacher ratio and class size in Punjab.

Table 1: Summary

Name of the Variable	Total Sample			Urban Areas			Rural Areas		
	Max.	Min.	Mean	Max.	Min.	Mean	Max.	Min.	Mean
PSEx (rupees)	98412	1501	12457	39450	1501	8314	43656	3622	14925
STR	92	6	28	92	15	18	38	6	18
Class Size	97	11	48	97	34	61	62	11	35
PA (Science Students)	687	347	556	681	465	580	687	347	523
PA (Arts Students)	660	320	488	660	357	503	630	320	469
Academic Achievement (Science Students)	643	347	506	639	411	530	643	347	473
Academic Achievement (Arts Students)	611	291	422	611	300	436	567	291	406

Table 1 shows Table 1 shows the misallocation of these indicators of resource inputs into schools. It is also evident that the mean of the PSEx in the rural areas is much greater than the PSEx in the urban areas. Contrary to it, mean of STR and class size is lower in the rural areas and higher in the urban areas. Furthermore, mean of the academic achievement of students is lower in the rural areas but higher in the urban areas.

From the summary table, it is evident that PSEx, STR and class size are misallocated among schools. This misallocation cause the following

1. Deficient use of the resource inputs in the ineffective schools where PSEx is much higher with the lower STR and class size.
2. Inefficient use and misuse of resource inputs in the overburdened schools where PSEx is much lower with the higher STR and class size. Furthermore, quality is compromised in these schools.
3. The deficient use, inefficient use and misuse of resource inputs are the factors that cause the wastage of resource inputs.
4. Quality of academic achievement is compromised in both types of schools i.e. ineffective schools and overburdened schools. Therefore, academic achievement remains lower in both types of schools.

Table 2: Relationship (Association) of Per Student Expenditures

Correlation			
No. of Schools: (Arts Students)--N = 258 (Science Students)—N = 252		Academic Achievement	
		Arts Students	Science Students
Per Student expenditure (PSEx)	Correlation	-.144	-.315
	Sig.	.186	.004**

Table 2 presents the magnitude of correlation between per student expenditures (PSEx) and academic achievement as measured by the Pearson correlation coefficient. The value of relationship for science students is significant but it is insignificant for arts students. However, the relationship is negative for both types of students.

Table 3: The Differential Impact of Per Student Expenditures

Coefficients [a]			
No. of Schools: Arts Students--N = 258		t	Sig.
Science Students--N = 252			
Per Student Expenditures	Arts Students	-2.750	.006**
	Science Students	3.303	.001**
a. Dependent Variable: Academic Achievement			

Table 3 presents the magnitude of the differential impact of PSEx on academic achievement as measured by the Stepwise Regression analysis coefficient. The t-value is significant for both types of students. However, the relationship is positive for science students and negative for arts students.

Table 4: Relationship (Association) of Student Teacher Ratio

Correlation		
No. of Schools: (Arts Students)------N = 258 (Science Students)—N = 252	Academic Achievement	
	Arts Students	Science Students

Student Teacher Ratio	Correlation	.007	.276
	Sig.	.949	.000**

Table 4 presents the magnitude of the correlation between the student teacher ratio (STR) and academic achievement as measured by the Pearson correlation coefficient. The value of relationship is positive for both types of students. However, the relationship is significant for science students but it is insignificant for the arts student.

Table 5: The Differential Impact of Student Teacher Ratio

Coefficients [a]			
No. of Schools: Arts Students--N = 258, Science Students--N = 252		t	Sig.
	Science Students	2.777	.006**
Student Teacher Ratio		Excluded Variable	
	Arts Students	1.195	.233
a. Dependent Variable: Academic Achievement			

Table 5 presents the magnitude of the differential impact of STR on academic achievement as measured by the Stepwise Regression analysis coefficient. The t-value is significant for only science students; however, it is insignificant for arts students. Therefore, the Stepwise Regression model has excluded STR because it is insignificant for arts students. Furthermore, the positive t-value shows the positive impact on academic achievement for both types of students.

