The impact of teacher wages on the performance of students: evidence from PISA

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Abstract

Teacher profile and characteristics are not weightless because student achievements are heavily teacher dependent. In this detailed and in-depth research, the impact of teacher wages on students' achievement was assessed in different ways by using different measuring sticks; starting salary, salary after 15 year of experience, salary per hour of net teaching time and salary ratio to GDP per capita and by using country scores, of 15 year old pupil enrolled in lower secondary school, in OECD member countries. For this propose PISA 2000, 2003 and 2006 survey data of students' scores were used. The independent variables "wages" was regressed on the dependent variable "students total mean country score". The results of these analyses gave an indication that there is a positive impact of teacher wages on students' performance.

Keywords: characteristics, profile, qualities, impact, teacher, learning, achievements, performance, student, salary, wages, gender, PISA, OECD

For every society, to succeed in this rapidly changing world, skilled human capital with a solid base of knowledge is essential and this "refined human capital" can only be produced by developing and sustaining education system according to social demands. For this reason, education of the young generation has become a priority in both developing and developed societies. Hence all stake holders; Parents, Students, Teachers, School Administrators and even whole nation keenly watch the performance of schools where the new generation is educated. Here a question arises; are these schools successfully grooming, developing, moulding, shaping and refining young generation for tomorrow? To answer this query students' and teachers' performance is monitored and evaluated by the concerned authorities and organizations.

Today both societies and social scientists are more interested in schools than ever. Do teachers' characteristics and qualities influence and affect achievements of students? This is the most debated question in the circles of educators and researchers. Its gravity has further increased due to the recent trend and culture of *international or external assessment*; like PISA, PIRLS, PCAP, TIMSS[1] etc. As the present world is shifting rapidly towards *knowledge economy* so for every country skilled human capital with a solid base of modern knowledge is very necessary. This *refined human capital* can only be possible by developing and sustaining education system according to social demands. For this reason, education of the young generation has become a priority in every society.

From a practical perspective, understanding the effects of teacher profile on student performance and achievements can be helpful for administrator, educators and teachers in assuring quality. Equally it can help education researchers in exploring the teacher role in the learning process. Similarly it can help policy-makers in taking good decisions for the betterment of students as well as teachers. Consequently teacher characteristics have taken further weight and new dimensions. Substantial research has already been conducted to dig out the truth.

[1] Programme for International Student Assessment (PISA) Progress i international Reading Literacy Study (PIRLS), Pan-Canadian Assessment Program (PCAP) Trends in International Mathematics and Sciences Study (TIMSS)

There are numerous social, psychological and environmental factors that affect, directly or indirectly, students' performance. These factors are so complex that it is very difficult for a researcher to assess exactly the impact of any one factor separately as all these factors are overlapped, inter-linked and multi-layered. Some factors are student related, some teacher related, some institution while some factors are policy related. Each and every factor has its own importance and one can not totally discard or set a side any of them.

Research showed that learning is affected by multiple factors that can be personal, institutional or social; students' intelligence, skills, potential, learning styles, level of motivation and behaviour; family resources, family attitudes and support; peer group skills, attitudes and behaviour; social trends, nature and level of social interaction of student with the society, use of media; school structure, organisation, resources and climate; curriculum composition and content; and teacher profile, teacher characteristics, teacher skills, knowledge, attitudes and practices. These all factors and many others have cumulative effects on the student achievements, performance, attitude, aptitude, behaviour, reactions and responses. Due to the complex nature of learning process, researchers have been compelled to use data sets and methodologies that provide "*focused or pointed measures"* so as to reduce the "NOISE". Here the term noise means variation in the results caused by other factors that are not understudy. In this way individual affects of any particular factor can be studied and estimated with minimum chance of error.

Teacher's importance is widely accepted because of his/her impact on student learning.[2] The research indicates that improved teacher characteristics are most likely to produce substantial gains in students' performance.[3] There are a wide range of teacher related variables; for example Gender ,Age, Race, Wage, Personality, Behaviour, Attitude, Education, Training, Experience, Job satisfaction, motivation, morale, ability and skill etc. This study examines estimates and evaluates the impact of teacher wages on students' performance using PISA[4] data. Wages is a *"key variable"*, here key variable means a variable that has an intrinsic ability to speak and explain the other variables also. Because teacher wage captures different aspects also: job satisfaction, desirability of profession, preferences, retention, continuation of teaching career and moral of a teacher etc. It is rational that teacher performance cannot be separated from students' performance; achievement during and after

[2] C. Jepsen (2004)
[3] Laura Goe, Leslie Stickler (2008)
[4] See Annex A

schoolings. Despite of this, there are many other important aspects of teacher qualities that can not be capture by indicators merely.

Teacher is a *"Link-Line"* between student and knowledge. In order to study this linkage, both extensive and intensive research work has been done on the impacts of teacher characteristics and students' achievement. These scientific investigations unearthed diversed findings: some studies reported a strong impact of teacher characteristics and teacher related indicators on students' total achievement;

- teacher pre- service training (Kim Creasy 2005)
- the impact of teacher qualification and student performance (Ferguson, 1991)
- Impact of teacher training on the achievement (In-service Training and Teacher Professional Development, OECD 1998, page 17)
- significant effect of teacher wages on student score (M. Sprietsma and F. Waltenberg, 2005)
- teacher specialization in particular subject a powerful predictor of student achievement (Linda Darling-Hammond 1999)
- role of teacher characteristics; education, experience and compensation (Darling-Hammond 2000; Darling-Hammond et al. 2001)
- attractive salaries of teachers and better student performance (Eric Hanushek 2000)
- individual characteristics and school autonomy (R. Robin and Sprietsma, Teachers Matter OECD, 2005)
- importance of motivation, qualification and in-service training (Key Topics in Education in Europe Volume 3, REPORT I- Eurydice, 2002. pp 25)
- teacher quality and fixed effects (Darling-Hammond and Youngs 2002)=
- Wayne and Youngs 2003; J.E Rockoff 2004)
- teacher and peer effects (C. Jepsen 2004).

So improving teacher quality is major concern among educators, master trainers, administrators and policy makers. Results of many past studies on this subject highlight that teachers can impact student achievement, (Darling-Hammond and Youngs 2002), and that,

there are identifiable characteristics of teachers which are predictive of their success in the classroom (Darling-Hammond and Youngs 2002; Wayne 2002; Wayne and Youngs 2003).

Those countries which adopt a salary structure in which "increase in salary incentives" available to teachers at different points in their careers have positive outcomes. Deferred compensation schemes help to attract, retain and motivate high-quality teachers. (Statutory salaries refer to scheduled salaries according to official pay scales.) Although attractive salaries are clearly important in improving teaching's appeal, the analysis suggests that policy needs to address more than pay.[5] Competitive salaries, good working conditions, job satisfaction and opportunities for development will increase the appeal and attraction of teaching profession for new entrants and existing staff alike.[6]

Good salaries, suitable working conditions and necessary elements of job satisfaction can be helpful in attracting competent future teachers. There is substantial evidence that teachers' relative earnings have an important influence on career decisions – for outsiders: whether to join the profession while for insiders: whether to stay. It is general rule of teacher labour market: the stronger are the employment prospects outside teaching the fewer qualified people will stay long-term in teaching. In particular, those people with skills who are likely to command the best job prospects elsewhere are less likely to remain in teaching for very long.[7]

While there exists research work that reveales "weak or no relationship" between teacher related factors and student achievement:

- Jencks et al. (1972) found that teacher factors have little or no effect on student achievement. Similarly Jacob
- Lefgren (2002) reported no impact of teacher training on student achievement
- Hanushek (1986; 1997; 2002) proved that achievement is independent of school resources [ref: M. Sprietsma and F. Waltenberg 2005]
- Dewey et al., (2000) argued that wages do not affect students' scores.

[5] **Teachers Matter** ATTRACTING, DEVELOPING AND RETAINING EFFECTIVE TEACHERS OECD 2005 page 169
[6] **Teachers Matter** ATTRACTING, DEVELOPING AND RETAINING EFFECTIVE TEACHERS OECD 2005 page 170
[7] **Teachers Matter** ATTRACTING, DEVELOPING AND RETAINING EFFECTIVE TEACHERS OECD 2005 page 180

To explain this diversity of the findings, Jacob and Lefgren (2002), have rightly argued *"different programs in different settings have different effects, it is useful to examine some of the possible explanations for the discrepancies in order to understand how the results from each study might be generalized."* By looking at only one aspect of the findings of previous studies one should not take "final judgement" that teacher qualities and characteristics are weightless in educational research. The students' performance should not be sole component or indicator used in the assessing teacher performance because teaching in more than test scores.[8] J.E Rockoff (2003) writes "It is clear that much research is still needed on teachers." From this it is obvious that a great deal of research is still needed to dig out the truth regarding the effectiveness of teacher and teacher characteristics.

