Teacher job satisfaction and learner performance: An investigation into the 2004 Grade 6 Intermediate Phase Systemic Evaluation

Bradley C. Carruthers

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1 Introduction

Since South Africa's first democratic elections in 1994, the South African Department of Education (DoE) has invoked a multitude of policies to address the educational inequality inherited from the country's apartheid history. Changes in the South African education landscape have been characterised by a significant shift in resources to poorer schools, but despite these efforts, the consensus among South African education commentators is that the formal schooling system remains unable to provide crucial skills needed in the labour market and fails to contribute to the upward social mobility of the poor (see for example Van der Berg (2007), Van der Berg (2008), Taylor (2011), Van der Berg *et al.* (2011) and Spaull (2013)).

Without evidence of improvement from continued interventions in the South African schooling system, it is clear that we need to deepen our understanding of the underlying factors driving educational outcomes to assist policy-makers in efficiently allocating resources. In this regard, empirical studies and education production functions have been used to estimate effects on learner outcomes, but the quality of these studies depend greatly on the absence of endogeneity - especially if researchers are interested in causality. Endogeneity comes in many forms, including inaccurate or sample-biased collection of data, the presence of reverse causality as well as omitted variable bias where relevant variables are not included in the identifying model. Traditional education production functions are particularly prone to endogeneity of the latter form, and the opaque nature of certain agent's traits (i.e. school and teacher quality, learner ability and family background) can severely complicate accurate estimation. To ensure that true causal effects on educational outcomes are approximated, more sophisticated econometric techniques are thus needed to bypass endogeneity issues in education production functions. A learner fixed effects model offers an opportunity to do just this, allowing the researcher to control for learner specific traits and therefore address omitted variable bias.

Using a learner fixed effects model across Maths, Science and English scores from the relatively

untouched South African 2004 Grade 6 Intermediate Phase systemic evaluation, this paper focuses on the effect of teacher attributes - specifically teacher motivation and self-concept - and how this is linked to school and household socio-economic status (SES). With teacher attributes having only recently come into focus in empirical education literature, the evidence is still mixed on whether teacher job satisfaction is conclusively linked to student achievement and there are also strong indications that teacher characteristics such as job satisfaction and self-efficacy influence and interact with learner outcomes intricately.

Firstly, OLS regressions are carried out confirming that the data illustrate two different South African schooling systems as found in Van der Berg (2007), Van der Berg (2008), Van der Berg *et al.* (2011) and Spaull (2013). In quintile 5 schools, it is found that school SES and school/home resources play a prominent role in educational outcomes, but household SES does not. The opposite is true for quintile 1-4 schools. Regarding the variables of interest, the OLS results do not appear to show substantial, consistent effects over subjects.

A fixed effects model is then employed over all three subjects and subject pairs in order to obtain a causal effect of teacher job satisfaction on learner outcomes, with the identifying assumption being that learner specific traits do not vary over subjects. The fixed effects specifications cannot include measures of SES alone owing to SES being student specific, but later analyses incorporate SES through interactions with the variables of interest. Throughout all specifications, effects for teacher job satisfaction and self-efficacy are inconsistent in magnitude and in statistical significance. It is thus not clear whether there is a consistent positive causal effect of teacher job satisfaction on learner test scores. It is hypothesised that the large differences between coefficients in models across all subjects and subject-pairs may reflect further endogeneity in the form of non-random teacher sorting and knowledge in subjects and/or a violation of the assumption regarding subject-invariant learner traits. Measurement error specifically related to missing values also presented a problem in the analysis.

Owing to this paper likely being the first to analyse a causal effect of teacher job satisfaction on stu-

dent achievement in the Grade 6 Intermediate Phase systemic evaluation, the results nonetheless hint at deeper, more complex relationships between teacher job satisfaction, self-efficacy, school environments and learner outcomes. Further investigation into this dataset with yet more sophisticated econometric techniques, and possibly a model of a more structural nature, is thus highly recommended.

The layout of the paper is as follows: Section 2 gives a brief overview of relevant literature; section 3 presents the model and describes certain aspects of the data descriptively and graphically; sections 4, 5 and 6 present the empirical results; section 7 makes some recommendations for further research and section 8 concludes.

2 Brief Literature Review

2.1 Teacher Job Satisfaction and Self-Efficacy

The literature on human capital theory and the benefits of education to students is well developed, but only recently has there been a shift in focus to determining avenues and degrees to which teachers affect learner outcomes. The 'quality' of teachers has become a particularly controversial issue with many debates ensuing concerning the measurement and impact of teacher quality on educational outcomes. Hanushek (2010: 82), in his chapter from the book 'Waiting for "Superman": How we can save American's failing public schools', states that "it is becoming broadly recognized that quality teachers are the key ingredient to a successful school and to improved student achievement", and the empirical evidence seems to increasingly point to exactly this.

Rockoff (2004) for example, analyses data from 10 000 elementary-school students and 300 teachers in New Jersey, USA, and discusses how increasing teacher quality may be a crucial element in raising student outcomes. He mentions further that there is substantial evidence surrounding the high correlation between principals' opinions of teacher quality and student test scores and concludes

by stating that there is much research that still needs to be done regarding the identification, recruitment and retainment of high-quality teachers.

In South Africa, Taylor (2011) investigated the National School Effectiveness Study to identify particular elements of teacher practice, school organisation and their influences on learner/school performance. His findings were that teacher knowledge, pupil-teacher ratios and school facilities were weakly associated with student achievement, but variables linked to management effectiveness were highly significant. More specifically the results showed that curriculum planning, up-to-date assessment records and low teacher absenteeism were distinctly related to learner outcomes, even after controlling for SES and past student performance. He suggests policies aimed at professional development for teachers, firstly to guarantee a level of technical ability for teachers, and secondly to enhance time management skills so as to ensure full curriculum delivery within academic time-frames. He does also however caution against manipulating indicators of efficient management through policy to force teachers to adhere to strict practices, since this may very well detract from the value of such practices.

In fact, Stearns *et al.* (2014) state that the present educational climate necessitates significant public pressure to raise student test outcomes, with teacher's often bearing the brunt of the blame for declining American school performance in particular. Caprara *et al.* (2006) agree that teacher job satisfaction is often at risk today in many countries owing to a myriad of new responsibilities for teachers and a lack of external rewards. Using self-reported questionnaires completed by over 2000 teachers representing 75 Italian junior high schools over two consecutive years in their study, Caprara *et al.* (2006) specifically examine teacher's self-efficacy beliefs as determinants of job satisfaction and learner achievement to find that teacher self-efficacy beliefs do effect teacher job satisfaction and learner outcomes.

In a study investigating the links between teacher perception of social-emotional learning and outcome variables relating to teacher stress, job satisfaction and teaching efficacy, Collie *et al.* (2012) find evidence of the relevance of teacher perceptions of school climate and socio-emotional learning

concerning their work experience, with implications practically and for research. This study thus not only substantiates the argument that teacher perceptions matter, but also conveys that teacher perceptions are strongly linked to their stress levels, teaching efficacy and job satisfaction. Collie *et al.* (2012) conclude by urging schools to make these aspects core considerations and further urge researchers and policy-makers to consider the complex nature of variables when analysing or introducing policy concerning teacher well-being/motivation.

Regarding effects of teacher turnover on student test scores, Ronfeldt *et al.* (2013) use two classes of fixed-effects models to examine over 850 000 New York City Grade 4 and 5 students over 8 years. Their results show that higher teacher turnover is linked to lower scores in English and Maths, particularly in schools with low-scoring students and Black students, even in classes where teachers do not leave (despite teacher quality being controlled for).

Concerning teacher job satisfaction in African countries, Michaelowa (2002) examines teacher job satisfaction, achievement and primary education cost in French-speaking Sub-Saharan Africa. She states that low teacher motivation and the corresponding detrimental effect on student achievement plague many education systems in and she finds evidence of teacher job satisfaction and education quality acting counter-actively. As an example, measures enforcing controls and incentive-related working conditions may improve student achievement but reduce teacher job satisfaction. She also states that highly educated teachers tend to have a mismatch between expectations and the professional reality, again leading to reduced teacher job satisfaction.

Despite the findings above, Banerjee *et al.* (2017) state that it has not been conclusively shown if teacher job satisfaction has positive effects on learner outcomes or if advantages to students with content teachers differ more broadly within schools and school culture. Using the Early Childhood Longitudinal Survey, Banerjee *et al.* (2017) investigate the nature of the relationship between teacher job satisfaction and elementary students' improvements in maths and reading, as well as the way in which the organisational cultures of schools effect the relationship between student outcome development and teacher job satisfaction. They find that teacher job satisfaction

influences student reading improvement positively but only slightly and has no effect on maths improvement from kindergarten to Grade 5. They do find though, that when interacted with school culture, teacher job satisfaction influence both learner outcomes and thus argue for amplified emphasis on increasing teacher job satisfaction and improving school culture.

It is thus clear that there complex relationships between variables concerning teacher job satisfaction, school environment and classroom resources exist. Another consideration, which is particularly pertinent for South Africa, is SES and how this relates to teacher characteristics and learner outcomes.

2.2 Socio-Economic Status

As a standard method of modelling education outcomes, the education production function has come a long way since Coleman *et al.*'s "Equality of Educational Opportunity" report in 1966. In this report, data collected from over 500 000 primary and secondary school students in approximately 3 000 schools was analysed in order to identify the most relevant educational inputs for students, especially those from minority and socially disadvantaged backgrounds. The main findings from the report, while controversial at the time, firmly established the importance of household SES by concluding that school characteristics had little effect when compared to socio-economic characteristics such as family background and student attributes. Interestingly in terms of school inputs, teacher quality was found to have the strongest impact on educational outcomes.

A key insight from the report by Coleman *et al.* (1966) is that students from high SES households generally enrol in schools with higher resource endowment. Importantly, this means that if family background attributes are not controlled for, estimates of the effect of school resources on learner outcomes would likely be biased upwards due to endogeneity in the form of omitted variable bias. One way in which to address omitted variable bias of this form is to specifically incorporate SES indicators into education production functions, with the aim of capturing family, learner and school

traits which may not have been observed. One method for including household SES indicators in education production functions that has become a popular proxy for broad learner SES, is an asset index built on a principal components analysis (PCA). An index constructed in this way will closely approximate household wealth, be less exposed to fluctuations compared to income and thus can serve as a strong link between a household's command over resources and household SES (Filmer & Pritchett, 2001).

As Cowan *et al.* (2013) note however, there are many facets to SES since SES can encompass access to cultural, social and human capital resources in addition to financial resources. In order to fully control for learner SES therefore, it is important to include a range of SES indicators in an empirical study (i.e. parental education, occupational status, access to books), such as has been done in Case & Deaton (1999) and Van der Berg & Burger (2003) in South African studies. South Africa in particular, with our history of inequitable allocation of school resources and persistent poverty/inequality, appears to stand out as an example of where SES consideration would be most warranted. It thus makes sense that a number of studies have endeavoured to uncover the relationships between school/family environments and learner outcomes in South Africa (see Van der Berg (2007), Taylor & Yu (2009) and Spaull (2013)). This study aims to deepen the understanding of how these relationships specifically relate to teacher job satisfaction. To do so, an education production function will be used and thus the basic theory regarding education production functions, as well as fixed effects models, will now be discussed.

3 Empirical Methodology and Data

3.1 Empirical Model: Education Production Function

The standard method to determine relevant factors in the education process is the education production function. In its most simplest form, the education production function models educational

outcomes at a specific point in time, with cumulative individual, peer, family and school inputs having a prolonged effect over time (Hanushek, 2002). This can be represented as follows:

$$A_{it} = f(T_i^{(t)}, S_i^{(t)}, P_i^{(t)}, B_i^{(t)}, I_i), \tag{3.1}$$

where A_{it} represents student i's outcome at time t, $T_i^{(t)}$ represents teacher inputs cumulatively up to time t, $S_i^{(t)}$ represents school inputs cumulatively up to time t, $P_i^{(t)}$ represents peer inputs cumulatively up to time t, $B_i^{(t)}$ represents a vector of family background traits cumulatively up to time t and I_i is a student-specific ability vector.

