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Does Teacher Quality Affect Student Achievement? An Empirical Study in Indonesia

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Abstract
The objective of this study is to examine the relationship between teacher qualities in relation to student achievement in Indonesia. Teacher quality in this study defines as teacher evaluation score, in the areas of professional and pedagogic competency. The result of this study consonant to previous study that teacher quality, in term of teacher evaluation score, is a matter and statistically significantly to student performance, in senior high school level. Instead of teacher quality variable, the study also examine others control variable such as, government and family expenditure, poverty gap, unemployment gap, electricity access, morbidity rate per district. Others variables show varying result in relations to student achievement. Electricity access variable is significant relation to student achievement; while teacher experience, family spending, government spending and morbidity rate variables are partly significant to student achievements.
Keywords: teacher quality, teacher evaluation score, education production function and student achievement

1. Introduction

Student achievement has been a focus of several empirical studies to measure the education output since Coleman Report (1966) was examined the student performance as measured by standardized test and school resources characteristic in relation to educational quality. Nowadays, policy maker, education institution, parents and other education stake holder, were frequently using standard test as indicator of education output instead of student attitude, dropout rate and attendance rate. Parent's likely want to send their children into the school that has good achievement score, as well as college consider accepting student with high student score in their institution. On the other side politician usually using student achievement as target to achieve and offering to their constituent in order to vote them in their campaign, government is using it to evaluate their program in education output. In order to raise the student achievement, many studies are conducted to analysis the determinant factor affecting this variable. Instead of vast and vary studies, in generally we can classified the variable affecting student achievement into some factors are family background, school resources and environment outside school and family.

Family backgrounds such as parental education, family size, income are the major variable influence factors according to the study Coleman et al (1966). The study reported that family education background significantly strong with the student achievement. Students who come from weak education background and mixed with others who have strong education, the achievement likely will increase. In others study family variable also found significant in Hanushek (1981, 1989, 1992) conclude that student's family significantly consistent affecting student achievement. Schools resources like teacher characteristic, school expenditure, class size, class room management, are examined in various and vast study. Teacher education, experience, class size found have no systematically related to students performance in Hanushek (1971, 1981, 1986). However others study shows that teacher characteristics have significant affect or the most center of school source instead of class size, related to student score (Hanushek 1992, 1998, 2005, 2006, 2010 and Aaronson, barroe and Sanders, 2007).

2. Statement of the Problem

Teacher in Indonesia, according to law no 14 2005, required to meet the qualification standard of teacher. These qualification including, at least possessing 4 years of bachelor degree, professional training, and the last is all teacher has to be certified. Certification program has began in 2006 intended to enhance the quality of teacher through provide training to teachers. In order to have certification, a teacher has to go through process both of a portfolio assessment and after passing the 90-hour class course work. After completed certification process, teacher will receive allowance equal to one month basic salaries. Teacher salaries plus certification allowance are the biggest share of education spending. However empirical studies show that certified teacher in Indonesia, does not have significant impact on improving student performance, Cerdan et, al (2013). Certification only improved the live house of teacher and reduces them to have another second job. This all tells us that government concern to increase the education output with all efforts in upgrading teacher competencies. Starting from 2012, the GOI evaluate teacher performance with the program Uji Kompetensi Guru (UKG) or teacher

competencies test. The objective of this program is to identify teacher baseline competencies and then highlights the result as basis for teacher continuous professional development and improvement. The Evaluation covered two areas of teacher competencies, pedagogic and professional subject matter. In pedagogic area, teacher evaluate how they integrate pedagogic concept implemented in class room learning process, while professional subject evaluate teacher how they mastering and understand each of the subject in their field.