Teachers' compensations are important to maintain the quality of teaching and to ensure and retain sufficient number of skilled teachers in school. As compensations and job conditions can affect both the demand for and supply of teachers. In addition, salaries and working conditions can be helpful in attracting, developing and retaining skilled and effective teachers. In competitive labour markets, the rate of salaries paid to different types of teachers reflects the supply and demand for those teachers. A career structure, promotions and increments, with age and experience-earnings can provide salary incentives that attract high quality teachers and increase job satisfaction and possibly performance. This research contributes to the existent pool of research by focusing the goal of examining the impact of teacher wages on student performance.

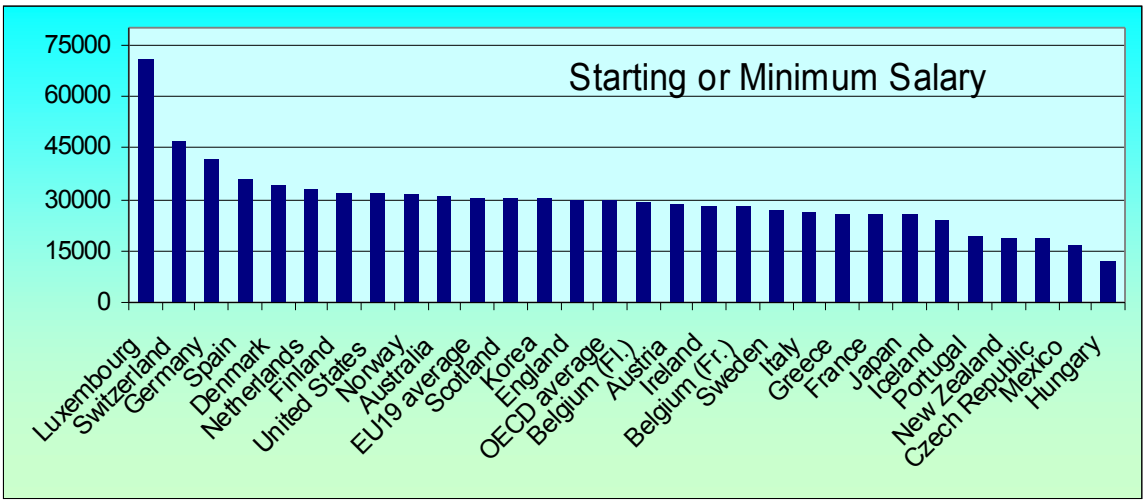
In this study student related variables were; **mean country scores in PISA 2000, 2003 and 2006**. While teacher related variable was statutory salary. Effect of Explanatory variable "**Lower Secondary School Teachers' salary**" was seen on the Explained variable **"Students mean country score"**. To get more precise information regarding the impact of teacher compensation, apart from the teachers' starting statutory salary and teachers' salary after 15 years of the experience, the salary per hour of net teaching time and teachers' statutory salary per teaching hour was also used in the calculation separately. As in all three previous PISA studies no data on teacher wages/ salaries had been collected, so it was necessary to go for other sources to find the required data. The data on teacher wages were collected from the Organization for Economic Cooperation and Development (OECD).[9]

[8] Marco A. Muñoz & Florence C. Chang 2008 20:147–164 161
[9] See Annex A

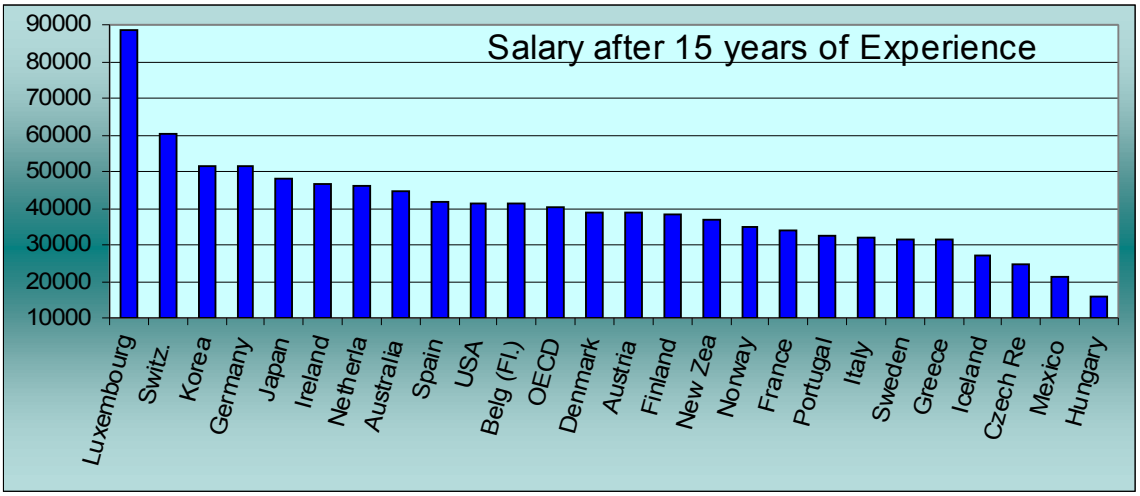
Teachers' Minimum salary and salary after 15 years of experience

The starting and mid-career (after 15 years of experience) statutory salary data of secondary school teachers was used as an explanatory variable. Study of the initial salary could help to find the answer of the question that how far good starting salaries are helpful in attracting good teachers? In the same way mid- career salary explains retention, motivation and job satisfaction.

Source OECD



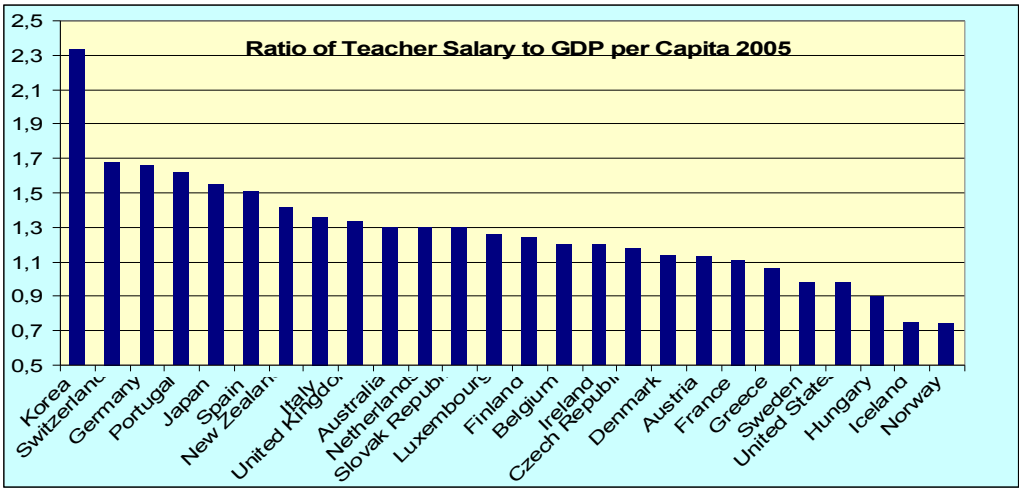
Salaries after 15 years of experience in 2005 (US$)



Source OECD

Teachers' Statutory salaries relative to GDP per capita

All over the world countries invest in education relative to their total budget according to their pre-set priorities. Comparing statutory salaries to GDP per capita is thus another way of assessing the relative value of teachers' salaries; it eliminates the wealth factor of countries. This comparison with GDP per capita provides some basis for standardised comparisons among countries.



