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The Impact of Number of Students per Teacher on Student Achievement

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Abstract

Effectiveness of teachers has a crucial place in education and it is usually evaluated based on students' achievement. The focus of teacher effectiveness has been primarily on quality of teachers and how teachers instruct. However, there are external factors that influence teachers' effectiveness like the number of students per teacher. The goal of this study was to identify if there is a significant correlation between number of students per teacher and students' achievement. In the study, the data for the number of students per teacher was obtained by dividing the total number of students in high schools by the total number of teachers in high schools in every city of Turkey. The data for students' achievement was based on each city's achievement ranking on Turkey's Transition to Higher Education Exam. Spearman Rho's analysis was conducted to see if there is a correlation between these variables. The result of the analysis showed a significant correlation of $-.561$. This moderate negative correlation between the student teacher ratio and achievement revealed that the cities with greater number of students per teacher tend to have a low achievement on Turkey's Transition to Higher Education Exam. The result suggested more teachers should be hired in order to decrease the number of students per teacher so that students' achievement can enhance.

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Keywords: Effectiveness of teachers, student teacher ratio, academic achievement, YGS, high school education.

1. Introduction

Teachers are a basic part of educational system as having a vital and decisive role in the quality of education and how well students learn. There might be seen a general public opinion that relates the level of students' learning to how much they study and do their homework. Nevertheless, students' success in course grades and general exams, in other words their academic achievement can be affected by many factors. Effectiveness of teachers in teaching

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their classes is a very important one of these factors that considered as the most important school related factor in increasing students' performance and success (Miles, 2011). Therefore, it is worthwhile to examine the factors that impact teacher quality or teacher effectiveness and how such factors affect students' academic achievement eventually.

The effectiveness of teachers and their contribution in producing a high quality education has been studied by many researchers. In those studies, researchers have focused on teacher-student interaction as an important aspect of a good education and academic achievement (Graue, Rauscher & Sherfinski, 2009). Among such researchers, Hamre et al. (2007) and La Paro et al. (2004) viewed social and academic interaction between teachers and students as a crucial determinant of the academic success. The interaction between teachers and students is generally believed to be affected by characteristics of teachers and students. However, there are some other aspects that affect this interaction like the number of students per teacher in a school.

Number of students per teacher is generally associated with class size and it is mainly believed that smaller classes provide a better teaching and learning. This belief has been shared by many countries like the USA, European countries, China, Japan, and many other countries and they made policies to reduce their class sizes (Blatchford & Lai, 2012). The average class size has been decreased in many countries; the decrease between 2000 and 2010 in lower secondary education class size has been quite high for some countries like 33.9% for Portugal, 27 % for Spain, 20% for Japan, 17% for Korea, 13.2% for United States. Nevertheless, there is still a big difference between class sizes of the countries. Amongst the OECD countries, the average class size at the lower secondary level is 23. There are countries like Finland, Iceland, the UK with class sizes of 19 and lower and countries like Turkey, Korea and China with class sizes of 28, 34 and even 54 (OECD, 2012).

The policies to reduce the class size are generally received well by many; it is generally supported by parents, teachers, administrators and consequently policy makers (Graue, Rauscher & Sherfinski, 2009). One of the most of important reasons behind such policies is that common support, which is based on the belief that smaller classes positively impact the academic achievement of the children. That support is primarily based on the research that advocates the benefits of smaller class size. The research behind the class size is plenty since such studies started a couple of decades ago and still researchers do various studies about different sides of this topic on different academic levels.

Among these studies, the STAR project that is implemented by the Tennessee State Department and CSPAR project which is done in the United Kingdom are the significant studies that show the importance of class size on academic achievement. The STAR project demonstrated that kindergarten and primary school students in small size classes with 13-17 students had significantly higher test scores than students in regular classes with 22-25 students (Word, Jahnston, Bain, Fulton, Zaharias, Achilles, Lintz & Folger, Breda, 1985-1990). The CSPAR project is a more recent non-experimental longitudinal study that also observed primary school students for 11 years to see the effect of class size on academic achievement. The study found that class size noticeably affects the academic success of students in both mathematics and literacy (Blatchford, 2003).