Shepherd (2011) notes that the education production form in equation 3.1 entails relatively strict assumptions regarding the dynamics of education and initial endowment measures. Commentators have also been critical of the specification of inputs, with Hanushek (1979) remarking that input choice seems to be motivated more by available data rather than what would be conceptually sound. Furthermore, a number of endogeneity issues can complicate education production modelling, including but not limited to: Measurement error, sample selection bias, simultaneity bias and omitted variable bias (especially relating to student ability). Hanushek (1979) specifically discusses how difficult it is to not only measure inherent ability, but to precisely determine and define this variable. Since certain characteristics of the individual, family and school are unobservable in reality, this may bias intervention effects in the form of omitted variable bias (Webbink, 2005).

As opposed to the model in equation 3.1, Shepherd (2011) discusses a "value-added" model which can overcome omitted variable bias and measurement error. This model assumes students are observed at two points in time (t and t^*) and is represented by:

$$A_{it} = f^*(T_i^{(t-t^*)}, S_i^{(t-t^*)}, P_i^{(t-t^*)}, B_i^{(t-t^*)}, I_i, A_{it^*}). \tag{3.2}$$

This model infers that current educational achievement is dependent on teacher, school, peer and family background inputs observed at the two points in time, as well as dependent on a prior achievement variable A_{it^*}.

The fact that the data available to estimate education production functions is generally cross-sectional, which is the case for this paper, implies that only current (and not cumulative) student performance and schooling inputs are available, leading to the following model:

$$A_{it} = f(T_i, S_i, P_i, B_i, I_i). \tag{3.3}$$

Thus, in the absence of another time point, there would be no way to control for learner unobservables such as innate ability. The dataset analysed in this paper however, contains learner outcomes across three subjects - Maths, Science and English - and so if the model in 3.2 is modified to have a subject dimension instead of a time dimension, a learner fixed effects model can be employed. With an additive and linear specification, the empirical model would be as follows:

$$A_{is} = \alpha_i + \boldsymbol{\beta} T_i + \boldsymbol{\gamma} S_i + \boldsymbol{\zeta} P_i + \boldsymbol{\phi} B_i + \boldsymbol{\psi} I_i + \epsilon_{is}, \tag{3.4}$$

where the s subscript indicates the subject dimension instead of time, and ϵ_{is} is independently, identically normally distributed. More generally, a fixed effects model is employed when individual-specific characteristics may bias the predictor, or equivalently, individual error terms are correlated with predictor variables. Assuming unobservables are unchanging over a time/subject dimension, variation in the dependent variable would be due (causally) to other influences (Stock & Watson, 2007). It is therefore important to stress that the identifying assumption for causal interpretations in the model of equation 3.4 is that learner unobservable factors are subject-invariant. In the

case of this paper, this assumption would be violated if specific traits of learners (such as subject specific learner ability or motivation) varied over subjects.

If the identifying assumption for equation 3.4 holds and in the absence of other forms of endogeneity, coefficient estimates would represent causal relationships on learner test scores. In summary therefore:

1. *What is the causal relationship of interest?* I am concerned with the causal effect of teacher job satisfaction on Grade 6 learner outcomes, represented by a β_{ij} coefficient in the $\boldsymbol{\beta}$ vector in equation 3.4.

2. *What is the experiment ideally capturing the causal effect?* The ideal experiment would be to have learner unobservables be invariant across subjects, to randomly assign teachers with different levels of accurately measured job satisfaction to South African schools (with teachers randomly assigned in all other aspects as well) and then to assess a causal difference in Grade 6 learner outcomes.

3. *What is the identification strategy?* Owing to the fact that the ideal experiment is infeasible for ethical and administrative reasons, the identification strategy is to analyse national systemic evaluation data instead. A soundly-based and well-implemented quasi-experimental method such as a learner fixed effects model would assist in approximating the causal relationship of concern.

4. *What is the mode of statistical inference?* Owing to (1) the population being Grade 6 learners in South Africa, (2) the national systemic evaluation survey being nationally representative of this group and (3) robust standard errors clustered around schools being implemented, there is a strong argument for valid statistical inference.

Lastly, while a fixed effects model may assist in eliminating omitted variable bias concerning unobservable covariates, fixed-effects estimates are also highly susceptible to attenuation bias as a

result of measurement error (Angrist & Pischke, 2008).

It should also be noted that the above fixed effects model is still a simplified version of the conceptual model first discussed (which as pointed out may itself have flaws). Limitations exist regarding model estimates being interpreted at causal and when interpreting the magnitudes of estimates as true impacts on learner outcomes.

3.2 Data

South Africa education legislation prescribes that education provision, delivery and performance should be evaluated and monitored (DoE, 2003). It is for this reason that systemic evaluation studies are administered to measure the South African education system's ability to achieve established social, transformational and economic goals (DoE, 2005). The 2004 Grade 6 Intermediate Phase systemic evaluation, conducted by the South African DoE, formed the source of data for this paper. The survey is nationally representative of Grade 6 learner test scores in South Africa and was administered to pursue three goals: To assess the current level of achievement within the system; to place attention on particular areas that need to be addressed; and to constitute a baseline for comparison to future evaluation studies (DoE, 2005).

The evaluation sampled 2 869 teachers, 33 296 parents, 989 principals and 34 015 learners from 998 public schools. Learners were evaluated at the end of their Grade 6 year in Mathematics, Natural Sciences and English with the objective being to provide systems-based information regarding learner performance in the Intermediate Phase (DoE, 2005). Over and above the collection of Maths, Sciences and English outcomes, comprehensive background information was recorded, including home and school environments - hopefully providing an opportunity to reveal factors that are related to learner outcomes. The large sample size of learners and schools and inclusion of a diverse range of potential covariates make the 2004 Grade 6 Intermediate Phase systemic evaluation highly useful in analysing student achievement in South Africa.

The dependent variables measuring student achievement employed in the empirical analysis are individual students' Maths, Science and English percentage scores, summary statistics of which are displayed in table A1 in the Appendix. A general to specific modelling procedure was implemented where variables supported by theory were included in the model irrespective of their significance. For the purposes of the fixed effects analysis, an additional variable of interest is created by conducting a multiple correspondence analysis on eight teacher survey questions concerning how valuable specific aspects of educators' work are to their job contentment. This is represented in the variable named 'Job Satisfaction Aspects Are Valued'.

Table A1 in the Appendix further displays summary statistics for covariates included in the specifications. To incorporate a measure of SES, two new variables are created in the data. A household SES variable is constructed by conducting a PCA on survey questions pertaining to aspects of learner home environments and assets (i.e. the type of floor, walls, roof, furniture in their homes; if they have access to water and electricity etc.). Using the average SES of students by school ID, school SES is calculated and interpreted as an approximation of the affluence of schools sampled.

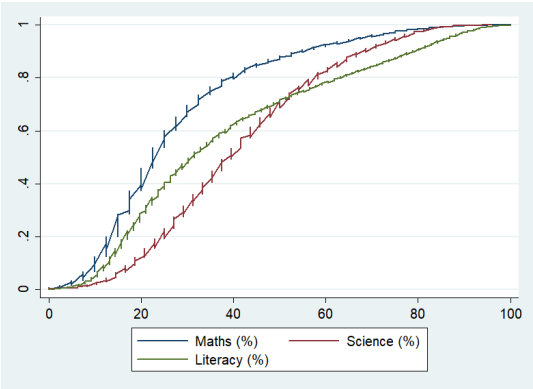
Table 1: **Learner achievement (%)**

Subject	Mean	Q1	Median	Q3
Maths	27	15	23	35
Science	41	27	40	54
English	38	18	32	55

Source: Own calculations in Stata using 2004 Grade 6 Intermediate Phase Systemic Evaluation.

Table 1 above depicts the means and quartiles for each subject, with figure 1 further illustrating the cumulative distribution curves per subject. The means for learner achievement in each subject correspond to the calculations of the DoE (2005) (i.e. 27%, 41% and 38% Maths, Science and English respectively), which are considered low in terms of student achievement.

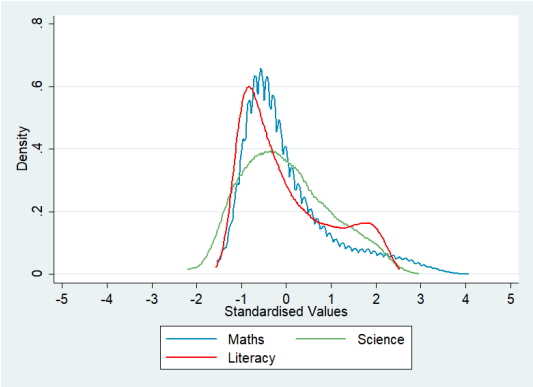
Figure 1: **Cumulative graph for subject scores**



Source: Own calculations in Stata using 2004 Grade 6 Intermediate Phase Systemic Evaluation.

Keeping in mind that a higher curve traced out in figure 1 implies a larger proportion of students attaining lower marks, it is clear that students perform the worst in Maths. Interestingly, English is the second worst subject performance-wise, but only for performance less than approximately 50%. Above the 50% mark, students struggle to attain high scores for Science rather than English.

Figure 2: **Standard learning area scores kernel densities**

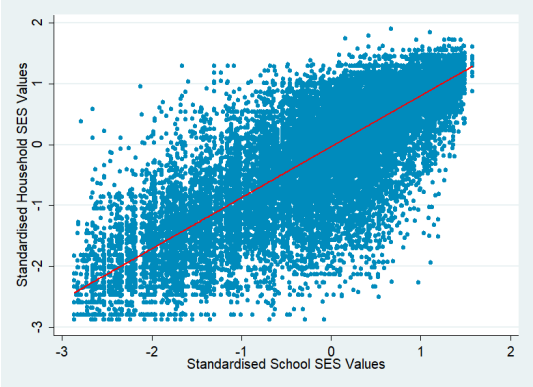


Source: Own calculations in Stata using 2004 Grade 6 Intermediate Phase Systemic Evaluation.

After standardising the scores of the three learning areas to have a mean of zero and a standard deviation of one, a density graph of the standard scores in figure 2[1] shows that all three curves are right-skewed, confirming the results in table 1; for all three subjects, the mean is greater than the median. It is also interesting to note that the curve for English is bi-modal, alluding to the possibility of there being two distinct data-generating processes in the data.

Figure 3[2] below plots school SES against household SES in a scatter plot with a locally weighted regression line. The scatter plot shows that different students from a range of household SES backgrounds attend diverse SES schools, implying that there is much variation across SES dimensions in the data. Although the locally weighted regression line that is applied is non-parametric and thus does not necessitate a linear form, the line in figure 3 highlights a strictly increasing and linear relationship between school SES and household SES.

Figure 3: **School SES vs. household SES**

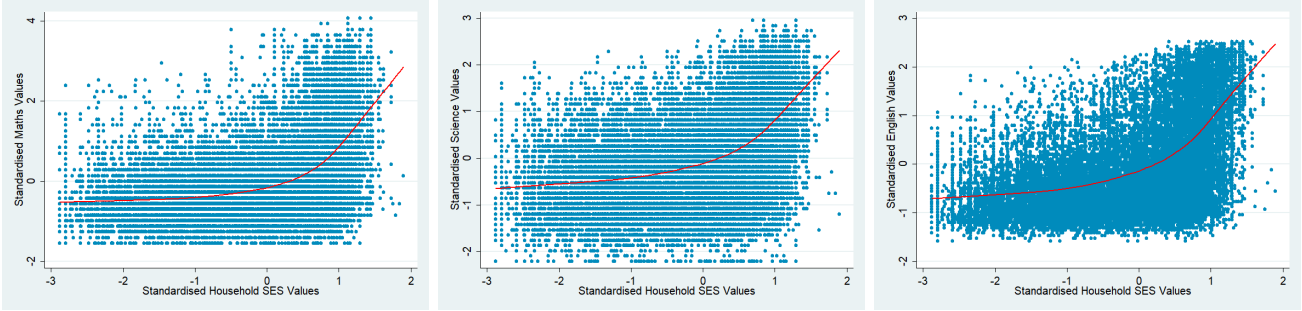


Source: Own calculations in Stata using 2004 Grade 6 Intermediate Phase Systemic Evaluation.

[1] From an essay submitted for Economics of Education 778.
[2] Based on an essay submitted for Economics of Education 778.