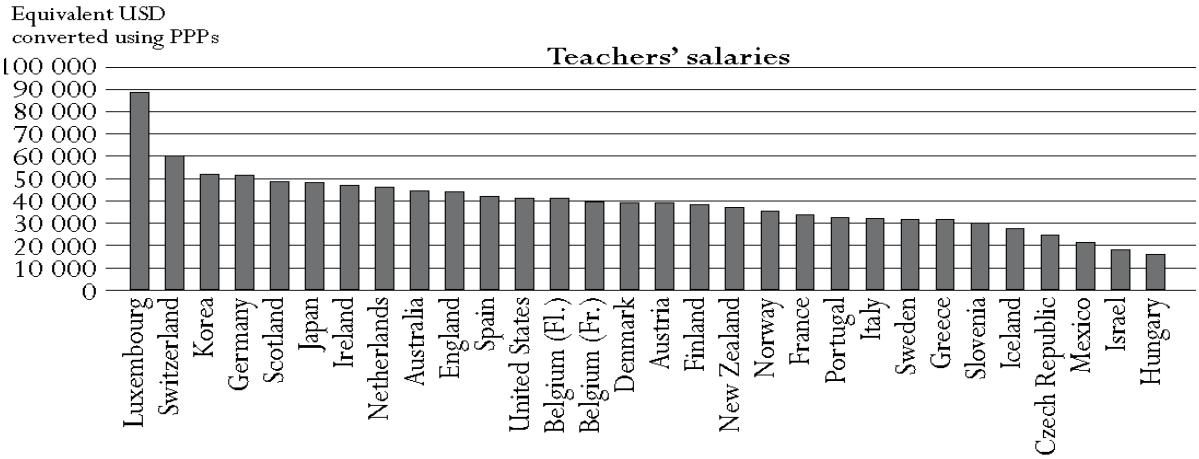
Lower Secondary School Teachers Statutory salaries per hour of net teaching time

An alternative measure of salaries and the cost of teaching time is the statutory salary for a fulltime classroom teacher relative to the number of hours per year that a teacher is required to spend in teaching students.[10] Although this measure does not adjust salaries for the amount of time that teachers spend in various teaching-related activities, it can however provide a rough estimate of the cost of the actual time teachers spend in the classroom. The average statutory salary per teaching hour after 15 years of experience is USD 59 in lower secondary schools. Salaries are relatively high in Denmark, Germany, Japan, Korea and Luxembourg (USD 60 or more).[11]

Even in OECD countries where statutory salaries are the same in primary and secondary education, salaries per teaching hour are usually higher in upper secondary education than in primary education, since in most countries, secondary teachers are required to teach fewer hours than primary teachers.

[10] see Education at glance, Indicator D4
[11] OECD

Salaries of teachers with at least 15 years experience at the lower secondary level range from less than USD 16 000 in Hungary to USD 51 000 or more in Germany, Korea and Switzerland, and exceed USD 88 000 in Luxembourg.



Source OECD

Building of model

Students' performance in PISA was a cumulative out put of multiple factors that affected their results. The model for this study is based upon teacher related single factor only, which might be determinants of students' achievements. The model estimates an education production function for scores that 15-year-old students obtained in PISA tests. Mathematically model of this study can be described as **"student score in PISA is a function of teachers' wages considering all other factors constant".** We can write our model as;

$$S_y = f(Twy)$$

Where **S** refers to student achievement, **T***w* refers to teacher wages and "*y*" refers to year 2000, 2003 and 2006. In this model "error term" is assumed as if it is zero.

So our Ordinary Least Square (OLS) regression model is as follow:

$$\mathbf{S_{yi} = \beta_1 + \beta_2} Twyi + \boldsymbol{\varepsilon_i}$$

Where, $\mathbf{S_{yi}}$ is Students' PISA Score in "*y*" year for country "*i*", T*w* stands for teachers' wages and "**ε**" is error term for *i*th country while $\boldsymbol{\beta_1}$ and $\boldsymbol{\beta_2}$ are the parameters; intercept and slope respectively.

RESULTS AND DISCUSSION

In fact this study was in continuation with previous studies conducted by many researchers in the world with an objective to assess and examine the impact of teacher characteristics on students' achievement. To have a much broader picture this study utilized extensive and data on students PISA scores have been used, so as to see the impact of teacher characteristics on the students' performance.

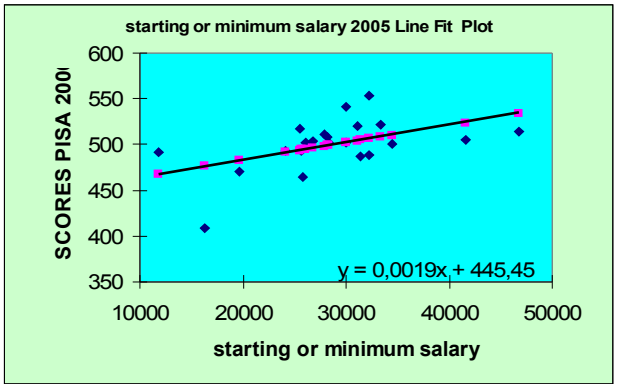
Affect of Explanatory variable "Teachers' salary" was seen on the Explained variable "Students mean country score" (as described in the research model). To get more precise information of the impact of teacher wages on student score, different datasets on teacher salary has been used; each has measured in different fashions.

- Teachers' Starting statutory salary
- Salary after 15 years of the experience
- Teachers' Statutory salaries relative to GDP per capita
- Salary per hour of net teaching time

This multi-facet data gave an opportunity to construct different models, to estimate the impacts

Model 1: Teachers' starting salary

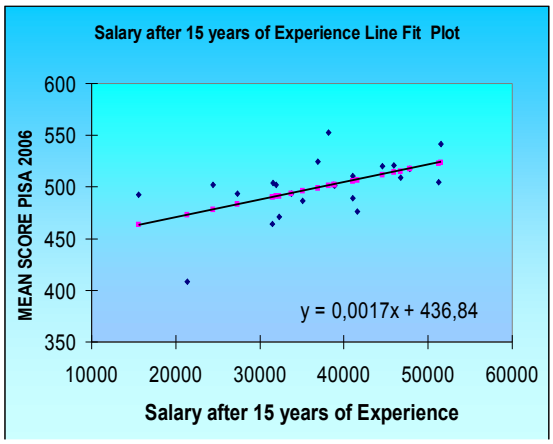
Teachers' statutory minimum or starting salary data was used in model 1. The linear regression analysis produced results as: R Squared (R^2) value of 0,25 gives an indication that 25% variation in dependent variable (students score) is explained by teacher minimum salary.



The p-value, for the Null hypothesis on minimum salary was found 0,01 at 5% level of significance. There is only 1% chance for the acceptance of the NULL Hypothesis (**H°**) which is smaller than 5% of level of significance. Therefore we have statistically significant evidence for rejecting the **H°** and accepting the Alternative Hypothesis ($\mathbf{H_1}$). Results show a statistically significant relationship between teachers' minimum salary and the students' performance.

In other words one can say that there is 99% chance that starting salary explains 25% variation in the students' scores in PISA. From the data it is evident that in Switzerland, Germany, Denmark, Netherlands, Finland, United States, Norway, Australia, Korea and United Kingdom teachers' starting salaries are higher, it ranges between 30000 US$ to 47000 US$, which is higher as compared to other OECD member countries. Similarly in comparison with rest of the OECD member countries, in the above mentioned countries students achieved higher scores in PISA 2006, it ranges from 502 to 553. On the contrary in Mexico and Hungary teachers' starting salaries are lowest among OECD member countries that rages from 12000 US$ to 16500 US$ only. Likewise in Mexico and Hungary students' mean scores in PISA 2006 were also lower as compared to many other member countries.

Model 2: Teachers' salary after 15 years of experience



The explanatory variable of "Salary after 15 years of experience" produced following results in the model. R Squared (R^2) value of 0,29 gives an indication that 29% of variation in the students scores is explained by teacher salary after 15 years of experience.