3. Literature Review

Many Studies show that teacher quality is the key central in student performance. The most questions arising on teacher characteristic is what kind of teacher attribute improving student quality. This question explored by Darling-Hammond (2000), Milanowski (2004), Rockof (2004), and Dobbie 2011. Rivkin Hanushek and kain (2005), and Kane, Rockoff, Staiger (2008). All of this study has the same findings that teacher characteristic significantly affect the student performance. Teacher characteristic such as, education background, experience, certificate status, leadership experience, perseverance, teacher evaluation score, preparedness course work are the variables that much pay attention by the scholar in relation to student achievement.

However the method to assessing teacher quality in delivering teaching in classroom is still debating among the researcher. Teacher score test according to some studies, believed can predicted the quality of each teacher in delivering student achievement. Milanowski (2004) found that proper teacher evaluation test can be used as tools to predict student achievement. Goldhaber (2007) used teacher license test to predict teacher effectiveness in the link to effect student achievement. The evidence of this study is supporting the hypothesis that teacher licensure test correlated to student achievement. Teacher quality in term of certification license found the most powerful tolls to predicting student achievement than the others variable such teacher degree, salaries, and expenditure level (Darling-Hammond 2000). White (2004) and Hill et al (2005) are using teacher evaluation score to predict student gain, and their result support that teacher evaluation score significantly related to student gain. Longitudinal database of The Tennessee Value-Added Assessment System (TVAAS) used by Sander Rivers (2000) to evaluate teacher and affect on student performance, they found that effective teacher affecting gain of student score. Although many studies supporting teacher quality affecting student gain, several scholar opposed the idea. Budding, R., & Zamarro, G. (2009) found that teacher characteristic such as teacher licensure testing uncorrelated to student success in the classroom. Similar studies also argue that teacher characteristic in term of teacher score and certified teacher unrelated to student scores see Huang, F. L., & Moon, T. R. (2009); Hanushek, et al (2005); McColskey et al. (2005), Sawchuk, S. (2011). Related studies to teacher characteristic in Indonesia, performed by Fahmi et al (2011) found that teacher certification unrelated to student achievement.

Socio economic status (SES) as it is confirmed in Konstantopoulos, S. (2005); Dahl (2005); Wobmann, (2006); Lacour (2011); Reardon (2011); Willingham (2012); and Silvernail et al (2014) found the correlation of SES to student achievement. Student comes from wealthy family tend to have better performance than un wealthy students. Low achievement related to poor resources in physical, spiritual, in making student getting success in their study. School location demographic is also found matter to student learning Jianzhong Xu (2009) and Mersch, R. L. D. (2012). Both of this study concluded that there is variation of student performance in difference places.

4. Purpose of the Study

This study motivated by the previous empirical study, that student achievement become focus on huge studies starting from Colemen Report (1966). In the huge vast and varied study, teacher characteristic found as the most important variable affecting student achievement. Government of Indonesia (GOI) starting 2006 administers teacher certification aiming to improve teacher quality. GOI also evaluate teacher quality by doing teacher competency testing (UKG) began in 2012 to assessing teacher competency in the field subject of teaching and pedagogic knowledge. Most of the government expenditure in education is used to funding teacher salaries and allowance of certification. This study intended to examine and explore the variable affecting student achievement in two areas are examine the relationship between teacher evaluations score and student achievement; and examine other variable controls such as parent expenditure, government expenditure, availability of electricity, morbidity rate in relation to student achievement.

5. Data and Methodology

This study deploys junior and senior secondary school data per district across Indonesia. Appendix 1 and 2 stipulate the data description in this study. Student performance derived from senior high school and junior high school of national exam on average period 2010-2013, per district. This national exam administer by ministry of education and culture GOI. The exam score range from 0 to 100, for all subject mathematic, English, chemistry and biology. Teacher evaluation score is sourcing from UKG on average per district. UKG intended to measure teacher competencies in each of their field subject, in the area of pedagogy and professional expertise. The score

of the evaluation range from 0 to 100. Others control variable used in the study are enrolment, teacher experience, and education back ground is obtained from ministry of education. Data of per capita expenditure in education, unemployment, morbidity rate, electricity access, poverty gap sourcing from data set in from indodapoer world bank, and the last data, government expenditure in education derived from ministry of finance.