Figure 4[3] illustrates locally weighted regression lines for learner outcomes in each subject on household SES. In all three figures there is see a positive, convex relationship where household SES has little influence on learner outcomes at low levels (in approximately the lowest 60-80% of the distribution), but a substantial impact at very high levels. It should be noted however, that this analysis does not control for confounding factors.

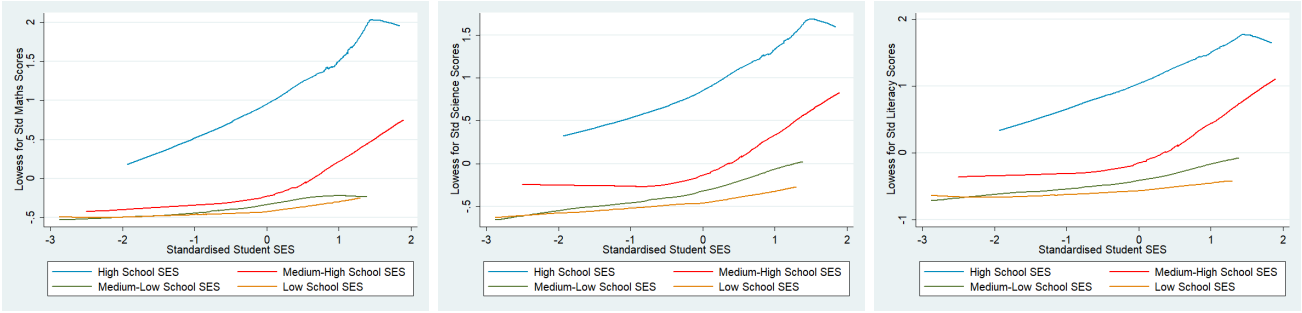
Figure 4: **Regression of learner outcomes on household SES**



Left: Maths, Centre: Science, Right: English.

Source: Own calculations in Stata using 2004 Grade 6 Intermediate Phase Systemic Evaluation.

Figure 5: **Household SES vs. learner outcomes by school**



Left: Maths, Centre: Science, Right: English.

Source: Own calculations in Stata using 2004 Grade 6 Intermediate Phase Systemic Evaluation.

[3]Based on an essay submitted for Economics of Education 778.

Locally weighted scatterplot smoothing for learner scores on household SES by school SES is shown in figure 5[4]. This further delineates the large disconnect concerning student achievement between the poorer quintiles of schools compared to the wealthiest quintile - illustrated by the relative flatness of the curves for low to medium-high school SES for all three subjects. Notably, there is a kink at the end of each subject curve for high SES schools. It is thus plausible that while higher SES schools are linked with superior performance, high SES students tend to perform similarly in high SES schools.

As the core focus of this paper is to assess the role of teacher job satisfaction in determining learner performance, it is worthwhile describing teacher level job satisfaction and job valuation. Table 2 shows proportions of selected teacher demographics, training and classroom resourcing controls in sub-populations relating to variables of interest. Regarding teachers wanting to change their career, it can be seen that men are more likely to want to leave teaching with women dominating the sub-sample of teachers not wanting to change (58.3%) and men forming a larger proportion of those who do want to change careers (52%). This could be due to social and gender-work norms influencing men's decisions on remaining in the teaching profession, or it could represent discrimination in the labour market; that is, men of a given skill level are more likely to earn higher wages outside of teaching, which could entice them out of the profession. Regarding teacher language, teachers who teach in their home language appear to be slightly more eager to change careers.

In a similar vein to the teacher gender trend, younger and higher educated teachers are more likely to want to leave teaching; teachers with bachelor's, honour's and master's degrees exhibit larger proportions for teachers wanting to change careers over those who don't (31%, 11.4% and 0.6% versus 25.7%, 6.2% and 0.4% respectively). Again, this may represent higher paying opportunities in the labour market for young, more educated teachers (who have skills that are highly transferable), whereas older teachers for example being taught under different systems not necessitating a

[4]From an essay submitted for Economics of Education 778.

four-year degree would be limited to remain in teaching. The same eagerness for career change is evident for teachers with more years of training, but only one out of the four results is statistically significant.

Regarding classroom resources, teachers who want to leave teaching come from less resourced classrooms/schools, but only the 'Library' result is statistically significant. Interestingly, the results for school SES quintiles indicate that teachers who want to change careers are over-represented in wealthier schools and under-represented in poorer schools. There could be a number of reasons for this: It could be that in poorer and more rural areas there is less proximity to labour market opportunities and therefore limited access to alternatives for teachers, or teachers in poorer schools could have less autonomy and ability to criticize their work situation which would translate into an inability to change careers. This result could also suggest higher pressure for student achievement, as Stearns *et al.* (2014) allude to more generally, being placed on wealthier, more expensive quintile 5 schools which have a larger endowment of resources and therefore potentially higher expectations from parents and other external agents.

The remaining results in table 2 imply that teacher gender and age do not have meaningful relationships to how teachers perceive society's, principals' and learners' appreciation of their work, but there are significant differences across socio-economic and resource settings. More specifically, teachers that view society, principals and learners appreciating what they do are more likely to be teaching in poorer resource settings, whilst teachers from resource-rich schools are significantly less likely to feel appreciated by society.

Table 2: **Proportion of teachers wanting to change career or feeling under-appreciated, by teacher and classroom characteristics**

	Full teacher sample	Want to Change Career		Society Appreciates My Work		Principal Appreciates My Work		Learners Appreciate My Work	
		No	Yes	No	Yes	No	Yes	No	Yes
Male	45.6	41.7	52***	46.3	45.6	51	45.2	43.4	45.8
Female	54.4	58.3	48***	53.7	54.4	49	54.8	56.7	54.2
Home language same as LoLT	18.8	17.3	22.8***	67.8	11.7***	28.4	18.5***	79.9	14.3***
Home language different from LoLT	81.2	82.7	77.2***	32.2	88.3***	71.6	81.5***	20.1	85.7***
20 - 29	4.3	4	4.7	7	3.9	2.7	4.3	6.9	4
30 - 34	20.4	18	24.6***	17	21	17.6	20.6	17.2	20.7
35 - 39	26.8	23.1	33.2***	27.6	26.6	35.8	26.7	27	26.7
40 - 44	20.6	20.8	19.5	19.7	20.7	20.3	20.5	22.1	20.5
45 - 49	15.2	17.4	11.9***	13.5	15.5	15.5	15	14.2	15.4
50+	12.7	16.8	6.1***	15.1	12.4	8.1	12.8	12.8	12.7
Classroom management training	57.5	60.9	51.8	53.3	58.3	46.3	58.1	56.1	57.8
<Grade 12	2.4	2.8	1.8	0.9	2.7**	2.2	2.5	0.01	2.5
Grade 12	61.1	64.9	55.2***	50.3	62.9***	61	64.2	49.2	62.1**
Bachelor's Degree	28	25.7	31**	37.7	26.4***	27.9	26.3	44.5	26.5***
Honours Degree	8.1	6.2	11.4***	11.2	7.6	6.6	8.1	0.1	0.1
Masters Degree	0.5	0.4	0.6	0	0.5	0.01	0	0	0
<2 Years Training	2.8	2.9	2.5	6.5	2.2***	2.2	2.9	9.3	2.3***
2 Years Training	11	12.7	8.2**	4.9	12***	6.8	11.2	2.5	11.7***
3 Years Training	51.3	50.5	53.3	33.1	54.4***	54.7	51.5	29.9	53.2***
3+ Years Training	35	33.9	36	55.6	31.3***	36.5	34.5	58.3	32.8***
No School Library	52	49.8	54.6	59.4	28.9	82.5	46.5	50.8	11.8
No Internet	17.9	15.3	20.3	50.8	11.8	27.1	16.6	55.2	14.1
No Classroom Electricity	72.4	68.7	77.8	94.3	68.5	77.7	71.5	99.5	69.7
No Class Library	40.6	37.8	45.7**	29.3	42.7**	42.7	40.7	31.2	41.6**
No Teacher Resource Centre	33.7	33.5	32.3	59.4	28.9***	33.6	33	61.8	30.6***
School SES Q1	23.3	27	16.9***	4.1	26.4***	10.8	24.1***	0	25.3***
School SES Q2	21.3	21.6	21.5	5.1	23.9***	12.8	21.8**	3.4	22.9***
School SES Q3	19	18.6	20.9	9.7	21**	23.7	19	4.9	20.6***
School SES Q4	18.4	16.3	21.1**	21.9	17.6	26.4	17.8*	22.1	17.8
School SES Q5	18.2	16.6	19.7	59.2	11.2***	26.4	17.2**	69.6	13.5***

Source: Own calculations in Stata using 2004 Grade 6 Intermediate Phase Systemic Evaluation.

4 Results: OLS Investigation into SES

It is clear from section 3.2 that not only do learner outcomes in the data differ greatly in terms of school and household SES, but so do teacher characteristics such as job satisfaction and perceptions of appreciation.

Table 3: **OLS regressions for quintile 5 and quintile 1-4 schools**

	Quintile 5 Sample			Quintile 1-4 Sample		
	(1)	(2)	(3)	(4)	(5)	(6)
	Std Maths	Std Science	Std English	Std Maths	Std Science	Std English
Would Not Like to Change Careers	0.200*	0.0115	-0.0461	-0.0362	-0.111*	-0.0528
	(2.12)	(0.16)	(-0.86)	(-1.09)	(-2.47)	(-1.39)
Think Society Appreciates My Work	0.0115	-0.00387	-0.0857	-0.0645	-0.0366	-0.00950
	(0.09)	(-0.06)	(-1.16)	(-0.68)	(-0.40)	(-0.12)
Think The Principal Appreciates My Work	-0.110	0.255*	0.0623	-0.0318	-0.112	0.112
	(-0.79)	(2.14)	(0.43)	(-0.35)	(-1.34)	(1.41)
Think Learners Appreciate My Work	-0.0991	-0.255**	-0.0992	0.123	-0.0234	-0.0169
	(-1.09)	(-3.19)	(-1.40)	(0.83)	(-0.16)	(-0.14)
School SES	-2.046	4.509	6.111**	0.0874	0.125*	0.236***
	(-0.97)	(1.59)	(3.09)	(1.63)	(2.31)	(5.20)
School SES Squared	1.130	-1.469	-2.308**	0.0280	0.00920	0.0449*
	(1.32)	(-1.26)	(-2.63)	(1.28)	(0.34)	(2.27)
Household SES	0.0581	0.0614	0.171*	0.0796***	0.0973***	0.123***
	(0.82)	(0.56)	(2.00)	(5.49)	(5.22)	(7.39)
Household SES Squared	0.0871	0.0645	-0.0273	0.0299***	0.0310**	0.0369***
	(1.53)	(1.02)	(-0.57)	(3.69)	(3.07)	(4.17)
Constant	4.010**	0.00387	-2.077	0.830	-0.269	0.267
	(2.68)	(0.00)	(-1.69)	(1.47)	(-0.43)	(0.60)
Observations	3395	3016	3418	10387	10402	10445
R^2	0.620	0.597	0.650	0.245	0.299	0.445

Note: t-statistics in parentheses. Statistical significance at the 0.05, 0.01 and 0.001 level is represented as *, ** and *** respectively. All regressions include pupil, school and teacher controls listed in table A1 (coefficients omitted for brevity). Robust standard errors clustered around schools used.

Source: Own calculations in Stata using 2004 Grade 6 Intermediate Phase Systemic Evaluation.

Table 3 above contains coefficients for variables of interest, as well as school and household SES variables from the model depicted in equation 3.3 in section 3.1. As is done in the literature (see

Van der Berg (2007), Van der Berg (2008), Van der Berg *et al.* (2011) and Spaull (2013)), the data for the OLS regressions is subsetted into quintile 1-4 schools (approximately 17 997 observations) and quintile 5 schools (5 575 observations) based on school SES.