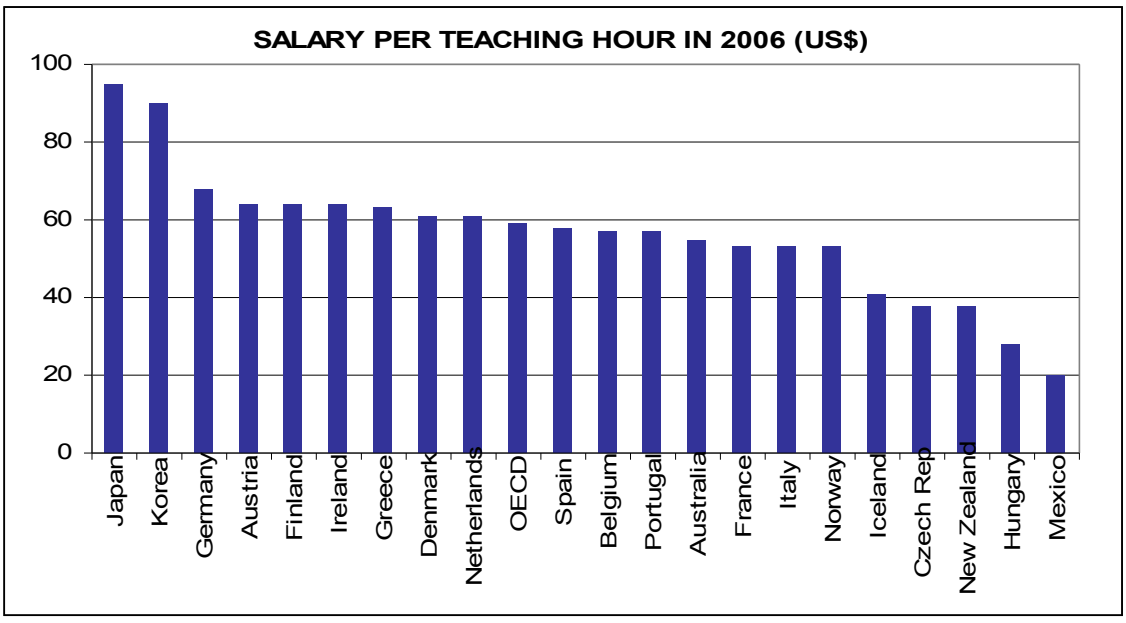
The p-value, for the Null hypothesis on minimum salary was found 0,008 at 5% of level of significance. The small p-value shows that there is less than 1% acceptance chance of the NULL Hypothesis. Therefore we have statistically significant evidence of rejecting the **H°** and accepting the Alternative Hypothesis ($\mathbf{H_1}$). We can deduce that there is a statistically significant relationship between teachers' salary after 15 years of experience and the students' achievements in PISA.

Table () gives the comparative data of teachers salaries after 15 years of Experience in 2005 and table () presents PISA 2006. Switzerland, Korea, Germany, Japan, Ireland, Netherlands, Australia, Spain, Belgium Denmark, Austria, Finland, New Zealand and Norway give comparatively higher salaries, rages from 35000 US$ to 60000 US$, all these countries have PISA 2006 score above 500 except that of Norway and Spain which has 487 and 476 respectively. Graph () shows

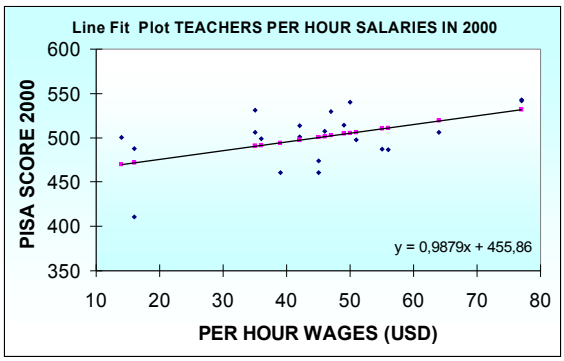
Model 3: Teachers Salaries per Hour of net teaching time

Per hour wages of net teaching time is another way to estimate the impact of teacher wages on the performance of the students. It is more effective way to have an estimate of teachers' compensation with respect to work load or net teaching time. Because per month or annual salary does not speak or explain net time spent by teacher in the class. As in different countries teaching time is homogeneously distributed; in USA and Mexico net teaching hour for lower secondary school teacher are 1047 hours and 1080 hours, while in Finland, Japan and Korea it is less than 600 hours per year. In other words in some countries teachers are more loaded as compared to their profession comrade, since comparative wages in per hour is the best way to have appropriate information of teachers' wages.

Teacher Salary Per Hour to Net teaching time 2006

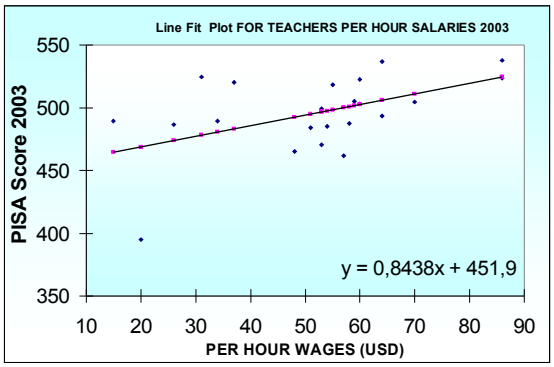


In order to have more detailed picture of the impact of "teacher compensation on students score" researcher analysed in three segments with three different data sets. (Thanks to detailed PISA surveys which enabled to have such analyses) For this purpose Per Hour wages in 2000 and PISA scores 2000, per hour wages in 2003 and Students' PISA Scores in 2003 and in the same way Per hour wages in 2005 and Students' PISA Scores in 2006 were used in the model. The three results were as;



Per Hour wages in 2000 and Students' PISA scores in 2000 gave the R Squared (R^2) value of 0,28 gives an indication that 28% of variation in the students scores is explained by teacher per hour salary in 2000. The p-value at 5% level of significance, for the Null hypothesis on per hour wages was found 0,013. This small p-value shows that there is only 1,3% chance for the acceptance of the NULL Hypothesis. Therefore we have statistically significant evidence of rejecting the **H°** and accepting the Alternative Hypothesis ($\mathbf{H_1}$). We can assume that there is a statistically significant relationship between teachers' per hour salary and the students' achievements in PISA. In the other words we can say that those countries where salaries per hour of net teaching time are higher there is possibility of better students' performance at school.

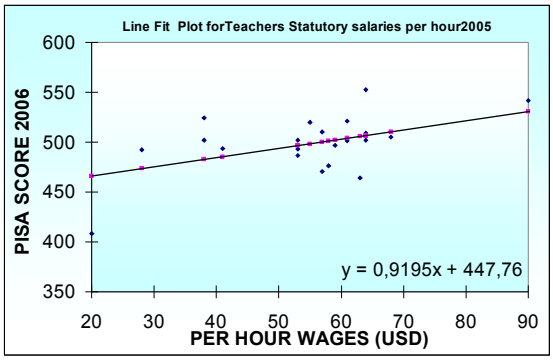
Having used 2003 Per Hour of net teaching time data and Students PISA scores in 2003 for OECD member countries, we have the results as; the R Squared (R^2) value of 0,25 gives an indication that 25% of variation in the students scores is explained by teacher per hour salary in 2003. The p-value at 5% level of significance, for the Null hypothesis on per hour wages was found 0,012. This small p-value shows that there is only 1.2% chance for the acceptance of the NULL Hypothesis.



Therefore we have statistically significant evidence of rejecting the **H°** and accepting the Alternative Hypothesis ($\mathbf{H_1}$). We can believe that there is a statistically significant relationship between teachers' per hour salary and the students' achievements in PISA. In the other words we can say that those countries where salaries per hour of net teaching time are higher there is possibility of better students' performance at school.

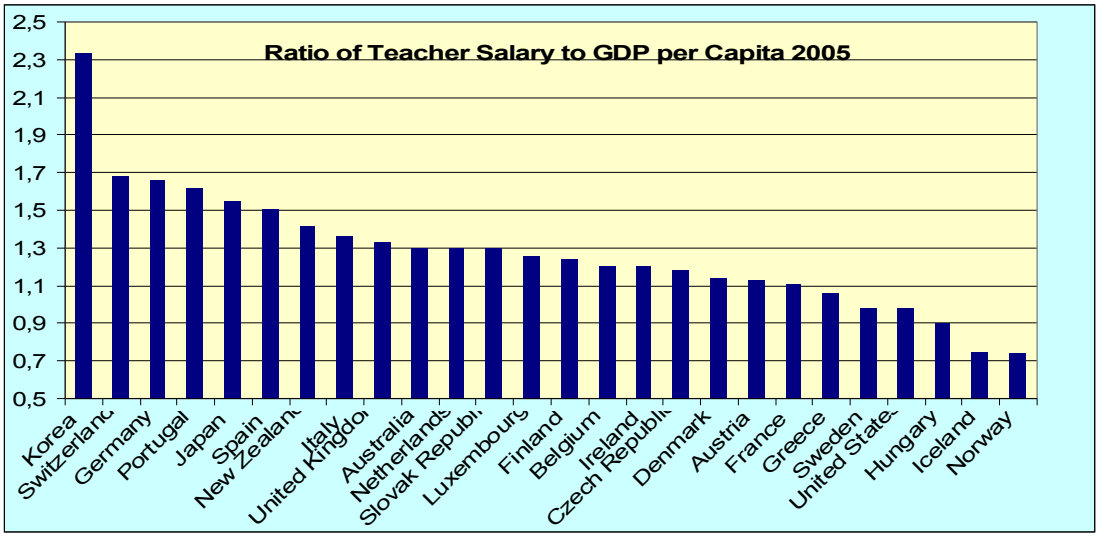
By using 2005 Teachers Salaries per Hour of net teaching time data and Students PISA scores in 2006 for OECD member countries we have the more or less similar results as we had for 2000 and 2003. The R Squared (R^2) value of 0,28 gives an indication that 28% of variation in the students scores is explained by teacher per hour salary in 2003. The p-value at 5% level of significance, for the Null hypothesis on per hour wages was found 0,009. This small p-value shows that there is less than 1% chance for the acceptance of the NULL Hypothesis. Therefore we have statistically significant evidence of rejecting the NULL Hypothesis **H°** and accepting the Alternative Hypothesis ($\mathbf{H_1}$).