Education production function concept widely used in measuring education output. This concept was used in coleman report (1966), Hanushek 1986, 1995, lee and barro (1997), sawada (2000). On general these study found that student achievement affecting by student family background, school resources, and community or district community factors. Based on previous studies, we use model of education production function to estimate student achievement as follows:

$$A_{it} = \beta_0 + \beta_1 X_{it,} + \beta_2 X_{2it,} + \beta_3 X_{3it,} + \beta_4 X_{4it,} + \beta_5 X_{5it,} + \beta_6 X_{6it,} + \beta_7 X_{7it,} + \beta_8 X_{8it,} + \beta_9 X4_{9it,} + \beta_{10} X_{10} 4_{it,} + \varepsilon_{it,}$$

Where:

Ait= Student Achievement, X1= Teacher Evaluation score, X2= Teacher experience, X3= Teacher education background, X4= Student enrolment, X5= Family spending on education, X6= District Government spending on education, X7= Electricity access, X8= Unemployment Gap, X9=Morbidity Rate X10= Poverty Gap.

6. Result

Table.1 describing the regression result for senior high school level. The estimation result showing that teacher evaluation score statistically significant in relation to student achievement in all subject of Mathematic, Chemistry, Biology and English language. Experience of teacher variables are mixed on each of subject, it is significant on Biology and English subject. Family spending on education significant related on Chemistry and English subject, while government spending significant only in mathematic. Electricity variable is significantly related to all subjects of test score. Definition of electricity here is how the student can accesses the lamp for studying, watching television, browsing the internet, using computer and other electronic devices. Unemployment and poverty variable do not have significant correlation to student achievement in all subject, while morbidity rate mixed, significant on mathematic and chemistry and insignificant on biology and chemistry.

Table. 1. Student Test Score Regression Results (Senior High School Level)

	Math		Chemistry		Biology		English	
Teacher Evaluation score	0.108		0.410		0.211		0.205	
	(0.046)	**	(0.064)	*	(0.037)	*	(0.041)	*
Teacher Experience	0.308		0.155		0.018		0.377	
	(0.165)		(0.142)		(0.008)	**	(0.149)	**
Education Degree	-0.598		-0.240		0.002		0.797	
	(0.836)		(1.293)		(0.001)		(0.652)	
Enrolment	0.094		0.008		0.055		0.069	
	(0.037)		(0.055)		(0.038)		(0.030)	**
Family spending	0.435		0.884		0.004		0.737	
	(0.206)		(0.296)	*	(0.005)		(0.163)	*
Government spending	0.151		0.058		0.020		0.004	
	(0.043)	*	(0.065)		(0.021)		(0.035)	
Electricity access	0.151		0.150		0.227		0.111	
	(0.043)	*	(0.069)	**	(0.076)	*	(0.036)	*
Unemployment gap	0.473		1.138		0.004		0.376	
	(0.304)		(0.449)		(0.002)		(0.246)	
Morbidity rate	-0.161		-0.203		-0.026		-0.041	
	(0.045)	*	(0.067)	*	(0.015)		(0.036)	
Poverty gap	0.497		0.668		0.001		-0.366	
	(0.307)		(0.465)		(0.002)		(0.248)	
Observation	429		417		422		438	
R-Square	0.31		0.28		0.24		0.33	

* significant at 1%; ** significant at 5%

Source: Author Calculation

Table.2 describing the regression result on Junior high school level. Teacher evaluation score, at junior high school level, not enough proved that teacher evaluation score has close relationship with student achievement. Others teacher characteristics such as teacher experience, education background also showing no correlation with student achievement. The strong relationship only showed by enrolment and morbidity rate. The coefficient of determination (R2) at junior high school has low value, 0.07, compare to senior high school. This regression model telling us only small parts of relationship between teacher characteristic and others variable in affecting student achievement. Regression model in senior high school is better explaining the relationship.