The results of table 3 confirm the finding in the literature that South Africa has two disparate schooling systems. Regarding school SES and school SES squared, the coefficients for quintile 5 schools in columns (1) - (3) are large with differing signs compared to quintile 1-4 schools in columns (4) - (6). This implies that, among quintile 5 schools, being enrolled in the wealthiest schools have a significant, large and diverse effects on learner outcomes in different subjects. Thus, it is not so much the affluence of the student attending a quintile 5 school that makes a difference in learner outcomes, but more so the affluence, and possible corresponding 'quality', of the school itself. Household SES on the other hand seems to play a larger and statistically significant role in quintile 1-4 schools: All the coefficients for household SES and household SES squared are positive and significant, contrasted by a lack of these effects for quintile 5 schools. The positive values for household SES squared indicate a convex quadratic form, suggesting that the impact of household SES in quintile 1-4 schools on learner scores is positive and is increasing as household SES increases.

Concerning the variables of interest, there does not appear to be consistent effects across all three subjects. For the 'Would Not Like to Change Careers' variable, there are statistically significant effects of 0.2 and -0.11 for Maths and Science scores respectively. The only other two significant coefficients are in Science for 'Think The Principal Appreciates My Work' (0.255) and again in Science for 'Think Learners Appreciate My Work' (-0.255). While the OLS results show inconsistent signs, sizes and statistical significances of the variables of interest (possibly hinting that there may be learner and school quality unobservables disturbing the results), a learner fixed effects model may assist in eliminating endogeneity in the form of omitted variable bias, so long as learner traits are not subject specific.

5 Results: Fixed Effects

5.1 Across All Three Subjects

Table 4 shows coefficients for the variables of interest from table A2 in the Appendix for learner fixed effects models over all three subjects with different control groups added piecewise. Column (5) represents the final specification 3.4 in section 3 with teacher demographics, teacher training and classroom resource controls.

Without any controls in column (1), the strongest and largest coefficient is for 'Think Society Appreciates My Work' which has a positive value of 0.0655 and with a t-statistic of 1.81 is significant at the 10% level. This implies that there is a positive contribution to learner test scores for teachers who perceive society as appreciative of their profession. The other coefficients in column (1) have mixed signs, are substantially smaller in size and are far from statistically significant. Column (2) adds teacher demographic controls and the perceptions of societal appreciation variable now increases in magnitude and becomes statistically significant at the 5% level. The other variables have all decreased in size and statistical significance, except for 'Job Satisfaction Aspects Are Valued' which is still effectively zero. In column (3), the only control is teacher training and these results mirror column (1).

Column (4) shows coefficients for the model where classroom resource controls are present, which are relatively weak and small. Since the coefficient for 'Would Not Like to Change Careers' decreases in both cases where teacher demographics and classroom resource controls are added, this implies that something about wanting to change careers is correlated to teacher demographics and access to classroom resources, confirming the findings from table 2. The drop in coefficient size for 'Think Society Appreciates My Work' when classroom resources is controlled for also substantiates the finding from table 2 that perceptions of societal appreciation are correlated with classroom resources. Lastly, column (5) in table 4 includes all controls simultaneously. Here, somewhat small coefficient sizes and low statistical significance can be seen - again the society

variable is the strongest and largest effect (but not statistically different from zero).

Table 4: **Teacher attributes for fixed effects across all three subjects**

	(1)	(2)	(3)	(4)	(5)
Would Not Like to Change Careers	0.0233	0.0143	0.0232	0.0200	0.0136
	(1.22)	(0.75)	(1.20)	(1.04)	(0.69)
Think Society Appreciates My Work	0.0655†	0.0722*	0.0666†	0.0514	0.0502
	(1.81)	(2.05)	(1.84)	(1.38)	(1.41)
Think The Principal Appreciates My Work	0.0122	0.00778	0.00800	-0.00698	-0.0149
	(0.34)	(0.23)	(0.22)	(-0.18)	(-0.41)
Think Learners Appreciate My Work	-0.0324	-0.00676	-0.0279	-0.0417	-0.00574
	(-0.69)	(-0.14)	(-0.58)	(-0.97)	(-0.13)
Job Satisfaction Aspects Are Valued	-0.000127	0.00257	-0.000799	0.00100	0.00184
	(-0.01)	(0.26)	(-0.08)	(0.10)	(0.19)
Constant	-0.0413	-0.135**	-0.0551	-0.294*	-0.435**
	(-0.87)	(-2.65)	(-0.99)	(-1.97)	(-2.87)
Teacher Demographic Controls	No	Yes	No	No	Yes
Teacher Training Controls	No	No	Yes	No	Yes
Classroom Resource Controls	No	No	No	Yes	Yes
Observations	58538	58538	58538	58538	58538
R^2	0.001	0.010	0.004	0.009	0.021

Note: t-statistics in parentheses. Statistical significance at the 0.1, 0.05, 0.01 and 0.001 level is represented as †, *, ** and *** respectively. The overall sample size has been reduced to just under 60 000 due to a large number of missing values on certain teacher training and classroom resources variables. Robust standard errors clustered around schools used.
Source: Own calculations in Stata using 2004 Grade 6 Intermediate Phase Systemic Evaluation.

Other noteworthy effects in the fully controlled for fixed effects model across all subjects depicted in full in column (5) in table A2 include: A substantial positive and significant female teacher effect of 0.0711, a large positive and significant effect for teacher home language being the same as the LoLT and a very large positive and significant effect coefficient for teachers having attendance registers.

Out of the variables of interest, the effect of 0.0722 standard deviations in column (2) for 'Think Society Appreciates My Work' is the strongest and largest in the fixed effects specifications explored thus far. Owing to that particular model only controlling for teacher demographics (and the full model in column (5) having diversely-signed, small and statistically insignificant variables) this is

either not a promising sign for a casual effect of teacher job satisfaction on learner outcomes, or implies that the assumptions that have been made to implement this identification strategy are erroneous. In order to obtain a clearer indication of whether the former or latter is the issue, fixed effects across subject pairs are no examined for robustness.

5.2 Across Subject Pairs

Table 5 summarises coefficients from table A3 in the Appendix where the model across all three subjects in column (1) is now compared with subject-pair models, all controls included. Again, the coefficient on 'Think Society Appreciates My Work' is the strongest and largest across the specifications, while all the other variable coefficients are small and statistically insignificant. It is very interesting that while the coefficient for this variable has a value of 0.0163 and t-statistic of 0.31 for the Maths/Science specification, the effects and statistical significances for the Science/English and English/Maths models are substantially stronger (with the coefficient in the English/Maths model just missing significance at the 5% level).

This discrepancy between the specifications hints that what was assumed invariant across subjects may inherently vary over subjects. Teachers of different ability and knowledge may sort themselves non-randomly across subjects and students' may have subject-specific traits confounding the fixed effects methodology. Our assumption that all these factors contained in the error term affect everything in the same way appears to be incorrect. This could point to how teachers' specific skill-sets (i.e. in Mathematics, the Sciences and Language) are valued differently in society - this would clearly translate into their ability to teach students. For example, a young, highly educated maths teacher may have a different perception of their abilities and value relative to an older reading teacher with a diploma. This suggests an identification strategy with a model that is more structural in nature. Regardless, it can still be seen how SES is connected to these models.

Table 5: **Teacher attributes for fixed effects over subject pairs**

	(1)	(2)	(3)	(4)
	All Subjects	Maths/Science	Science/English	English/Maths
Would Not Like to Change Careers	0.0136	0.0129	0.0211	0.0183
	(0.69)	(0.43)	(0.73)	(0.57)
Think Society Appreciates My Work	0.0502	0.0163	0.0742	0.110†
	(1.41)	(0.31)	(1.40)	(1.95)
Think The Principal Appreciates My Work	-0.0149	0.0319	-0.00744	-0.0476
	(-0.41)	(0.57)	(-0.17)	(-0.94)
Think Learners Appreciate My Work	-0.00574	-0.0163	0.0812	-0.0430
	(-0.13)	(-0.28)	(1.29)	(-0.65)
Job Satisfaction Aspects Are Valued	0.00184	-0.0152	-0.00308	0.0159
	(0.19)	(-1.21)	(-0.23)	(0.97)
Constant	-0.435**	-0.177	-0.354*	-0.691*
	(-2.87)	(-0.73)	(-2.09)	(-2.37)
Teacher Demographic Controls	Yes	Yes	Yes	Yes
Teacher Training Controls	Yes	Yes	Yes	Yes
Classroom Resource Controls	Yes	Yes	Yes	Yes
Observations	58538	38712	38911	39453
R^2	0.021	0.035	0.051	0.062

Note: t-statistics in parentheses. Statistical significance at the 0.1, 0.05, 0.01 and 0.001 level is represented as †, *, ** and *** respectively. Robust standard errors clustered around schools used.

Source: Own calculations in Stata using 2004 Grade 6 Intermediate Phase Systemic Evaluation.

6 Results: Fixed Effects with SES Interactions

To integrate measures of SES into the fixed effects specifications, interaction terms for Household SES are added to the full-subject and subject-pair models, displayed in table 6 and table 7 by school quintile below. The first striking aspect of table 6 is the interaction term with the second variable of interest. Across all models except for Science/English, the effects for the interaction term are positive, large and highly significant, implying that learners of wealthier backgrounds see greater returns to their performance when taught by teachers who view society as valuing their work relative to their poorer counterparts.

Table 6: **Teacher attribute SES interactions for fixed effects**

	(1)	(2)	(3)	(4)
	All Subjects	Maths/Science	Science/English	English/Maths
1. Would Not Like to Change Careers	0.0209	0.0285	0.0184	0.0208
	(1.03)	(0.96)	(0.61)	(0.65)
1. × Household SES	-0.0195	-0.000126	0.000822	-0.0349
	(-1.13)	(-0.00)	(0.03)	(-1.44)
2. Think Society Appreciates My Work	0.0236	-0.0212	0.0894	0.0365
	(0.68)	(-0.41)	(1.57)	(0.74)
2. × Household SES	0.0663*	0.0938*	-0.0149	0.186***
	(2.19)	(2.29)	(-0.31)	(4.20)
3. Think The Principal Appreciates My Work	-0.0126	0.0121	-0.0324	-0.00971
	(-0.36)	(0.22)	(-0.67)	(-0.22)
3. × Household SES	0.0119	0.0527	0.1000†	-0.0494
	(0.40)	(1.37)	(1.91)	(-1.46)
4. Think Learners Appreciate My Work	0.0829	0.0593	0.193*	0.0544
	(1.39)	(0.80)	(2.21)	(0.86)
4. × Household SES	-0.126**	-0.120*	-0.142*	-0.192***
	(-2.61)	(-2.18)	(-2.09)	(-3.42)
5. Job Satisfaction Aspects Are Valued	0.000278	-0.0179	0.000761	0.0176
	(0.02)	(-1.28)	(0.05)	(1.05)
5. × Household SES	0.00297	0.00646	-0.00742	0.0209
	(0.24)	(0.53)	(-0.48)	(1.14)
Constant	-0.486**	-0.211	-0.350†	-0.772**
	(-3.20)	(-0.86)	(-1.88)	(-2.81)
Teacher Demographic Controls	Yes	Yes	Yes	Yes
Teacher Training Controls	Yes	Yes	Yes	Yes
Classroom Resource Controls	Yes	Yes	Yes	Yes
Observations	53956	35630	35925	36357
R^2	0.023	0.041	0.054	0.070

Note: t-statistics in parentheses. Statistical significance at the 0.1, 0.05, 0.01 and 0.001 level is represented as †, *, ** and *** respectively. Robust standard errors clustered around schools used.

Source: Own calculations in Stata using 2004 Grade 6 Intermediate Phase Systemic Evaluation.

While statistically insignificant, the coefficients for the society variable itself are for the most part positive - the teacher differential impact thus depends on relative home affluence. These results point to how English and Science teacher comparisons in quintile 1-4 schools may exhibit no

differences, but how there may be inherent differences in quintile 5 schools.

Fascinatingly, for interaction with the fourth variable of interest, all coefficients are strongly negative and statistically significant at the 5% level at least. Contrary to 'Think Society Appreciates My Work', learners from wealthier homes see a negative return to their achievement when taught by a teacher who believes learners appreciate their work. Again, the coefficients for the variable itself are positive, which may imply a reverse differential impact dependent on relative home affluence, or it may relate to the distribution of relatively more wealth students across the school system. Concerning the latter: It is known that teachers in quintile 5 schools generally do not view learners as appreciating their work; thus, poorer students, most likely to be in poorer schools, taught by teachers who believe learners are appreciative of their work, are performing better. Therefore, wealthier students who have teachers reporting that learners appreciate teachers' work may just be more likely to be found in relatively poorer schools where performance is lower.