We can believe that there is a statistically significant relationship between teachers' per hour salary in 2005 and the students' achievements in PISA 2006. In the other words we can say that those countries where salaries per hour of net teaching time are higher, there is higher probability of better students' performance at school. Comparative data table of TEACHERS' STATUTORY SALARY PER TEACHING HOUR IN US$ in 2000, 2003 and 2006 indicates that Japan, Korea, Switzerland, Germany, Austria, Finland, Ireland and Netherlands are the countries where teachers receive higher per hour wages and likewise these countries also scored higher in all three PISA tests. On the contrary in Poland, Mexico and Hungary TEACHERS' SALARY STATUTORY PER TEACHING HOUR IN US$ is the lowest in OECD member countries as well as in these countries students' performance in PISA TESTS also remained lower.



Model 4: Teachers' statutory salaries relative to GDP per capita

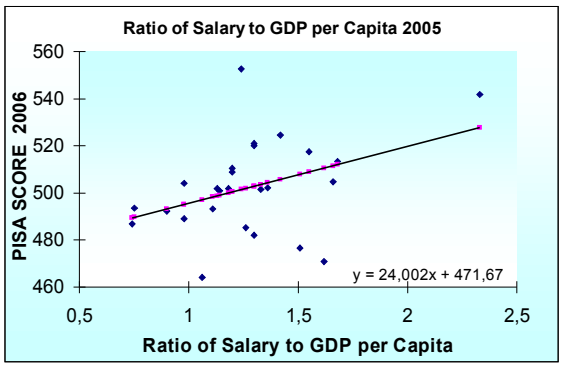
Though considering teachers starting, mid career (after fifteen years) and per teaching hour salaries gives some practical information but comparing statutory salaries to GDP per capita gives real picture of the teachers' wages in that countries because between countries variation is very large on per capita income scale.



Taking this between countries variation in to account the simple comparison of salaries become meaning less and illogical. So with an intention to have more precise and real picture

of the impact of teachers' compensations ratio of teachers' salary to GDP per capita is the best indicator of wages. Even if it does not give comparative information regarding other professions but it tells about the relative value of teacher's compensation in that country. [12]

To facilitate more comprehensive information researcher used the ratio of teacher salary to per capita GDP and country scores in PISA 2006 in the model. The results of this analysis were; The ratio of teacher salary to per capita GDP in 2006 and mean PISA scores in 2006 gave the R Squared (R^2) value of 0,15 gives an indication that 15% of variation in the students scores is explained by teacher wages in 2006. For the Null hypothesis on teacher wages the p-value at 5% level of significance was found 0,048 This small p-value shows that there are only 4,8% chances for the acceptance of the NULL Hypothesis. As this value is less than 5% of we can confidently reject the **H°** and accept the Alternative Hypothesis ($\mathbf{H_1}$) that teacher wages have significance in the student achievement.



Conclusions:-

Modern research has successfully tested, traced, taped and tabulated impact of teacher factors on students' learning and achievements. This research examined, evaluated and assessed the impact of teacher wages on the students' achievements utilizing extensive PISA surveys data and teacher salary data from OECD. Through this investigative study an attempt had been made to answer the question***;*** *does teachers' salary matter?*

The available evidence to address this question was in some places somewhat limited. It is true that the results of studies on teachers are difficult to interpret due to the difficulty in controlling confounding factors and complex nature of the teaching and learning process. Nevertheless the conclusions of this study are as follows.

The results of these models give an indication that teacher wages do have impact on students' performance. The estimated impact of teacher salary was found positive but not very large, teachers are motivated by many other factors which can be both material and non-material. These results also attested that "money is not everything" and it is not only the "money that makes mare go". Good salaries may have great effects on recruitment and

[12] OECD 2006

retention of teachers in the profession. While increase in pay with age and experience can be very helpful in the retention of quality staff.

In fact there can not be a single explanation for students' achievements, as there is a web of interrelated factors which have cumulative effects on students' performance; factors related to teachers, students, peers, school, society and culture. The student scores are not the only criteria to evaluate a teacher. Teacher qualities and characteristics have weight and credence in the transmittance and dissemination of knowledge because students' learning and achievements is heavily teacher dependent.

The findings of this study highlight the significance and importance of teacher wages. This investigation shows that further work is still required to find out the detailed impact of teacher characteristics by using student and teacher data at micro level.

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Annex A

Introduction to OECD

The Organization of Economic Cooperation and Development (OECD) is an international organization. At present OECD comprises on 30 member countries: Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Korea, Luxembourg, Mexico, the Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Spain, Sweden, Switzerland, Turkey, United Kingdom, United States

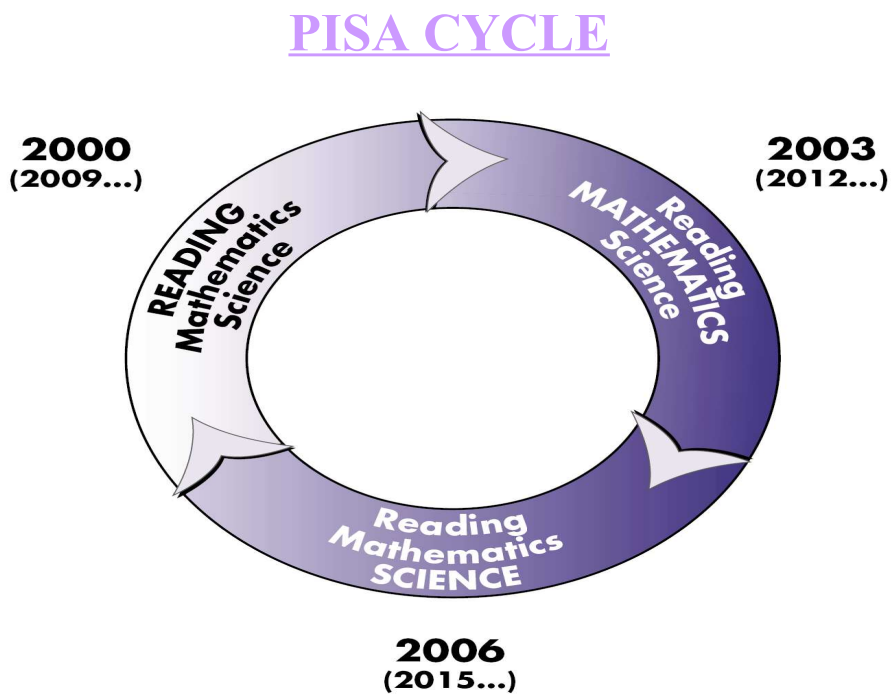
The basic objectives of OECD are to achieve highest sustainable economic development and growth, expansion of world trade, financial stability, uplifting standard of living and overcome unemployment in member and non-member countries. Since its inception this organization is very active and provides an extraordinary forum where the governments of its member as well as non-member countries share and compare policy experiences, work for domestic and international polices, find solution of common problems and make joint efforts to meet the economic, social, and environmental challenges.