Both of these huge projects clearly show the influence of small class size on academic achievement of children and there are many other studies showing the positive impacts of class size on students. Nevertheless, some researchers concluded that this academic achievement cannot solely be the result of the small class size. They suggest that number of students in a classroom has an influence on the classroom process, course activities, students' engagement and consequently students' learning. However, the real reason behind the academic achievement is that; small class size actually gives teachers the opportunity to spend more time with each student which more directly affects their learning and academic success (Croll & Hastings, 1996). In fact, such judgments reveal that other than class size, the student teacher ratio is an important aspect to look since that factor actually indicates the time a teacher can spend on each student.

Student teacher ratio is understood by many as class size; though they are similar, they are not exactly the same thing. Class size is the number of students attending a class or in general terms, the average number of students in a classroom. Student teacher ratio is number of students per teacher or in other words the average number of students

a teacher instructs in a school (Graue & Rauscher, 2009). Therefore, a country, a city or school with small class size may not always have a low student teacher ratio or vice versa. For example, a teacher might teach in small size classes but can be assigned to teach in many classes so, in such a situation the class size can be small but the student teacher ratio can be high and there can also be cases with the opposite situation.

In schools with smaller student teacher ratio, teachers can have more time to spend with each student and check the progress of every student they are responsible and can provide a more individualized teaching that is more suitable to each student (Johnson, 2011). There are lots of studies about class size but not that much about student teacher ratio although student teacher ratio is at least as important as the class size. Furthermore, the factors behind the students' performance in the Transition to Higher Education Examination (YGS) in Turkey hasn't been studied much, even though it is a quite important exam for all high school students and graduates since that exam is the main determinant for being admitted to a college in Turkey. Therefore, in this study we wanted to examine the correlation between student teacher ratio and student achievement among high school students who took Turkey's Transition to Higher Education Examination.

2. Method

In this study, we conducted a correlation analysis by using existing data gathered from Ministry of National Education of Turkey and Student Selection and Placement Center. These data included the average number of students per teacher among 81 cities of Turkey and ranking of these cities in the Transition to Higher Education Exam. The data about the average number of students included the educational years of 2009-2010, 2010-2011, 2011-2012, and 2012-2013. Achievement rankings of the 81 cities were based on the results of the Transition to Higher Education Examination results in 2013.

Ministry of National Education keeps the records of educational statistics in Turkey and publishes yearly reports about those statistics. These reports include information such as number of students among different grade levels, number of teachers in different type of schools, number of schools among cities etc. Ministry of National Education collects the data via their own system called "e-school" which is the system that the work and the operations related to the education and administration in the schools of Turkey are stored and performed. The number of students per teacher is gathered through dividing the total number of students by the total number of teachers for every city of Turkey. It simply gives the average number of students per teacher in national level and for each city (Republic of Turkey Ministry of National Education, 2010, 2011, 2012, 2013).

The high school education in Turkey is four-years, and students who want to go to college can take the Transition to Higher Education Examination (YGS) in their senior year or after graduating from high school. Student Selection and Placement Center of Turkey conducts this exam once a year. Transition to Higher Education Examination (YGS) includes 160 questions in total and these questions are divided to the subjects of literature, social sciences, mathematics, and science (40 questions for each subject). Students have to complete this exam within 160 minutes. The minimum score that can be gathered from this exam is 100 points and maximum score is 500 points. Like the Ministry of National Education, Student Selection and Placement Center also reports yearly statistics about students' achievement on the exam. In their reports, they include data such as number of students who took the exam, average scores on different subjects, achievement rankings of cities etc. Achievement scores of the all cities in Turkey are calculated by taking the average score of the all students in each city and these scores and ranks of cities are reported in their official web-page (Student Selection and Placement Center, 2013). In this study, we used the achievement ranking of 81 cities in Turkey for the year of 2013 since it was the most recent exam.