Table.2. Student Test Score Regression Results (Junior High School Level)

	Math		English	
Teacher Evaluation score	-0.155		-0.040	
	(0.092)		(0.067)	
Teacher Experience	0.198		0.021	
	(0.182)		(0.077)	
Education Degree	3.085		-1.152	
	(1.489)		(1.080)	
Enrolment	0.231		0.152	
	(0.069)	*	(0.052)	**
Family expenditure	0.049		0.277	
	(0.309)		(0.235)	
Government Expenditure	-0.068		-0.066	
	(0.066)		(0.050)	
Electricity access	0.012		-0.036	
	(0.069)		(0.051)	
Unemployment gap	-0.474		0.004	
	(0.485)		(0.360)	
Morbidity rate	-0.180		-0.162	
	(0.069)	**	(0.052)	*
Poverty gap	0.171		-0.145	
	(0.472)		(0.361)	
Observation	443		442	
R-Square	0.07		0.07	

* significant at 1%; ** significant at 5%

Source: Author Calculation

This study found that, the senior high school level, teacher quality statistically significant affecting student achievement, while it is insignificant in Junior high school level. There is gap of education level between junior high school and senior high school teacher. In senior high school, Teachers with bachelor or 4 year degree is more than junior high school. This is might the reason why teacher evaluation scores insignificant and unrelated to student achievement in junior high school level. Teacher quality is defined as teacher capabilities in the area of in professional knowledge and pedagogical matters. This empirical study consonant with studies of Kimball, et al (2004); Hill et al (2005); Goldhaber (2006); Buddin, R., & Zamarro, G. (2008); ferguson and brown (2008), noted that teacher evaluation score has a positive relationship with student achievement. Access to electricity variable also statistically significant, as noted that every district specially in the east area, almost not covered by electricity causing the students do not using electronic devices such as computer, TV, lamp etc. This phenomenon reveal in the study of Glewwe, P. et .al (2011) study conducted in developing countries that electricity found statistically significant and positive on students score. Teacher experience significant on Biology and English subject while mathematic and chemistry are insignificant. Unemployment and poverty gap found no correlation to student achievement in this study, as it found close related in Lacour (2011), Dahl (2005), Reardon, (2011).

7. Implication and Conclusion

Teacher evaluation score, senior high school level, found statistically positive and significant in relation to student achievement. However teacher evaluation score is insignificant in junior high school level. This findings support the studies that teacher quality is matter to student achievement. Stake holder may use teacher evaluation

score to evaluate teacher performance, and as basis for further improvement. Instead of teacher quality, district government also must pay attention to electricity access in their area since this variable significant related to student achievement. Availability of this electricity infrastructure will make the students easier and comfortable to study both in the schools or their house. This study also noted that district spending variable has small affect on student performance. Education spending share is mostly used for teacher cost. Study conducted by Cerdan et al.(2013) noted that education spending mainly used for teacher personal cost include teacher salaries and allowance of certification. Allocation budget on teacher training and development are still less pay attention by the government. Class size effect or low Student teacher ratio, base on some studies have small effect or advantage on student outcomes. Teacher distribution is unequal among district across Indonesia, Mae Chu Chang et al (2014). The region with excessive teacher will have big spending and vice versa deficit teacher in remote and rural have less education budget. Policy should be addressing to enhance teacher capabilities and professional development rather than focus on smaller class size or increase teacher personal. Teacher distribution needs to take action by central government, since the unequal teacher in some region. This policy should be done by central government, since teacher recruitment done by local government without coordination and communication with others local governments.

Regard to data availability, this study using data per district to explore teacher qualities and student achievement relationship. In the future, study should be extended by using data per class or at least per school basis, so the result will be better rather than per district. Teacher variable may is using teacher qualities in term of teaching class method, UKG score per individual, teacher sex and race and the time period of data. Student variable should consider for social economic class background, parents education, and other entities, so we will know if there is variation result of each entities included.