Table 7 uses the same specification as in table 6, but is split into quintile 5 and 1-4 schools. As in table 3 in section 4, stark differences can be seen between quintile 5 and 1-4 schools. For quintile 5 schools, there is a positive, significant coefficient for 'Would Not Like to Change Careers' in the Maths/Science specification; significant, positive effects for 'Think Society Appreciates Work' across all subjects and the English/Maths specification and a consistent negative effect for 'Think Principal Appreciates Work', all of which is not present in quintile 1-4 schools.

The similarity between quintile 5 and 1-4 schools is for the interaction term with 'Think Principal Appreciates Work' where positive, significant coefficients are observed in both quintile 5 and 1-4 schools. This implies that learners of wealthier backgrounds see greater returns to their performance in both quintile 5 and 1-4 schools when taught by teachers who view the principal as valuing their work relative to their poorer counterparts. The matter is complicated however by the strong negative baseline effects for quintile 5 schools in the same variable - indicating that teachers in quintile 5 schools who view principals as valuing their work already have negative effects on learner outcomes.

Table 7: **Teacher attribute SES interactions for fixed effects, by SES**

	Quintile 5				Quintile 1-4			
	All	M/S	S/E	E/M	All	M/S	S/E	E/M
1. Would Not Like to Change Careers	-0.0771	0.203**	0.0136	-0.00172	0.0184	-0.0108	-0.000547	0.0255
	(-1.62)	(2.78)	(0.24)	(-0.02)	(0.74)	(-0.31)	(-0.01)	(0.68)
1. × Household SES	0.0310	0.103†	-0.0662	-0.0167	-0.0270	-0.0212	-0.0107	-0.0352
	(0.69)	(1.80)	(-1.37)	(-0.22)	(-1.30)	(-0.73)	(-0.34)	(-1.32)
2. Think Society Appreciates Work	0.143†	0.223	0.119	0.304***	0.00933	-0.106	0.106	-0.00589
	(1.69)	(1.60)	(1.39)	(3.99)	(0.17)	(-1.43)	(1.39)	(-0.07)
2. × Household SES	-0.0440	-0.0919	0.0300	-0.0985	0.0415	0.00348	-0.0258	0.235***
	(-0.76)	(-0.91)	(0.54)	(-1.20)	(0.92)	(0.08)	(-0.49)	(3.50)
3. Think Principal Appreciates Work	-0.162*	0.172	-0.240**	-0.546***	0.0223	0.0717	-0.0792	0.0392
	(-1.99)	(1.13)	(-2.63)	(-6.45)	(0.58)	(1.04)	(-1.39)	(0.68)
3. × Household SES	0.0759†	0.112†	0.0279	0.169**	0.0436	0.0904†	0.0949†	-0.00261
	(1.79)	(1.89)	(0.54)	(3.16)	(1.49)	(1.88)	(1.86)	(-0.06)
4. Think Learners Appreciate Work	0.0645	-0.260†	0.0266	-0.0525	0.0563	-0.0291	0.332**	0.0468
	(0.78)	(-1.83)	(0.26)	(-0.64)	(0.60)	(-0.31)	(2.89)	(0.49)
4. × Household SES	-0.0719	-0.114	0.0105	-0.0651	-0.111	-0.0988	-0.0115	-0.152*
	(-1.23)	(-1.31)	(0.16)	(-0.84)	(-1.60)	(-0.95)	(-0.17)	(-2.53)
5. Job Satisfaction Aspects Are Valued	0.0597*	0	0	0	0	0	0	0
	(2.53)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
5. × Household SES	-0.0544*	-0.0376	-0.00473	-0.0157	0.00763	0.00755	-0.0203	0.0375†
	(-2.60)	(-1.09)	(-0.22)	(-0.50)	(0.57)	(0.65)	(-1.25)	(1.94)
Constant	0.437	2.471†	-1.806*	1.530***	-0.742***	-0.260	-0.437*	-0.919**
	(0.97)	(1.77)	(-2.49)	(5.66)	(-3.88)	(-0.87)	(-2.33)	(-3.00)
Teacher Demographic Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Teacher Training Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Classroom Resource Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	11946	21738	21798	22230	42010	31923	31726	32158
R^2	0.085	0.158	0.193	0.216	0.021	0.038	0.065	0.075

Note: t-statistics in parentheses. Statistical significance at the 0.1, 0.05, 0.01 and 0.001 level is represented as †, *, ** and *** respectively. Robust standard errors clustered around schools used.

Source: Own calculations in Stata using 2004 Grade 6 Intermediate Phase Systemic Evaluation.

More generally, there appears to be a proxying of school function and learner environment in the results, which would then effect teacher job satisfaction and self-efficacy. The results in table 7 are thus not necessarily the impact of the corresponding variables, alluding to the complex mechanisms

and interactions between variables mentioned by Collie *et al.* (2012) and Banerjee *et al.* (2017).

7 Recommendations for Further Research

This study is most likely one of the first to analyse the 2004 Grade 6 Intermediate Phase systemic evaluation regarding teacher characteristics relating to job satisfaction/self-efficacy and considering the above analysis, there is no conclusive evidence of a causal relationship between teacher job satisfaction on learner educational outcomes. While the empirical analysis found some evidence of teacher job satisfaction and self-efficacy effects, it became clear these effects were inconsistent across specifications including all three subjects, over subject pairs and when interacted with household SES.

The results indicate it is likely that other forms of endogeneity relating to sample selection bias and measurement error need to be addressed in the identification strategy to be more confident in ascertaining a relationship between teacher job satisfaction and student achievement. Regarding measurement error, not only is it alarming that Angrist & Pischke (2008) emphasise fixed effects models as being particularly prone to attenuation bias, but a large concern is also that the large number of missing values may be distributed non-randomly, which would bias results if variables containing missing values are left unconsidered. One recommendation for further research into this data-set would thus be to include missing value dummies to recover variation from observations that were neglected in this analysis.

As mentioned previously, the learner fixed effects specifications employed in this paper assume learner unobservable factors are subject-invariant. After the analysis, a strong argument can be made that not only do learners exhibit subject-specific traits (such as strengths in linguistic versus numerical subjects etc.), but also as surmised in section 5.2, teachers sort themselves according to their ability and knowledge non-randomly across subjects. Additionally, the possibility of teachers' skill-sets being valued differently in society could also translate into their ability to teach students

and into job satisfaction and self-efficacy.

In light of the above findings and caveats, further exploration of the Intermediate Phase systemic evaluation is highly recommended since it is a large and rich dataset that has been left relatively untouched. More sophisticated econometric techniques, such as models of a more structural nature, could be employed to ascertain more substantial evidence of a causal relationship of teacher job satisfaction on learner outcomes, or could be used to focus on entirely different relationships, such as access to classroom-specific resources which was seen to play an important role in the above analysis.

8 Concluding Remarks

Education is something that South Africa, and the rest of Africa for that matter, still has to get right. Certain factors continue to reduce the effective delivery of quality education in South Africa - no doubt still linked to the legacy of Apartheid. The implications of a perpetually under-educated population in the modern, exponentially evolving world are dire; well-aligned government education policy is thus becoming increasingly more crucial. Representative data and soundly conducted quantitative analysis provide an avenue to uncover valuable insights into the South African education production function and into the influence of agent's attributes in the knowledge transfer process.

This paper investigated the relatively unexplored 2004 Grade 6 Intermediate Phase Systemic Evaluation. After a brief discussion of the relevant literature, aspects of the data were explored descriptively and graphically where it was found that household and school SES play a large role in learner outcomes in Maths, Science and English, as well as in teachers' job satisfaction and self-efficacy. More specifically, the data confirmed the findings of recent South African empirical education literature that that there are abundant differences between quintile 5 and 1-4 schools and how aspects regarding teachers, schools and SES interact with learner outcomes.

The divergence between South Africa's two separate schooling systems served as a basis to employ a traditional education production function and implement OLS regressions to gain initial insight into how the variables of interest and school/household SES influenced learner outcomes. Among quintile 5 schools, it appeared that students home background played less of a role compared to the affluence of the school itself. On the other hand, household SES played the largest role in quintile 1-4 schools. The variables of interest exhibited different signs, varying sizes and inconsistent statistical significance levels and this further motivated a learner fixed effects model to address potential endogeneity relating to learner and school unobservables.

In the learner fixed effects models employed there were again isolated cases where certain variables of interest effects were large and statistically significant, particularly for the 'Think Society Appreciates My Work' variables where there were positive large effects. In the full model across all three subjects where teacher demographics, teacher training and classroom resources were controlled for, the coefficients were small and not statistically different from zero at even the 10% level. In the models over subject pairs there was again little evidence of consistent teacher job satisfaction effects, but there were distinct differences across subject-pair specifications, suggesting more endogeneity in the data. When interacting SES with the variables of concern, the results reiterated the differences between quintile 5 and 1-4 schools, with a substantial effect for the 'Think Principal Appreciates Work' variable as opposed to the society variable prominent in previous models.

Lastly, recommendations were discussed regarding other forms of endogeneity potentially inherent in the analysis with a focus on measurement error and sample selection bias regarding teacher/subject combinations, all of which would influence accurate estimation of a causal job satisfaction effect. There is also a strong possibility that the assumption of subject-invariant learner traits is implausible. Since this study was likely the first of its kind in investigating the 2004 Grade 6 Intermediate Phase Systemic Evaluation regarding teacher job satisfaction and self-efficacy, further investigation into the dataset is highly recommended owing to its size, richness and inclusion of numerous, diverse variables. (Approximately 7 350 words)

Appendix

Table A1: **Summary statistics of model variables**

Variable	Mean	S.D.	Min	Max	N
Educational Outcomes					
Maths Score (%)	27.58797	17.82077	0	100	102048
Science Score (%)	41.04531	18.54542	0	95.83334	102045
English Score (%)	38.49276	24.3848	0	100	102048
Variables of Interest					
Would Not Like to Change Careers	.6278206	.4833884	0	1	94261
Think Society Appreciates My Work	.8589375	.3480878	0	1	95681
Think The Principal Appreciates My Work	.9442797	.2293819	0	1	95118
Think Learners Appreciate My Work	.9206386	.2703035	0	1	95777
Job Satisfaction Aspects Are Valued	-5.85e-10	1	-5.426387	1.264366	95878
Teacher Demographics					
Female Teacher	.5456909	.4979105	0	1	96912
Teacher Age Group	4.620139	1.414589	1	7	97491
Teacher Lang Same as LoLT	.1941929	.39558	0	1	102048
Teacher Training					
Highest Qualification	1.244398	1.585643	0	5	90725
Professional Teacher Training	2.407594	1.864552	0	6	97126
Curriculum Training This Year	1.608552	1.780161	0	4	96207
Inclusive Education Training	.4495686	.497453	0	1	86692
Learning Area Training	.7477317	.4343168	0	1	91478
Classroom Mgmt. Training	.5687338	.4952559	0	1	88901
HIV/Aids Training	.5322763	.4989599	0	1	90004
Race and Values Training	.2388007	.4263532	0	1	85653
Gender Equity Training	.312508	.4635183	0	1	86225
Drug Abuse Training	.2911572	.4542984	0	1	86613
Classroom Resources					
Teacher Resource Centre	.3529361	.4778856	0	1	93575
Library	.5399379	.498405	0	1	94935
Internet	.1892386	.3917001	0	1	92497
Classroom Electricity	.7567548	.4290441	0	1	97153
Classroom Accommodates Special Needs	.2248803	.4175057	0	1	96727
Attendance Register	.9880278	.108761	0	1	97142
Lesson Plans	.9595104	.1971055	0	1	96494
Learner Performance Records	.9887386	.1055212	0	1	97057
Reports Signed by Caregivers	.8372548	.3691349	0	1	95499
Learner Portfolios	.8900093	.3128798	0	1	95799
Learner Profiles	.7934267	.4048488	0	1	93986
Curriculum Documents	.9595584	.1969935	0	1	96114
No Class Library Books	1.062445	.9415243	0	2	95812
Learner Attendance (<50%)	5.184207	1.148414	1	6	97309
School Management Team Assistance (Always)	2.121341	1.25262	0	4	97337
Total Time Allocated to Learning Area (4 - 9 Hours)	.7752086	1.205039	0	3	95622
School Fees Collected in Teaching Time	.3121982	.4633928	0	1	89046