In order to get the appropriate average number of students per teacher for our study, we calculated the average number of students per teacher in the educational years of 2009-2010, 2010-2011, 2011-2012, and 2012-2013. The logic behind this calculation was to find out the average student/teacher ratio for all of the high school years of the senior students, who took the Transition to Higher Education Examination in 2013.

The correlation between the average number of students per teacher among 81 cities of Turkey and ranking of those cities was calculated by Spearman's Rho analysis. We used this nonparametric test and it made it possible for

us to find out the correlation between an ordinal and ratio variables.

3. Results

The correlation was analyzed between the average number of students per teacher among 81 cities of Turkey and ranking of those cities in the Transition to Higher Education Examination (YGS). In our results, the Spearman's Rho correlation was $-.561$ with the significance level $.000$ which means that there is a significant moderate correlation between these variables.

Table 1. The Spearman's Rho Correlation between student number per teacher in each city and YGS ranking of cities

		YGS ranking of cities	Average student number per teacher
YGS ranking of cities	Correlation Coefficient	1.000	$-.561^{**}$
	Sig. (2-tailed)	.	.000
	N	81	81
Average student number per teacher	Correlation Coefficient	$-.561^{**}$	1.000
	Sig. (2-tailed)	.000	.
	N	81	81

** . Correlation is significant at the 0.01 level (2-tailed).

The negative correlation between the average student number per teacher and ranking of 81 cities of Turkey can be clearly seen in the Figure 1. The cities which have lower number of students per teacher tend to have a higher ranking on the YGS and the cities which have higher number of students per teacher generally have low achievement rankings on the YGS.

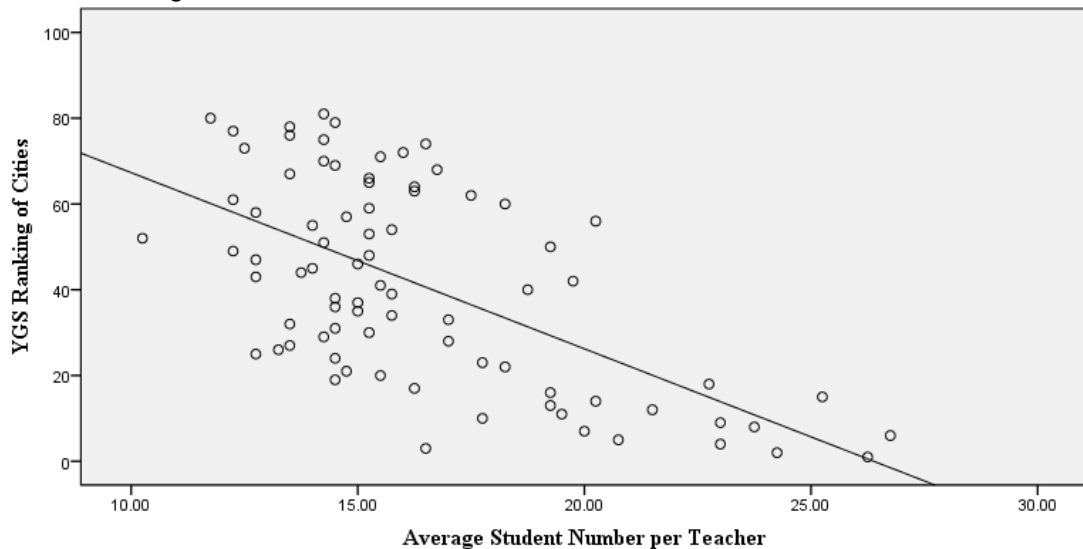


Figure 1. Average number of students per teacher in each of 81 city by YGS ranking of cities (Rankings of cities are in reverse order. Higher number of ranking indicates that the city has higher scores.)