Table 6: Relationship of Class Size

Correlation			
No. of Schools: (Arts Students)-N = 258, (Science Students)—N = 252		Academic Achievement	
		Arts Students	Science Students
Class Size	Correlation	.166	.343
	Sig.	.127	.001**

Table 6 presents the magnitude of correlation between class size and academic achievement as measured by Pearson correlation coefficient. The value of relationship is positive for both types of students. However, it is significant for science students and insignificant for arts students.

Table 7: The Differential Impact of Class Size

Coefficients [a]			
No. of Schools: Arts Students--N = 258, Science Students--N = 252		t	Sig.
Class Size		Excluded Variables	
	Arts Students	-.320	.749
	Science Students	-1.077	.283
a. Dependent Variable: Academic Achievement			

Table 7 presents the magnitude of the differential impact of class size on academic achievement as measured by Stepwise Regression analysis coefficient. The t-value of class size is insignificant. However, the direction of the impact is negative for both the arts and science students.

Discussion

The discussion about per student expenditures, student teacher ratio and class size are as under:

Per Student Expenditures

From the results of the study, it is evident that the relationship of per student expenditures (PSEx) with academic achievement is significant only for science students. However, this relationship is in the negative direction in for both types of students. Likewise, the impact of PSEx is significant for both types of students. The negative t-value shows negative impact for science students but the positive t-value shows positive impact for arts students. Therefore, the study finds the mixed effects. Actually, the funds are misallocated. There are discrepancies in the allocation of SRIs to schools. The results show that the average PSEx is very low in the urban areas with higher academic achievement. However, the average PSEx is very high in the rural areas with lower level of academic achievement. Therefore, it means that more funds have the negative effects. However, PSEx may have positive and significant effects, if SRIs are allocated with a well-defined policy and if used at the optimal level of usage.

The findings of the study do not support Coleman report (1966) that started discussion about school expenditures. Coleman report (1966) found that PSEx showed very little relation to achievement if the social background and the attitudes of individual students and their schoolmates were held constant. The findings of the study also do not support Hanushek (1989a; 1989b; 1991; 1994; 1996a; 1996b; 2003), Pritchett (2004), Woßmann (2003) and Lips, Watkins & Fleming (2008). According to these studies, the relationship between school expenditures and student achievement is weak or non-existent because schools do not effectively use funds to improve the learning environment.

The findings of the study for science students are not in line with the findings of many studies (Ahmad, 1993; Hedges, Laine, & Greenwald, 1994; Greenwald, Hedges, & Laine, 1996; Hedges & Greenwald, 1996; Eide & Showalter, 1998; Krueger, 1999; Grissmer, 2000; Guryan, 2000; Tow, 2006 and Kang, 2007). However, the findings of the study for arts students are in line with the findings of these studies. These studies concluded that there was a significant relationship between school expenditures and student achievement. Furthermore, the findings of the study do not support Iida et al (2002) that concluded that teaching expenditure had no significant effect. The findings of the study are in the line with Levacic et al. (2005) that PSEx had the mixed effects on student achievement in KS3 English.

Student Teacher Ratio

The direction of correlation and t-value of student teacher ratio (STR) is positive. The relationship and the differential impact of STR are significant for science students. However, these are insignificant for arts students. The positive direction of both the correlation and the differential impact means that higher STR produces the higher level of academic achievement.

Likewise, the study found that the urban schools with higher STR achieve higher level of academic achievement. However, the rural schools produce lower level of academic achievement with the lower STR. It is a serious problem in the education system. Furthermore, the study found that the average STR in the 288 schools is 28 at secondary stage. However, it is 18 in the rural areas and 37 in the urban areas. This misallocation of STR between the rural and the urban areas is a great discrepancy.

Usually, the theoretical concept is that lower STR produces higher level of academic achievement, and higher STR produces the lower level of academic achievement. There are the some other factors that influence the efficiency of STR. In the rural areas, it is the weaker prior ability, the weaker SES and the weaker prior school environment that lowers academic achievement. Likewise, it is the stronger prior ability, the stronger SES and the stronger prior school environment that enhance academic achievement in the urban areas. It is derived that if these factors are controlled, STR may have a significant negative effect on academic achievement.