Programmes Planned in Teaching Time	.1228393	.3282545	0	1	88571
Homework Marked in Teaching Time	.697989	.4591325	0	1	92394
Remedial Support in Teaching Time	.8074018	.3943422	0	1	94923
Studying (Professional) in Teaching Time	.0418794	.2003148	0	1	87537
Class Sharing During Teaching Time	.0300116	.1706202	0	1	95363
Pupil/School					
Household SES	-5.01e-09	1.774468	-5.108543	3.367867	93516
School SES	-.0567272	1.488118	-4.323224	2.29277	101976
Household SES Squared	3.148702	4.366429	2.63e-08	26.09721	93516
School SES Squared	2.21769	3.277059	2.49e-07	18.69027	101976
Home (Rural)	.4003038	.4899623	0	1	100731
School (Rural)	1.408732	1.561244	0	5	100731
Home Language Different from LoLT	.1836692	.3872161	0	1	100191
Gender (Boy)	.5045309	.4999819	0	1	101304
Age Group	.4012375	.6502629	0	2	100848
Province	3.539187	2.461294	0	8	102048
Household Residents	1.125394	1.81671	0	7	99957
Household Books	.8352025	.7727552	0	2	98976
Time to School	1.353136	1.539697	0	5	100287
No Pre-primary before Grade 1	.2840967	.4509853	0	1	100677
School Library Indication	1.898663	1.67862	0	4	97398
Community Library Indication	1.814102	1.634675	0	4	98538
Absenteeism Indication	.8660219	.7672927	0	3	99576
Learner Has Maths Textbook	.5962697	.4906471	0	1	99564
Learner Has Science Textbook	.5799958	.4935617	0	1	99099
Learner Has English Textbook	.6086564	.4880535	0	1	99603
Learner Feels Safe	.8525376	.354568	0	1	100134
Learner Enjoys School	.9257647	.2621547	0	1	100626
Learner Enjoys Learning	.9085815	.2882047	0	1	100122
Learners Help Each Other	.7679606	.4221361	0	1	99927
Learner Likes Teachers	.9168367	.2761303	0	1	99996
Teachers Encourage Learners	.8455607	.3613712	0	1	99981
Teachers Interested in Learner Work	.8840558	.3201596	0	1	100005
Caregivers Informed of Learner Progress	.7723426	.4193224	0	1	99966
School Awards Prizes	.6695936	.4703618	0	1	100104
School Provides for Special Needs	.7513646	.4322241	0	1	100026
Playing with Friends Prevents HW	.5353161	.4987537	0	1	100365
Helping Parents Prevents HW	.5235445	.4994479	0	1	99705
Watching TV Prevents HW	.4074387	.4913602	0	1	99534
Listening to the Radio Prevents HW	.4208686	.493701	0	1	99537
Looking After Siblings Prevents HW	.3325492	.4711289	0	1	99468
Nobody to Help with HW	.3930369	.4884274	0	1	99525
Nobody Makes Sure I Complete HW	.3915314	.4880952	0	1	99402
Not Understanding Prevents HW	.4095818	.4917591	0	1	99438
Learners Never Leave Early	1.619549	1.265024	0	3	98370
Learners Never Arrive Late	1.776421	1.242814	0	3	96798
Learners Never Absent	1.790283	1.258061	0	3	96015
Learners Never Damage School Property	1.37419	1.317914	0	3	95871
Learners Never Swear	1.410863	1.268127	0	3	95718

Learners Never Smoke at School	.5352843	1.036777	0	3	95439
Learners Never Abuse Alcohol at School	.5652188	1.07803	0	3	95586
Learners Never Abuse Drugs at School	.3131612	.8299418	0	3	98403
Learners Never Bring Weapons to School	.8269843	1.247572	0	3	97968
Teachers Never Injure Me	1.04232	1.294182	0	3	97260
Learners Never Injure Me	1.678185	1.29234	0	3	96372
Learners Never Bully Me	1.523023	1.242126	0	3	96036
Learners Never Receive Corporal Punishment	1.521134	1.20881	0	3	96384

Source: Own calculations in Stata using 2004 Grade 6 Intermediate Phase Systemic Evaluation.

Table A2: **Teacher attributes for fixed effects across all three subjects**

	(1)	(2)	(3)	(4)	(5)
Would Not Like to Change Careers	0.0233	0.0143	0.0232	0.0200	0.0136
	(1.22)	(0.75)	(1.20)	(1.04)	(0.69)
Think Society Appreciates My Work	0.0655	0.0722*	0.0666	0.0514	0.0502
	(1.81)	(2.05)	(1.84)	(1.38)	(1.41)
Think The Principal Appreciates My Work	0.0122	0.00778	0.00800	-0.00698	-0.0149
	(0.34)	(0.23)	(0.22)	(-0.18)	(-0.41)
Think Learners Appreciate My Work	-0.0324	-0.00676	-0.0279	-0.0417	-0.00574
	(-0.69)	(-0.14)	(-0.58)	(-0.97)	(-0.13)
Job Satisfaction Aspects Are Valued	-0.000127	0.00257	-0.000799	0.00100	0.00184
	(-0.01)	(0.26)	(-0.08)	(0.10)	(0.19)
Female Teacher		0.0651***			0.0711***
		(4.25)			(4.40)
Aged 20-24		0.0777			0.00553
		(0.94)			(0.08)
Aged 25-29		0.0796*			0.0761
		(1.96)			(1.88)
Aged 30-34		-0.00817			-0.0179
		(-0.34)			(-0.74)
Teacher Age (35-39)		0			0
		(.)			(.)
Aged 40-44		0.0206			0.0182
		(0.84)			(0.67)
Aged 45-49		0.00977			-0.000580
		(0.44)			(-0.02)
Aged 50+		0.0162			0.00407
		(0.53)			(0.12)
Teacher Lang Same as LoLT		0.150***			0.139**
		(3.37)			(3.27)
Highest Qual. (Grade 12)			0		0
			(.)		(.)
< Grade 12			-0.0123		0.00966
			(-0.25)		(0.22)
Bachelor's Degree			-0.00880		0.00145
			(-0.31)		(0.05)
Honours Degree			-0.00276		-0.00583

	(-0.09)		(-0.19)
Masters Degree	-0.150**		-0.386**
	(-2.79)		(-3.15)
Professional Teacher Training (3+ Years)	0		0
	(.)		(.)
< A Year	-0.0120		0.0381
	(-0.25)		(0.52)
1 Year	0.0388		0.0478
	(0.65)		(0.85)
2 Years	0.00140		0.00511
	(0.05)		(0.18)
3 Years	-0.00714		-0.00118
	(-0.32)		(-0.05)
None	0.111		0.0658
	(0.95)		(0.50)
Curric. Training This Year (< 80 Hours)	0		0
	(.)		(.)
80 Hours	0.0147		0.0179
	(0.31)		(0.39)
80+ Hours	-0.0184		-0.0156
	(-0.59)		(-0.52)
None	-0.0455		-0.0184
	(-1.53)		(-0.60)
Type of Curric. Training Recognition (Attendance Cert.)	0		0
	(.)		(.)
Credits for Further Study	0.0355		0.0199
	(0.76)		(0.45)
No Recognition	0.0380		0.0372
	(1.62)		(1.66)
No Training	0.0231		-0.0139
	(0.58)		(-0.34)
Inclusive Education Training	-0.0127		-0.0231
	(-0.48)		(-0.91)
Learning Area Training	-0.00943		0.00613
	(-0.38)		(0.24)
Classroom Mgmt. Training	0.0222		0.0160
	(1.01)		(0.76)
HIV/Aids Training	0.0147		0.0133
	(0.71)		(0.65)
Race and Values Training	-0.00129		0.0205
	(-0.04)		(0.65)
Gender Equity Training	0.00620		0.00465
	(0.21)		(0.16)
Drug Abuse Training	-0.00196		-0.00239
	(-0.07)		(-0.09)
Teacher Resource Centre		-0.00381	-0.0147
		(-0.15)	(-0.58)
Library		0.00917	0.00713
		(0.36)	(0.29)

Internet	0.0422	0.0430
	(1.41)	(1.50)
Classroom Electricity	-0.0485	-0.0677
	(-1.08)	(-1.45)
Classroom Accommodates Special Needs	-0.0314	-0.0341
	(-1.39)	(-1.55)
Attendance Register	0.176	0.234*
	(1.75)	(2.31)
Lesson Plans	0.0667	0.0703
	(1.32)	(1.39)
Learner Performance Records	0.0677	0.0607
	(1.19)	(0.99)
Reports Signed by Caregivers	0.0611*	0.0574*
	(1.98)	(1.99)
Learner Portfolios	0.0150	0.0168
	(0.42)	(0.46)
Learner Profiles	-0.0313	-0.0391
	(-1.06)	(-1.29)
Curriculum Documents	-0.0365	-0.0173
	(-0.80)	(-0.39)
No Class Library Books	0	0
	(.)	(.)
1-10	0.0310	0.0361
	(0.97)	(1.13)
10+	0.0310	0.0205
	(1.46)	(0.99)
Learner Attendance (< 50%)	0	0
	(.)	(.)
50 - 59%	-0.115	-0.130
	(-0.94)	(-1.05)
60 - 69%	0.000563	0.0217
	(0.01)	(0.28)
70 - 79%	0.0186	0.0118
	(0.25)	(0.16)
80 - 89%	-0.0105	-0.0199
	(-0.15)	(-0.27)
90 - 100%	0.00841	0.00359
	(0.12)	(0.05)
School Management Team Assistance (Always)	0	0
	(.)	(.)
Most of the Time	0.00127	0.00140
	(0.05)	(0.06)
Sometimes	0.000881	-0.0178
	(0.03)	(-0.64)
Never	-0.0551	-0.0743
	(-1.36)	(-1.89)
Total Time Allocated to Learning Area (4 - 9 Hours)	0	0
	(.)	(.)
< 4 Hours	-0.0170	-0.00878

				(-0.84)	(-0.43)
9+ Hours				-0.0316	-0.0305
				(-1.34)	(-1.25)
School Fees Collected in Teaching Time				0.00315	-0.0158
				(0.13)	(-0.66)
Programmes Planned in Teaching Time				-0.0276	-0.0149
				(-0.90)	(-0.47)
Homework Marked in Teaching Time				0.0338	0.0385
				(1.57)	(1.85)
Remedial Support in Teaching Time				-0.0163	-0.0168
				(-0.72)	(-0.75)
Studying (Professional) in Teaching Time				0.0349	0.0324
				(0.78)	(0.75)
Class Sharing During Teaching Time				0.0356	0.0253
				(0.60)	(0.43)
Constant	-0.0413	-0.135**	-0.0551	-0.294*	-0.435**
	(-0.87)	(-2.65)	(-0.99)	(-1.97)	(-2.87)
Observations	58538	58538	58538	58538	58538
R^2	0.001	0.010	0.004	0.009	0.021

Note: t-statistics in parentheses. Statistical significance at the 0.05, 0.01 and 0.001 level is represented as *, ** and *** respectively. Robust standard errors clustered around schools used.

Source: Own calculations in Stata using 2004 Grade 6 Intermediate Phase Systemic Evaluation.