Introduction of PISA

The organisation for Economic Co-operation and Development (OECD) in 1997 launched Programme for International Student Assessment (PISA), with the purpose of collecting and presenting cross-country comparable data on 15 year old students' performance in schools. Students performance in three subjects areas; Science, Mathematics and Reading, is assessed in PISA. So far three PISA surveys have been completed. Each study assessed one of the three subject areas (one subject was considered the major subject area and the other two subjects were considered minor subject areas for that assessment year). First PISA survey was carried out in 2000, that year reading was the major area of assessment. In 2003 Mathematics was the major, reading and science were minor. In PISA 2006, the focus was on science but the assessment also included reading and mathematics and collected data on student, family and institutional factors that could help to explain differences in performance. More than 400000 students from 57 countries took part in PISA 2006. (PISA 2006: Science Competencies for Tomorrow's World Executive Summary)

PISA provides an excellent opportunity to all stake holders to evaluate and estimate the impact of teacher profile and characteristics on student performance.

Figure I PISA Cycle



SOURCE: OECD, Programme for International Students Assessment (PISA) 2000, 2003 and 2006.

PISA study shows the commitment of participating, OECD member countries and as well as non-member partner countries, to monitor the outcomes of education systems in terms of student achievement on a regular basis. PISA study makes an effort to estimate; how well students, at age 15, are prepared to meet the challenges of tomorrow. Age 15 is chosen because at this age, in most OECD countries, students are approaching at the end of compulsory schooling. Consequently PISA estimates the level of preparation and readiness of the young entrants in institute of superior education or labour market. While PISA does assess students' knowledge, it also examines their ability to reflect, and to apply their knowledge and experience to real world issues. So one can say, today PISA is the most wide-ranged and thorough international programme to gauge student performance and to collect data on the student, family and institutional factors that can help to explain differences in student performance.

Annex B Tables

Lower Secondary School Teachers Salary IN 2005 (Equivalent to US$ using PPPs)			
country	starting or minimum salary	Salary after 15years of experiece	Salary at top of scale
Australia	31092	44526	44526
Austria	28379	38805	56139
Belgium (Fl.)	29270	41007	50001
Belgium (Fr.)	27 865	39335	48190
Czech Republic	18 654	24423	29078
Denmark	34517	38911	38911
England	29992	43835	43835
Finland	32273	38159	38159
France	25711	33723	48692
Germany	41630	51240	53493
Greece	25823	31439	37772
Hungary	11818	15622	20682
Iceland	24134	27295	31925
Ireland	28198	46709	52930
Italy	26108	31917	39135
Japan	25593	47855	61054
Korea	30058	51516	82790
Luxembourg	70908	88634	123187
Mexico	16351	21347	35286
Netherlands	33298	45960	51207
New Zealand	19071	36894	36894
Norway	31382	35058	39044
Portugal	19704	32275	50634
Scotland	30213	48205	48205
Spain	35840	41588	51904
Sweden	26756	31585	36153
Switzerland	46751	60061	72706
United States	32225	41090	m
OECD average	29772	40322	48983
EU19 average	30366	40177	48332

SOURCE: OECD

Table - OECD member countries scores in PISA 2000

PISA 2000 RESULTS				
COUNTRY	**READING SCORE**	**MATHS SCORE**	**SCIENCE SCORE**	**TOTAL MEAN SCORE**
Australia	528	533	528	**530**
Austria	507	515	519	**514**
Belgium	507	520	496	**508**
Canada	534	533	529	**532**
Czech Republic	492	498	511	**500**
Denmark	497	514	481	**497**
Finland	546	536	538	**540**
France	505	517	501	**508**
Germany	484	490	487	**487**
Greece	474	447	461	**461**
Hungary	480	488	496	**488**
Iceland	507	514	496	**506**
Ireland	527	503	513	**514**
Italy	487	457	478	**474**
Japan	522	557	550	**543**
Korea	525	547	552	**541**
Luxembourg	441	446	443	**443**
Mexico	422	387	422	**410**
Netherlands				**-**
New Zealand	529	537	528	**531**
Norway	505	499	500	**501**
Poland	479	470	483	**477**
Portugal	470	454	459	**461**
Slovak Republic	-	-	-	**-**
Spain	493	476	491	**487**
Sweden	516	510	512	**513**
Switzerland	494	529	496	**506**
Turkey	-	-	-	**-**
United Kingdom	523	529	532	**528**
United States	504	493	500	**499**

Source OECD

Table- OECD member countries scores in PISA 2003

PISA 2003 RESULTS				
Country	**READING**	**MATHS**	**SCIENCE**	**TOTAL MEAN SCORE**
Australia	506	524	525	**518**
Austria	467	506	490	**488**
Belgium	489	529	509	**509**
Canada	514	533	527	**525**
Czech Republic	473	517	526	**505**
Denmark	479	514	484	**492**
Finland	521	544	545	**537**
France	476	511	511	**499**
Germany	471	503	506	**493**
Greece	453	445	487	**462**
Hungary	467	490	503	**487**
Iceland	464	515	490	**490**
Ireland	501	503	506	**503**
Italy	455	466	490	**470**
Japan	487	534	550	**524**
Korea	525	542	546	**538**
Luxembourg	463	493	489	**482**
Mexico	389	385	410	**395**
Netherlands	503	538	527	**523**
New Zealand	508	524	529	**520**
Norway	475	495	485	**485**
Poland	477	490	501	**489**
Portugal	459	466	471	**465**
Slovak Republic	453	498	502	**484**
Spain	461	485	489	**478**
Sweden	496	509	509	**505**
Switzerland	482	527	518	**509**
Turkey	426	423	434	**428**
United Kingdom	..	..	..	**-**
United States	479	483	499	**487**
OECD	477	500	503	**493**

Source OECD

Table - OECD member countries scores in PISA 2006

PISA 2006 RESULTS				
COUNTRY	**READING**	**MATHS**	**SCIENCE**	**TOATAL MEAN SCORE**
Australia	513	520	527	**520**
Austria	490	505	511	**502**
Belgium	501	520	510	**510**
Canada	527	527	534	**529**
Czech Republic	483	510	513	**502**
Denmark	494	513	496	**501**
Finland	547	548	563	**553**
France	488	496	495	**493**
Germany	495	504	516	**505**
Greece	460	459	473	**464**
Hungary	482	491	504	**492**
Iceland	484	506	491	**494**
Ireland	517	501	508	**509**
Italy	469	462	475	**469**
Japan	498	523	531	**517**
Korea	556	547	522	**542**
Luxembourg	479	490	486	**485**
Mexico	410	406	410	**409**
Netherlands	507	531	525	**521**
New Zealand	521	522	530	**524**
Norway	484	490	487	**487**
Poland	508	495	498	**500**
Portugal	472	466	474	**471**
Slovak Republic	466	492	488	**482**
Spain	461	480	488	**476**
Sweden	507	502	503	**504**
Switzerland	499	530	512	**514**
Turkey	447	424	424	**432**
United Kingdom	495	495	515	**502**
United States	m	474	489	**489**
OECD	492	498	500	**497**

Source OECD

Table - PISA Scores 2000, 2003 AND 2006

DETAILED TABLE OF PISA SCORES AND PER HOUR WAGES 2000, 2003 AND 2006 (in US$)						
PISA SCORE AND PER HOUR WAGES 2000			**PISA SCORE AND PER HOUR WAGES 2003**		**PISA SCORE AND PER HOUR WAGES 2006**	
COUNTRY	**Total score PISA 2000**	**WAGES**	**Total score PISA 2003**	**WAGES**	**Total score PISA 2006**	**WAGES**
Australia	**530**	**47**	518	55	520	55
Austria	**514**	**42**	488	58	502	64
Czech Rep	**500**	**14**	525	31	510	57
Denmark	**497**	**51**	505	59	502	38
Finland	**540**	**50**	537	64	501	61
France	**508**	**46**	499	53	553	64
Germany	**487**	**55**	493	64	493	53
Greece	**461**	**39**	462	57	505	68
Hungary	**488**	**16**	487	26	464	63
Iceland	**506**	**35**	490	34	492	28
Ireland	**514**	**49**	503	60	494	41
Italy	**474**	**45**	470	53	509	64
Japan	**543**	**77**	524	86	502	53
Korea	**541**	**77**	538	86	517	95
Mexico	**410**	**16**	395	20	542	90
New Zealand	**531**	**35**	523	60	409	20
Norway	**501**	**42**	520	37	521	61
Portugal	**461**	**45**	485	54	524	38
Spain	**487**	**56**	489	15	487	53
Switzerland	**506**	**64**	465	48	471	57
United States	**499**	**36**	484	51	476	58