The findings of the study about STR are not in line with the findings of Lee & Barro (1998), Hanushek (1998), and the Student Achievement Guarantee in Education (SAGE) program (Maier, Molnar, Percy, Smith, & Zahorik, 1997; Molnar, Smith, & Zahorik, 1998), Grissmer (2000), Graddy & Stevens (2003) and Levacic et al (2005). Furthermore, the findings of the study support Alderman, Orazem & Paterno (2001) that high STR had a uniform negative effect on student achievement.

Class Size

The study found positive direction of the relationship of class size with academic achievement. The positive relationship shows that larger class size produces the higher level of academic achievement. Likewise, smaller class size produces the lower level of academic achievement. Furthermore, the study also identified an average class size in the rural areas is 35; however, it is 61 in the urban areas. In the rural areas, class size is smaller with lower level of academic achievement. However, there is larger class size with higher level of academic achievement in the urban areas. This is a serious problem. Furthermore, it is also the possibility that the schools where effective teachers and head teachers struggle hard, larger class size may produce higher level of academic achievement. On the other hand, the schools where teachers and head teachers do not work hard, smaller class size may produce lower level of academic achievement.

Usually, the theoretical concept is that smaller class size produces higher level of academic achievement, and the larger class size produces the lower level of academic achievement. Some other factors influence the efficiency of small class size. It is the weaker prior ability, the weaker SES and the weaker prior school environment that lowers academic achievement in the rural areas. Likewise, it is the stronger prior ability, the stronger SES and the stronger prior school environment that enhance academic achievement in the urban areas. It is derived that if these factors are controlled, smaller class size has a significant effect on academic achievement.
Furthermore, the negative direction of t-value shows that smaller class size has a negative impact on academic achievement; however, the impact is insignificant for both types of students.

The findings of the study are consistent with those of Fuller & Clarke, (1994) that class size effects in the upper grades are not evident in the research studies from a variety of countries, including Botswana, Philippines and Thailand. Likewise, the findings of the study are also in line with the findings of Biggs (1999) and Jin & Cortazzi (1999). According to these studies, class size in the Asian countries is quite large; however, the students in these countries consistently have been getting higher scores in the international math achievement tests. Similarly, the study supports Rivkin et al. (2000) that class size effects are small, raising serious doubts that the additional expenditures would substantially raise the student achievement under the current institutional structures.

Conclusions and Policy Implications

In most of the rural schools, per student expenditure (PSEx) is higher owing to very less student enrollment and it is lower in most of the urban schools owing to higher student enrollment. This is the misallocation of SRIs per student; therefore, PSEx has the negative impact. In this way, SRIs are deficiently used that means that a large portion of the benefits of SRIs are being wasted and remained un-used in the schools where PSEx is very high. Likewise, the school where the student enrollment is very high but PSEx is very low, students can not learn efficiently; therefore, the quality of education is compromised. These both of the situations are harmful for the quality education.

PSEx is an indicator of the provision of the other SRIs. The effectiveness of PSEx depends upon the fairly allocation and the efficient use of the SRIs provided to schools. However, it is not the situation in the present education system of Pakistan.

The schools with the better academic environment have higher STR owing to students' rush and the average academic achievement of students is higher. However, the schools with the poorer academic environment have the lower STR owing to lower enrollment of students and the average academic achievement is lower. Therefore, the higher STR produces higher academic achievement and the lower STR produces lower academic achievement. The misallocation of STR is the main cause that shows the misleading impact of STR. This discrepancy is very expensive and is very harmful for the present education system.

The less productive schools with lower academic achievement attract only a small number of students; therefore, class size remains lower. Unlike, productive or higher productive schools with better academic achievement attract a large or very large number of students, therefore, class size rises. These are the misleading factors about the impact of class size. Therefore, there is only a small impact of small class size. This discrepancy is also very expensive and is very harmful for the present education system.

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