Table A3: **Teacher attributes for fixed effects over subject pairs**

	(1)	(2)	(3)	(4)
	All Subjects	Maths/Science	Science/English	Maths/English
Would Not Like to Change Careers	0.0136	0.0129	0.0211	0.0183
	(0.69)	(0.43)	(0.73)	(0.57)
Think Society Appreciates My Work	0.0502	0.0163	0.0742	0.110
	(1.41)	(0.31)	(1.40)	(1.95)
Think The Principal Appreciates My Work	-0.0149	0.0319	-0.00744	-0.0476
	(-0.41)	(0.57)	(-0.17)	(-0.94)
Think Learners Appreciate My Work	-0.00574	-0.0163	0.0812	-0.0430
	(-0.13)	(-0.28)	(1.29)	(-0.65)
Job Satisfaction Aspects Are Valued	0.00184	-0.0152	-0.00308	0.0159
	(0.19)	(-1.21)	(-0.23)	(0.97)
Female Teacher	0.0711***	0.0576*	0.0147	0.113***
	(4.40)	(2.30)	(0.73)	(4.65)
Aged 20-24	0.00553	-0.116	-0.0317	0.0143
	(0.08)	(-1.40)	(-0.41)	(0.16)
Aged 25-29	0.0761	0.0650	0.0627	0.0597
	(1.88)	(1.15)	(1.10)	(0.97)
Aged 30-34	-0.0179	0.0337	-0.0998**	0.0289
	(-0.74)	(0.88)	(-3.17)	(0.63)
Teacher Age (35-39)	0	0	0	0
	(.)	(.)	(.)	(.)
Aged 40-44	0.0182	0.0915**	0.0432	-0.0537

	(0.67)	(2.91)	(1.48)	(-0.93)
Aged 45-49	-0.000580	0.0294	-0.0253	-0.0194
	(-0.02)	(0.72)	(-0.75)	(-0.43)
Aged 50+	0.00407	0.0750	-0.00571	-0.00538
	(0.12)	(1.42)	(-0.16)	(-0.10)
Teacher Lang Same as LoLT	0.139**	0.0834	0.139*	0.170**
	(3.27)	(1.24)	(2.33)	(3.16)
Highest Qual. (Grade 12)	0	0	0	0
	(.)	(.)	(.)	(.)
< Grade 12	0.00966	-0.0640	0.0626	0.0661
	(0.22)	(-1.21)	(1.10)	(0.97)
Bachelor's Degree	0.00145	-0.00230	0.0496	-0.0376
	(0.05)	(-0.07)	(1.81)	(-0.68)
Honours Degree	-0.00583	-0.0804	-0.0248	0.00738
	(-0.19)	(-1.85)	(-0.58)	(0.17)
Masters Degree	-0.386**	-0.470**	-0.229	0
	(-3.15)	(-3.22)	(-1.58)	(.)
Professional Teacher Training (3+ Years)	0	0	0	0
	(.)	(.)	(.)	(.)
< A Year	0.0381	0.119	0.0423	0.192*
	(0.52)	(1.09)	(0.24)	(2.19)
1 Year	0.0478	0.131	-0.00398	0.0348
	(0.85)	(1.90)	(-0.04)	(0.33)
2 Years	0.00511	-0.00982	-0.0228	0.000938
	(0.18)	(-0.19)	(-0.48)	(0.02)
3 Years	-0.00118	0.0341	0.00677	-0.0458
	(-0.05)	(1.09)	(0.27)	(-1.19)
None	0.0658	0.371***	0.0652	-0.277
	(0.50)	(6.94)	(0.51)	(-1.12)
Curric. Training This Year (< 80 Hours)	0	0	0	0
	(.)	(.)	(.)	(.)
80 Hours	0.0179	-0.0928	-0.0857	0.119*
	(0.39)	(-1.05)	(-1.25)	(2.05)
80+ Hours	-0.0156	-0.0368	-0.00174	0.0186
	(-0.52)	(-0.80)	(-0.04)	(0.43)
None	-0.0184	0.0983	-0.0780	-0.0528
	(-0.60)	(1.88)	(-1.95)	(-0.94)
Type of Curric. Training Recognition (Attendance Cert.)	0	0	0	0
	(.)	(.)	(.)	(.)
Credits for Further Study	0.0199	-0.0708	0.00464	0.196***
	(0.45)	(-0.85)	(0.08)	(3.51)
No Recognition	0.0372	-0.0420	0.0694*	0.0832*
	(1.66)	(-1.16)	(2.16)	(2.20)
No Training	-0.0139	-0.176**	0.0663	0.0980
	(-0.34)	(-2.86)	(1.16)	(1.42)
Inclusive Education Training	-0.0231	0.0448	0.0140	-0.0787*
	(-0.91)	(1.07)	(0.43)	(-2.38)
Learning Area Training	0.00613	-0.0120	0.0268	0.0265
	(0.24)	(-0.30)	(0.71)	(0.63)

Classroom Mgmt. Training	0.0160	-0.00674	0.0176	-0.0116
	(0.76)	(-0.21)	(0.57)	(-0.32)
HIV/Aids Training	0.0133	0.0340	0.0756**	-0.00624
	(0.65)	(1.09)	(2.67)	(-0.21)
Race and Values Training	0.0205	-0.0120	-0.0115	0.0762
	(0.65)	(-0.20)	(-0.33)	(1.53)
Gender Equity Training	0.00465	-0.0191	-0.0328	0.0157
	(0.16)	(-0.37)	(-0.89)	(0.42)
Drug Abuse Training	-0.00239	-0.00848	0.0636	-0.0484
	(-0.09)	(-0.21)	(1.91)	(-1.22)
Teacher Resource Centre	-0.0147	-0.0372	-0.0958**	0.0281
	(-0.58)	(-0.90)	(-2.65)	(0.70)
Library	0.00713	0.00849	-0.0459	0.0497
	(0.29)	(0.21)	(-1.29)	(1.33)
Internet	0.0430	0.0581	0.0683*	0.0426
	(1.50)	(1.24)	(2.12)	(0.93)
Classroom Electricity	-0.0677	-0.253***	-0.127*	-0.0408
	(-1.45)	(-4.14)	(-1.99)	(-0.57)
Classroom Accommodates Special Needs	-0.0341	-0.0796*	-0.0272	-0.0124
	(-1.55)	(-2.38)	(-0.98)	(-0.34)
Attendance Register	0.234*	0.246	-0.0391	0.451*
	(2.31)	(1.59)	(-0.45)	(2.56)
Lesson Plans	0.0703	0.164	-0.0374	0.159*
	(1.39)	(1.60)	(-0.48)	(2.14)
Learner Performance Records	0.0607	0.123	-0.00233	0.110
	(0.99)	(0.88)	(-0.02)	(0.90)
Reports Signed by Caregivers	0.0574*	0.0796	0.0354	0.0219
	(1.99)	(1.65)	(1.13)	(0.48)
Learner Portfolios	0.0168	-0.0360	0.0994	0.0854
	(0.46)	(-0.69)	(1.80)	(1.25)
Learner Profiles	-0.0391	-0.00645	-0.0611	-0.0661
	(-1.29)	(-0.15)	(-1.69)	(-1.42)
Curriculum Documents	-0.0173	-0.105	0.0165	-0.0270
	(-0.39)	(-1.35)	(0.25)	(-0.33)
No Class Library Books	0	0	0	0
	(.)	(.)	(.)	(.)
1-10	0.0361	0.0420	0.0510	0.0386
	(1.13)	(1.11)	(1.03)	(0.79)
10+	0.0205	0.0226	0.00865	0.0122
	(0.99)	(0.66)	(0.32)	(0.38)
Learner Attendance (< 50%)	0	0	0	0
	(.)	(.)	(.)	(.)
50 - 59%	-0.130	-0.622***	0.219	-0.249
	(-1.05)	(-3.39)	(1.71)	(-1.40)
60 - 69%	0.0217	-0.238	0.101	0.172
	(0.28)	(-1.83)	(1.10)	(1.54)
70 - 79%	0.0118	-0.186	0.232*	-0.0850
	(0.16)	(-1.76)	(2.44)	(-0.71)
80 - 89%	-0.0199	-0.0984	0.166	-0.159

	(-0.27)	(-1.08)	(1.82)	(-1.31)
90 - 100%	0.00359	-0.0952	0.217*	-0.126
	(0.05)	(-1.00)	(2.49)	(-1.04)
School Management Team Assistance (Always)	0	0	0	0
	(.)	(.)	(.)	(.)
Most of the Time	0.00140	-0.0440	0.0550*	-0.0105
	(0.06)	(-1.21)	(2.09)	(-0.29)
Sometimes	-0.0178	-0.0408	0.0801*	-0.0800
	(-0.64)	(-1.00)	(2.40)	(-1.68)
Never	-0.0743	-0.102	-0.00811	-0.124
	(-1.89)	(-1.40)	(-0.16)	(-1.95)
Total Time Allocated to Learning Area (4 - 9 Hours)	0	0	0	0
	(.)	(.)	(.)	(.)
< 4 Hours	-0.00878	-0.0165	-0.0737**	0.0123
	(-0.43)	(-0.58)	(-2.87)	(0.28)
9+ Hours	-0.0305	-0.0225	-0.0379	-0.0177
	(-1.25)	(-0.56)	(-1.12)	(-0.52)
School Fees Collected in Teaching Time	-0.0158	-0.0974**	-0.0301	0.0391
	(-0.66)	(-2.73)	(-0.99)	(1.01)
Programmes Planned in Teaching Time	-0.0149	0.0396	-0.0190	-0.0795
	(-0.47)	(0.70)	(-0.48)	(-1.68)
Homework Marked in Teaching Time	0.0385	0.0151	0.0449	0.0415
	(1.85)	(0.40)	(1.61)	(1.39)
Remedial Support in Teaching Time	-0.0168	-0.00836	-0.0282	-0.0363
	(-0.75)	(-0.24)	(-1.03)	(-1.00)
Studying (Professional) in Teaching Time	0.0324	0.0593	0.0477	-0.121
	(0.75)	(0.99)	(0.70)	(-1.38)
Class Sharing During Teaching Time	0.0253	0.113	-0.0540	0.0949
	(0.43)	(1.40)	(-0.69)	(1.15)
Constant	-0.435**	-0.177	-0.354*	-0.691*
	(-2.87)	(-0.73)	(-2.09)	(-2.37)
Observations	58538	38712	38911	39453
R^2	0.021	0.035	0.051	0.062

Note: t-statistics in parentheses. Statistical significance at the 0.05, 0.01 and 0.001 level is represented as *, ** and *** respectively. Robust standard errors clustered around schools used.

Source: Own calculations in Stata using 2004 Grade 6 Intermediate Phase Systemic Evaluation.

Table A4: **Teacher attribute SES interactions for fixed effects**

	(1)	(2)	(3)	(4)
	All Subjects	Maths/Science	Science/English	English/Maths
1. Would Not Like to Change Careers	0.0209	0.0285	0.0184	0.0208
	(1.03)	(0.96)	(0.61)	(0.65)
1. × Household SES	-0.0195	-0.000126	0.000822	-0.0349
	(-1.13)	(-0.00)	(0.03)	(-1.44)
2. Think Society Appreciates My Work	0.0236	-0.0212	0.0894	0.0365
	(0.68)	(-0.41)	(1.57)	(0.74)
2. × Household SES	0.0663*	0.0938*	-0.0149	0.186***
	(2.19)	(2.29)	(-0.31)	(4.20)
3. Think The Principal Appreciates My Work	-0.0126	0.0121	-0.0324	-0.00971
	(-0.36)	(0.22)	(-0.67)	(-0.22)
3. × Household SES	0.0119	0.0527	0.1000	-0.0494
	(0.40)	(1.37)	(1.91)	(-1.46)
4. Think Learners Appreciate My Work	0.0829	0.0593	0.193*	0.0544
	(1.39)	(0.80)	(2.21)	(0.86)
4. × Household SES	-0.126**	-0.120*	-0.142*	-0.192***
	(-2.61)	(-2.18)	(-2.09)	(-3.42)
5. Job Satisfaction Aspects Are Valued	0.000278	-0.0179	0.000761	0.0176
	(0.02)	(-1.28)	(0.05)	(1.05)
5. × Household SES	0.00297	0.00646	-0.00742	0.0209
	(0.24)	(0.53)	(-0.48)	(1.14)
Female Teacher	0.0707***	0.0637*	0.0130	0.107***
	(4.27)	(2.51)	(0.63)	(4.43)
Aged 20-24	0.0254	-0.0145	0.0424	-0.0000591
	(0.36)	(-0.17)	(0.57)	(-0.00)
Aged 25-29	0.0686	0.0561	0.0550	0.0461
	(1.67)	(0.99)	(0.96)	(0.71)
Aged 30-34	-0.0191	0.0466	-0.103**	0.0213
	(-0.77)	(1.18)	(-3.25)	(0.48)
Teacher Age (35-39)	0	0	0	0
	(.)	(.)	(.)	(.)
Aged 40-44	0.0134	0.0901**	0.0400	-0.0592
	(0.49)	(2.95)	(1.36)	(-1.01)
Aged 45-49	-0.000642	0.0444	-0.0183	-0.0360
	(-0.02)	(1.09)	(-0.54)	(-0.78)
Aged 50+	0.00243	0.0879	-0.00261	-0.0231
	(0.07)	(1.68)	(-0.07)	(-0.42)
Teacher Lang Same as LoLT	0.141**	0.119	0.138*	0.165**
	(3.21)	(1.72)	(2.28)	(2.98)
Highest Qual. (Grade 12)	0	0	0	0
	(.)	(.)	(.)	(.)
< Grade 12	0.0129	-0.0583	0.0654	0.0702
	(0.30)	(-1.10)	(1.22)	(1.00)
Bachelor's Degree	0.00450	0.00174	0.0603*	-0.0439
	(0.14)	(0.05)	(2.12)	(-0.74)
Honours Degree	0.000140	-0.0784	-0.0152	0.0112