Source OECD

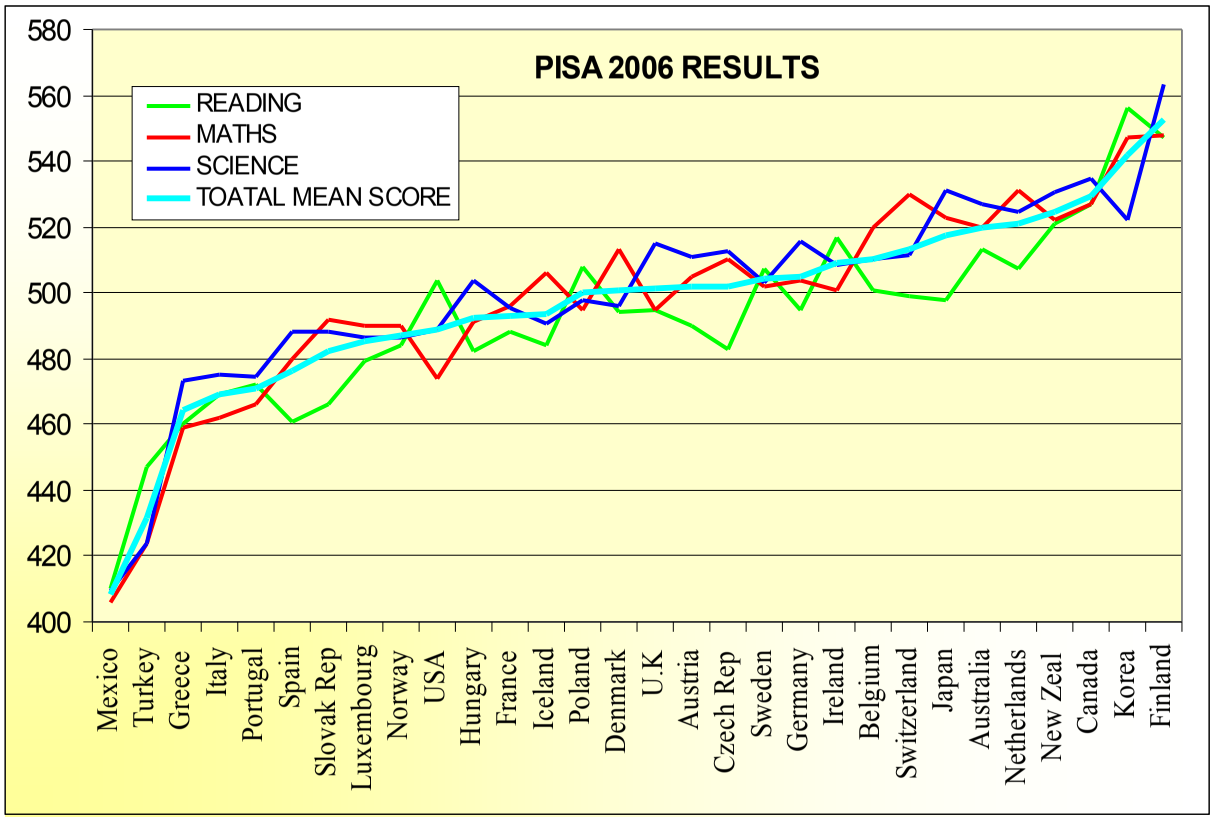


Table Education performance

Education > Performance, 2004*

	Student performance on the combined reading, scientific and mathematical literacy scales, mean score, 2003*			% educational attainment of adult population and current graduation rates				Index of earning differentials, tertiary-type A to upper-secondary (25-64 years old)*		% unemployment ratio at tertiary-type A attainment level (25-64 years old)*		
	Reading	Maths	Science	Upper secondary or higher, 25-64 year-olds	Current upper secondary graduation rate	Tertiary-type A attainment, 25-64 year-olds	First-time tertiary-type A (ISCED 5A) graduation rate	Women	Men	Women	Men	
Australia	525.4	524.3	525.1	64.1	..	21.9	46.4	158 -4	151 -4	2.9	2.7	Australia
Austria	490.7	505.6	491.0	80.2	..	9.2	19.6	..	..	4.8	..	Austria
Belgium	507.0	529.3	508.8	64.3	..	13.6	..	147 -1	146 -1	4.3	3.9	Belgium
Canada	527.9	532.5	518.7	84.3	..	22.2	..	175 -1	170 -1	4.8	4.6	Canada
Czech Republic*	488.5	516.5	523.3	89.1	86.5	12.3	19.7	163	195	1.8	2.1	Czech Republic*
Denmark	492.3	514.3	475.2	81.2	90.4 -1	25.3	45.3 -1	129 -1	142 -1	3.5	2.9	Denmark
Finland	543.5	544.3	548.2	77.6	89.6 -1	17.3	47.8 -1	167 -1	180 -1	4.3	3.5	Finland
France	496.2	510.8	511.2	65.3	81.2 -1	14.3	26.0 -1	156	172	7.0	6.6	France
Germany	491.4	503.0	502.3	83.9	98.9	14.7	20.6	157	159	5.9	5.1	Germany
Greece	472.3	444.9	481.0	56.2	..	14.7	..	..	..	9.5	4.7	Greece
Hungary	481.9	490.0	503.3	75.4	86.1	16.6	28.8	191	254	2.4	1.5	Hungary
Iceland	491.7	515.1	494.7	61.0	84.1	24.5	50.0	..	..	..	..	Iceland
Ireland	515.5	502.8	505.4	62.8	92.4	17.3	37.4	172 -2	154 -2	1.9	2.1	Ireland
Italy	475.7	465.7	486.5	48.6	81.4	11.1	36.8	147 -2	162 -2	5.8	3.8	Italy
Japan	498.1	534.1	547.6	84.0 -1	91.4	21.5 -1	36.1	..	..	3.2	2.9	Japan
Korea	534.1	542.2	538.4	74.4	96.1	22.0	..	201 -1	138 -1	2.5	2.7	Korea
Luxembourg	479.4	493.2	482.8	63.2	69.4	14.1	..	145 -2	170 -2	4.7	2.6	Luxembourg
Mexico	399.7	385.2	404.9	22.6	37.7	14.4	..	..	..	3.0	3.0	Mexico
Netherlands	513.1	537.8	524.4	70.9	..	27.2	40.2	..	..	2.5	3.0	Netherlands
New Zealand	521.6	523.5	520.9	77.6	74.6	17.6	48.4	150	148	2.8	2.5	New Zealand
Norway	499.7	495.2	484.2	88.3	99.9	29.5	45.4	130 -1	129 -1	2.1	2.8	Norway
Poland*	496.6	490.2	497.8	50.1	79.3	15.7	44.8	155	184	6.5	5.9	Poland*
Portugal*	477.6	466.0	467.7	25.2	..	12.5	32.8	..	..	4.4	4.5	Portugal*
Slovak Republic*	469.2	498.2	494.9	84.7	83.2	11.8	27.7	..	..	4.3	5.0	Slovak Republic*
Spain	480.5	485.1	487.1	45.0	66.1	18.9	32.6	156	144	8.8	5.3	Spain
Sweden	514.3	509.0	506.1	82.9	77.9	19.3	37.4	136 -1	147 -1	3.6	4.3	Sweden
Switzerland	499.1	526.6	513.0	82.5	89.2	18.0	25.9	171	156	3.9	2.8	Switzerland
Turkey*	441.0	423.4	434.2	26.1	52.8	9.1	10.8	..	..	10.3	7.2	Turkey*
United Kingdom	..	..	..	65.0	..	20.3	39.3	198	161	2.0	2.5	United Kingdom
United States	495.2	482.9	491.3	87.9	75.4	29.7	33.6	173	188	2.9	3.0	United States
OECD average	494.2	500.0	499.6	67.5	81.1	17.9	34.8	..	..	4.4	3.7	OECD average
Brazil*	..	..	..	29.5	65.4	7.8	..	..	..	..	..	Brazil*
Russian Federation	..	..	..	88.9 -1	87.3	20.8 -1	..	..	..	..	..	Russian Federation

Source OECD

Teachers' salaries (2005)

Annual statutory teachers' salaries in public institutions at starting salary, after 15 years of experience and at the top of the scale by level of education, in equivalent USD converted using PPPs