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Appendix 1. Data Profile (Senior High School Level)

No	Variables	Symbols	Mean	Std. Dev.	Observations
1	Student Achievement (English score test)	At	69,05	7,23	438
2	Enrollment	x1	55,44	10,33	438
3	Teacher experience	x2	6,74	2,14	438
4	Teacher evaluation score	x3	53,97	8,41	438
5	Family expenditure	x4	4,74	2,10	438
6	Unemployement	x5	2,50	1,27	438
7	Morbidity access	x6	26,88	8,40	438
8	Goverment expenditure	x7	35,19	9,49	438
9	Electricity access	x8	93,52	10,36	438
10	Poverty gap	x9	1,85	1,28	438
11	Teacher education	x10	0,71	0,45	438
12	Student Achievement (Biology score test)	At	0,13	0,01	422
13	Enrollment	x1	0,14	0,01	422
14	Teacher experience	x2	0,40	0,07	422
15	Teacher evaluation score	x3	0,15	0,02	422
16	Family expenditure	x4	0,50	0,12	422
17	Unemployement	x5	0,73	0,28	422
18	Morbidity access	x6	0,20	0,03	422
19	Goverment expenditure	x7	0,17	0,03	422
20	Electricity access	x8	0,10	0,01	422
21	Poverty gap	x9	0,88	0,34	422
22	Teacher education	x10	0,81	0,39	422
23	Student Achievement (Chemistry score test)	At	63,74	12,54	417
24	Enrollment	x1	55,41	10,30	417
25	Teacher experience	x2	7,14	3,89	417
26	Teacher evaluation score	x3	51,01	9,94	417
27	Family expenditure	x4	4,77	2,07	417
28	Unemployement	x5	2,52	1,28	417
29	Morbidity access	x6	27,10	8,29	417
30	Goverment expenditure	x7	35,37	9,16	417
31	Electricity access	x8	93,61	9,90	417
32	Poverty gap	x9	1,85	1,26	417
33	Teacher education	x10	0,77	0,42	417
34	Student Achievement (Math score test)	At	69,29	8,70	429
35	enrolment	x1	55,32	10,33	429
36	teacher experience	x2	6,66	2,36	429
37	Teacher evaluation score	x3	54,23	9,53	429
38	Family expenditure	x4	4,72	2,08	429
39	Unemployement	x5	2,50	1,28	429
40	Morbidity access	x6	26,79	8,42	429
41	Goverment expenditure	x7	35,21	9,53	429
42	Electricity access	x8	93,66	9,83	429
43	Poverty gap	x9	1,85	1,28	429
44	Teacher education	x10	0,74	0,44	429

Appendix 2. Data Profile (Junior High School Level)

No	Variables	Symbols	Mean	Std. Dev.	Observations
1	Student Achivement (English score test)	At	56,35	8,84	442
2	Enrollment	x1	72,08	9,49	442
3	Teacher experience	x2	8,49	5,56	442
4	Teacher evaluation score	x3	47,60	7,51	442
5	Family expenditure	x4	4,72	2,10	442
6	Unemployement	x5	2,50	1,27	442
7	Morbidity access	x6	26,94	8,45	442
8	Goverment expenditure	x7	35,23	9,47	442
9	Electricity access	x8	93,42	10,60	442
10	Poverty gap	x9	1,86	1,29	442
11	Teacher education	x10	0,18	0,39	442
12	Student Achivement (Math Score Test)	At	57,91	11,78	443
13	Enrollment	x1	72,08	9,48	443
14	Teacher experience	x2	8,75	3,20	443
15	Teacher evaluation score	x3	46,66	7,34	443
16	Family expenditure	x4	4,72	2,09	443
17	Unemployement	x5	2,50	1,27	443
18	Morbidity acces	x6	26,93	8,45	443
19	Goverment expenditure	x7	35,23	9,46	443
20	Electricity access	x8	93,43	10,59	443
21	Poverty gap	x9	1,86	1,29	443
22	Teacher education	x10	0,19	0,39	443