4. Discussion

We found a negative correlation between student teacher ratio and achievement ranking of cities in the Transition to Higher Education Examination. The 81 cities in Turkey are ranked according to their success in the Transition to Higher Education Examination (YGS). The negative correlation indicates that as the average number of students per teacher decreases, a city gets a better ranking. Figure 1 and Table 2 noticeably shows the correlation between the student teacher ratio and the academic achievement of the students for each city. Furthermore, when you closely examine Table 2, it can be clearly seen that the majority of the cities that rank in the last 15 have a

teacher student ration bigger than 20 and most of cities that rank in the first 15 have teacher student ratio below 15. These numbers of student teacher ratio can be critical in terms of affecting teachers' effectiveness and student achievement. Hence, it can be suggested to put a limit on student teacher ratio and check its influence on academic achievement which can be examined in another study.

Table 2. Cities' ranking and student/teacher ratio

City	Ranking	Student ratio	City	Ranking	Student ratio	City	Ranking	Student ratio
Ankara	1	14.25	Mersin	28	15.75	Amasya	55	13.50
Karabuk	2	11.75	Aksaray	29	15.25	Giresun	56	13.25
Denizli	3	14.50	Tunceli	30	10.25	Cankiri	57	12.75
Aydin	4	13.50	Bilecik	31	14.25	Ordu	58	14.50
Isparta	5	12.25	Tekirdag	32	19.25	K. Maras	59	17.75
Kirsehir	6	13.30	Sinop	33	12.25	Adana	60	18.25
Eskisehir	7	14.25	Elazig	34	15.25	Artvin	61	14.75
Antalya	8	16.50	Kastamonu	35	12.75	Yozgat	62	15.50
Burdur	9	12.50	Samsun	36	15	Rize	63	14.50
Karaman	10	16	Mugla	37	14	Gaziantep	64	22.75
Kayseri	11	15.50	Trabzon	38	13.75	Duzce	65	16.25
Nigde	12	14.25	Canakkale	39	12.75	Bitlis	66	19.25
Yalova	13	14.50	Hatay	40	19.75	Batman	67	25.25
Bursa	14	16.25	Malatya	41	15.50	Siirt	68	20.25
Balikesir	15	13.50	Kocaeli	42	18.25	Adiyaman	69	19.25
Izmir	16	15.25	Tokat	43	15.75	Igdir	70	21.50
Uzak	17	15.25	Corum	44	14.50	Kars	71	19.50
Kirklareli	18	16.25	Erzincan	45	15	Bingol	72	17.75
Konya	19	16.25	Zonguldak	46	14.50	Diyarbakir	73	23
Bayburt	20	17.50	Manisa	47	15	Agri	74	23.75
Nevsehir	21	12.25	Sivas	48	15.75	Mus	75	20
Kilis	22	18.25	Osmaniye	49	17	Sanliurfa	76	26.75
Erzurum	23	15.25	Bartın	50	13.50	Van	77	20.75
Edirne	24	12.75	Gumushane	51	14.50	Mardin	78	23
Kirikkale	25	14.75	Afyon	52	15.25	Ardahan	79	16.50
Istanbul	26	20.25	Bolu	53	14.25	Sirnak	80	24.25
Kutahya	27	14	Sakarya	54	17	Hakkari	81	26.25

Our finding about the negative correlation between student teacher ratio and academic achievement clearly implies a change in that ratio especially for the cities with very high student teacher ratio. The solution which is hiring more teachers to decrease that ratio is obvious though it can be considered expensive. However, promoting that solution and actually implementing it, may not only have an apparent positive impact on students' achievement but also decrease teachers' workload and make them more enthusiastic about teaching and actually love their jobs. In our study, we did a non-experimental study by using the existing data yet an experimental study can be done in future to examine the correlation between teacher student ratio and academic achievement. Such a study can prove the correlation more evidently and show the importance of student teacher ratio in the educational system.

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