		Primary education				Lower secondary education				Upper secondary education			
		Starting salary / minimum training	Salary after 15 years of experience / minimum training	Salary at top of scale / minimum training	Ratio of salary after 15 years of experience to GDP per capita	Starting salary / minimum training	Salary after 15 years of experience / minimum training	Salary at top of scale / minimum training	Ratio of salary after 15 years of experience to GDP per capita	Starting salary / minimum training	Salary after 15 years of experience / minimum training	Salary at top of scale / minimum training	Ratio of salary after 15 years of experience to GDP per capita
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
OECD countries	Australia	30858	44423	44423	1.30	31092	44526	44526	1.30	31092	44526	44526	1.30
	Austria	27094	35823	53938	1.04	28379	38805	56139	1.13	28589	39531	59151	1.15
	Belgium (Fl.)	29270	41007	50001	1.24	29270	41007	50001	1.24	36327	52451	63054	1.59
	Belgium (Fr.)	27754	38901	47452	1.18	27865	39335	48190	1.19	34729	50601	61039	1.53
	Czech Republic	18654	24423	29078	1.19	18654	24423	29078	1.19	18955	24868	29663	1.21
	Denmark	34517	38911	38911	1.14	34517	38911	38911	1.14	33902	47374	47374	1.39
	England	29992	43835	43835	1.33	29992	43835	43835	1.33	29992	43835	43835	1.33
	Finland	27806	32406	32406	1.05	32273	38159	38159	1.23	34681	43346	43346	1.40
	France	23212	31224	46071	1.03	25711	33723	48692	1.11	25960	33974	48967	1.12
	Germany	40125	49930	52062	1.62	41630	51240	53493	1.66	45022	55195	57671	1.79
	Greece	25823	31439	37772	1.06	25823	31439	37772	1.06	25823	31439	37772	1.06
	Hungary	11818	15622	20682	0.89	11818	15622	20682	0.89	13706	19541	25508	1.12
	Iceland	24134	27295	31925	0.75	24134	27295	31925	0.75	25952	31966	33917	0.88
	Ireland	28198	46709	52930	1.20	28198	46709	52930	1.20	28198	46709	52930	1.20
	Italy	24224	29301	35641	1.04	26108	31917	39135	1.14	26108	32813	40917	1.17
	Japan	25593	47855	61054	1.56	25593	47855	61054	1.56	25593	47863	62865	1.56
	Korea	30183	51641	82915	2.34	30058	51516	82790	2.33	30058	51516	82790	2.33
	Luxembourg	49219	67779	100314	0.96	70908	88634	123187	1.26	70908	88634	123187	1.26
	Mexico	12753	16784	27824	1.58	16351	21347	35286	2.01	m	m	m	m
	Netherlands	32195	41835	46734	1.19	33298	45960	51207	1.31	33630	61511	67848	1.75
	New Zealand	19071	36894	36894	1.42	19071	36894	36894	1.42	19071	36894	36894	1.42
	Norway	31382	35058	39044	0.74	31382	35058	39044	0.74	33589	37778	40950	0.80
	Poland	m	m	m	m	m	m	m	m	m	m	m	m
	Portugal	19704	32275	50634	1.62	19704	32275	50634	1.62	19704	32275	50634	1.62
	Scotland	30213	48205	48205	1.47	30213	48205	48205	1.47	30213	48205	48205	1.47
	Slovak Republic	m	m	m	m	m	m	m	m	m	m	m	m
	Spain	31847	37056	46623	1.35	35840	41588	51904	1.52	36611	42552	53120	1.55
	Sweden	26234	30802	35750	0.96	26756	31585	36153	0.98	28387	34108	38785	1.06
	Switzerland	40657	52743	63899	1.48	46751	60061	72706	1.68	54973	70300	83900	1.97
	Turkey	17909	19577	21623	2.54	a	a	a	a	18179	19847	21893	2.57
	United States	33521	40734	m	0.97	32225	41090	m	0.98	32367	41044	m	0.98
	OECD average	*27723*	*37603*	*45666*	*1.28*	*29772*	*40322*	*48983*	*1.30*	*31154*	*43239*	*51879*	*1.41*
	EU19 average	*28311*	*37762*	*45739*	*1.19*	*30366*	*40177*	*48332*	*1.25*	*31655*	*43629*	*52263*	*1.36*
Partner economies	Brazil	m	m	m	m	m	m	m	m	m	m	m	m
	Chile	m	m	m	m	m	m	m	m	m	m	m	m
	Estonia	m	m	m	m	m	m	m	m	m	m	m	m
	Israel	14716	18055	25131	0.70	14716	18055	25131	0.70	14716	18055	25131	0.70
	Russian Federation	m	m	m	m	m	m	m	m	m	m	m	m
	Slovenia	25148	29766	31664	1.30	25148	29766	31664	1.30	25148	29766	31664	1.30

Source: OECD. See Annex 3 for notes *(www.oecd.org/edu/eag2007)*.

Teachers' salaries (2005)

Annual statutory teachers' salaries in public institutions at starting salary, after 15 years of experience and at the top of the scale by level of education, in equivalent USD converted using PPPs

		Ratio of salary at top of scale to starting salary			Years from starting to top salary (lower secondary education)	Salary per hour of net contact (teaching) time after 15 years of experience			Ratio of salary per teaching hour of upper secondary to primary teachers (after 15 years of experience)
		Primary education	Lower secondary education	Upper secondary education		Primary education	Lower secondary education	Upper secondary education	
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
OECD countries	Australia	1.44	1.43	1.43	9	50	55	55	1.10
	Austria	1.99	1.98	2.07	34	46	64	67	1.45
	Belgium (Fl.)	1.71	1.71	1.74	27	51	57	78	1.53
	Belgium (Fr.)	1.71	1.73	1.76	27	54	54	76	1.41
	Czech Republic	1.56	1.56	1.56	32	30	38	40	1.34
	Denmark	1.13	1.13	1.40	8	61	61	85	1.39
	England	1.46	1.46	1.46	5	m	m	m	m
	Finland	1.17	1.18	1.25	16	48	64	79	1.65
	France	1.98	1.89	1.89	34	34	53	54	1.60
	Germany	1.30	1.28	1.28	28	62	68	77	1.25
	Greece	1.46	1.46	1.46	33	40	63	66	1.63
	Hungary	1.75	1.75	1.86	40	20	28	35	1.75
	Iceland	1.32	1.32	1.31	18	41	41	57	1.40
	Ireland	1.88	1.88	1.88	22	51	64	64	1.25
	Italy	1.47	1.50	1.57	35	40	53	55	1.37
	Japan	2.39	2.39	2.46	31	83	95	112	1.35
	Korea	2.75	2.75	2.75	37	64	90	93	1.46
	Luxembourg	2.04	1.74	1.74	30	88	138	138	1.58
	Mexico	2.18	2.16	m	14	21	20	m	m
	Netherlands	1.45	1.54	2.02	18	45	61	82	1.82
	New Zealand	1.93	1.93	1.93	8	37	38	39	1.04
	Norway	1.24	1.24	1.22	16	47	53	72	1.53
	Poland	m	m	m	m	m	m	m	m
	Portugal	2.57	2.57	2.57	26	38	57	63	1.67
	Scotland	1.60	1.60	1.60	6	54	54	54	1.00
	Slovak Republic	m	m	m	m	m	m	m	m
	Spain	1.46	1.45	1.45	38	42	58	61	1.46
	Sweden	m	m	m	a	m	m	m	m
	Switzerland	1.57	1.56	1.53	26	m	m	m	m
	Turkey	1.21	a	1.20	a	31	a	35	1.14
	United States	m	m	m	m	w	w	w	w
	OECD average	*1.69*	*1.70*	*1.71*	*24*	*47*	*59*	*68*	*1.42*
	EU19 average	*1.65*	*1.63*	*1.70*	*26*	*47*	*61*	*69*	*1.48*
Partner economies	Brazil	m	m	m	m	m	m	m	m
	Chile	m	m	m	m	m	m	m	m
	Estonia	m	m	m	m	m	m	m	m
	Israel	1.71	1.71	1.71	36	18	23	27	1.54
	Russian Federation	m	m	m	m	m	m	m	m
	Slovenia	1.26	1.26	1.26	13	43	43	47	1.09

Note: Ratio of salary at the top of the scale to starting salary has not been calculated for Sweden because the underlying salaries are estimates derived from actual rather than statutory salaries.

Source: OECD. See Annex 3 for notes *(www.oecd.org/edu/eag2007)*.