	(0.00)	(-1.78)	(-0.36)	(0.26)
Masters Degree	-0.463***	-0.638***	-0.178	0
	(-4.08)	(-3.78)	(-1.10)	(.)
Professional Teacher Training (3+ Years)	0	0	0	0
	(.)	(.)	(.)	(.)
< A Year	0.0936	0.155	0.0682	0.308**
	(1.13)	(1.44)	(0.38)	(3.03)
1 Year	0.0370	0.118	0.00756	0.0297
	(0.66)	(1.71)	(0.08)	(0.28)
2 Years	0.00385	-0.0245	-0.0369	0.0105
	(0.13)	(-0.49)	(-0.78)	(0.23)
3 Years	-0.00114	0.0340	0.0125	-0.0557
	(-0.05)	(1.06)	(0.51)	(-1.40)
None	0.0523	0.329***	0.0429	-0.267
	(0.39)	(6.19)	(0.33)	(-1.06)
Curric. Training This Year (< 80 Hours)	0	0	0	0
	(.)	(.)	(.)	(.)
80 Hours	0.0193	-0.116	-0.0729	0.130*
	(0.42)	(-1.30)	(-1.09)	(2.31)
80+ Hours	-0.0196	-0.0518	0.00145	0.0246
	(-0.65)	(-1.13)	(0.04)	(0.56)
None	-0.0186	0.100*	-0.0627	-0.0506
	(-0.56)	(2.15)	(-1.55)	(-0.86)
Type of Curric. Training Recognition (Attendance Cert.)	0	0	0	0
	(.)	(.)	(.)	(.)
Credits for Further Study	0.0224	-0.0596	0.0260	0.198***
	(0.49)	(-0.67)	(0.42)	(3.41)
No Recognition	0.0415	-0.0390	0.0767*	0.0775
	(1.77)	(-1.02)	(2.35)	(1.95)
No Training	-0.0139	-0.197***	0.0824	0.106
	(-0.33)	(-3.31)	(1.41)	(1.56)
Inclusive Education Training	-0.0304	0.0599	-0.000798	-0.0993**
	(-1.16)	(1.46)	(-0.03)	(-2.83)
Learning Area Training	0.000566	-0.0251	0.0246	0.0214
	(0.02)	(-0.63)	(0.64)	(0.51)
Classroom Mgmt. Training	0.0173	-0.00817	0.0237	-0.00912
	(0.79)	(-0.25)	(0.78)	(-0.24)
HIV/Aids Training	0.00732	0.0455	0.0664*	-0.0185
	(0.35)	(1.47)	(2.28)	(-0.60)
Race and Values Training	0.0295	-0.0184	-0.00342	0.0840
	(0.90)	(-0.32)	(-0.09)	(1.56)
Gender Equity Training	-0.00268	-0.0231	-0.0330	0.0198
	(-0.09)	(-0.47)	(-0.89)	(0.53)
Drug Abuse Training	-0.00115	-0.0146	0.0697*	-0.0482
	(-0.04)	(-0.39)	(2.07)	(-1.22)
Teacher Resource Centre	-0.0140	-0.0492	-0.0944**	0.0298
	(-0.52)	(-1.19)	(-2.60)	(0.70)
Library	0.00952	0.00272	-0.0478	0.0599
	(0.37)	(0.06)	(-1.35)	(1.54)

Internet	0.0375	0.0507	0.0570	0.0420
	(1.27)	(1.08)	(1.77)	(0.87)
Classroom Electricity	-0.0840	-0.276***	-0.135*	-0.0471
	(-1.73)	(-4.05)	(-2.07)	(-0.64)
Classroom Accommodates Special Needs	-0.0258	-0.0803*	-0.0214	0.00122
	(-1.15)	(-2.27)	(-0.80)	(0.03)
Attendance Register	0.271**	0.300	-0.0531	0.540***
	(2.69)	(1.95)	(-0.59)	(3.43)
Lesson Plans	0.0632	0.185	-0.0504	0.145
	(1.21)	(1.68)	(-0.64)	(1.80)
Learner Performance Records	0.0690	0.118	0.0222	0.138
	(1.08)	(0.76)	(0.24)	(1.26)
Reports Signed by Caregivers	0.0593*	0.0841	0.0396	0.0102
	(2.00)	(1.70)	(1.28)	(0.21)
Learner Portfolios	0.0236	-0.0508	0.106	0.117
	(0.61)	(-0.92)	(1.81)	(1.66)
Learner Profiles	-0.0404	-0.00637	-0.0617	-0.0675
	(-1.26)	(-0.14)	(-1.71)	(-1.38)
Curriculum Documents	-0.0337	-0.0827	-0.00956	-0.0464
	(-0.68)	(-0.97)	(-0.13)	(-0.52)
No Class Library Books	0	0	0	0
	(.)	(.)	(.)	(.)
1-10	0.0350	0.0457	0.0422	0.0494
	(1.06)	(1.21)	(0.88)	(0.98)
10+	0.0193	0.0251	0.00152	0.0183
	(0.91)	(0.70)	(0.06)	(0.57)
Learner Attendance (< 50%)	0	0	0	0
	(.)	(.)	(.)	(.)
50 - 59%	-0.125	-0.653***	0.149	-0.278
	(-1.05)	(-3.45)	(1.15)	(-1.52)
60 - 69%	0.0494	-0.235	0.0725	0.172
	(0.76)	(-1.64)	(0.76)	(1.47)
70 - 79%	0.0515	-0.159	0.216*	-0.0730
	(0.84)	(-1.28)	(2.21)	(-0.59)
80 - 89%	0.0116	-0.0732	0.142	-0.168
	(0.19)	(-0.74)	(1.49)	(-1.35)
90 - 100%	0.0315	-0.0918	0.179*	-0.130
	(0.56)	(-0.88)	(1.97)	(-1.04)
School Management Team Assistance (Always)	0	0	0	0
	(.)	(.)	(.)	(.)
Most of the Time	0.00270	-0.0526	0.0578*	-0.0130
	(0.11)	(-1.42)	(2.12)	(-0.36)
Sometimes	-0.0228	-0.0511	0.0740*	-0.0757
	(-0.80)	(-1.25)	(2.21)	(-1.56)
Never	-0.0673	-0.109	-0.00902	-0.108
	(-1.66)	(-1.49)	(-0.19)	(-1.57)
Total Time Allocated to Learning Area (4 - 9 Hours)	0	0	0	0
	(.)	(.)	(.)	(.)
< 4 Hours	-0.0164	-0.0245	-0.0784**	0.0212

	(-0.79)	(-0.86)	(-3.03)	(0.47)
9+ Hours	-0.0291	-0.0328	-0.0381	-0.0106
	(-1.18)	(-0.82)	(-1.12)	(-0.30)
School Fees Collected in Teaching Time	-0.0205	-0.128***	-0.0295	0.0432
	(-0.82)	(-3.61)	(-0.97)	(1.08)
Programmes Planned in Teaching Time	-0.0192	0.0454	-0.0307	-0.0761
	(-0.59)	(0.78)	(-0.77)	(-1.55)
Homework Marked in Teaching Time	0.0356	0.0132	0.0460	0.0342
	(1.70)	(0.35)	(1.69)	(1.13)
Remedial Support in Teaching Time	-0.0194	-0.00814	-0.0287	-0.0441
	(-0.85)	(-0.23)	(-1.05)	(-1.19)
Studying (Professional) in Teaching Time	0.0334	0.0687	0.0354	-0.117
	(0.76)	(1.12)	(0.52)	(-1.31)
Class Sharing During Teaching Time	0.0285	0.113	-0.0592	0.0704
	(0.46)	(1.29)	(-0.73)	(0.82)
Constant	-0.486**	-0.211	-0.350	-0.772**
	(-3.20)	(-0.86)	(-1.88)	(-2.81)
Observations	53956	35630	35925	36357
R^2	0.023	0.041	0.054	0.070

Note: t-statistics in parentheses. Statistical significance at the 0.05, 0.01 and 0.001 level is represented as *, ** and *** respectively. Robust standard errors clustered around schools used.

Source: Own calculations in Stata using 2004 Grade 6 Intermediate Phase Systemic Evaluation.

Table A5: **Teacher attribute SES interactions for fixed effects, by SES**

	Quintile 5				Quintile 1-4			
	All	M/S	S/E	E/M	All	M/S	S/E	E/M
1. Would Not Like to Change Careers	-0.0771	0.203**	0.0136	-0.00172	0.0184	-0.0108	-0.000547	0.0255
	(-1.62)	(2.78)	(0.24)	(-0.02)	(0.74)	(-0.31)	(-0.01)	(0.68)
1. × Household SES	0.0310	0.103	-0.0662	-0.0167	-0.0270	-0.0212	-0.0107	-0.0352
	(0.69)	(1.80)	(-1.37)	(-0.22)	(-1.30)	(-0.73)	(-0.34)	(-1.32)
2. Think Society Appreciates Work	0.143	0.223	0.119	0.304***	0.00933	-0.106	0.106	-0.00589
	(1.69)	(1.60)	(1.39)	(3.99)	(0.17)	(-1.43)	(1.39)	(-0.07)
2. × Household SES	-0.0440	-0.0919	0.0300	-0.0985	0.0415	0.00348	-0.0258	0.235***
	(-0.76)	(-0.91)	(0.54)	(-1.20)	(0.92)	(0.08)	(-0.49)	(3.50)
3. Think Principal Appreciates Work	-0.162*	0.172	-0.240**	-0.546***	0.0223	0.0717	-0.0792	0.0392
	(-1.99)	(1.13)	(-2.63)	(-6.45)	(0.58)	(1.04)	(-1.39)	(0.68)
3. × Household SES	0.0759	0.112	0.0279	0.169**	0.0436	0.0904	0.0949	-0.00261
	(1.79)	(1.89)	(0.54)	(3.16)	(1.49)	(1.88)	(1.86)	(-0.06)
4. Think Learners Appreciate Work	0.0645	-0.260	0.0266	-0.0525	0.0563	-0.0291	0.332**	0.0468
	(0.78)	(-1.83)	(0.26)	(-0.64)	(0.60)	(-0.31)	(2.89)	(0.49)
4. × Household SES	-0.0719	-0.114	0.0105	-0.0651	-0.111	-0.0988	-0.0115	-0.152*
	(-1.23)	(-1.31)	(0.16)	(-0.84)	(-1.60)	(-0.95)	(-0.17)	(-2.53)
5. Job Satisfaction Aspects Are Valued	0.0597*	0	0	0	0	0	0	0
	(2.53)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
5. × Household SES	-0.0544*	-0.0376	-0.00473	-0.0157	0.00763	0.00755	-0.0203	0.0375
	(-2.60)	(-1.09)	(-0.22)	(-0.50)	(0.57)	(0.65)	(-1.25)	(1.94)

Female Teacher	0.157***	-0.142	0.114**	0.237***	0.0542**	0.0526	0.0201	0.0914**
	(3.88)	(-1.39)	(3.17)	(4.02)	(3.00)	(1.78)	(0.91)	(3.17)
Aged 20-24	-0.0279	0.0123	-0.454*	0.954***	0.189	0.0562	0.0806	0.0777
	(-0.22)	(0.02)	(-2.58)	(6.39)	(1.85)	(1.06)	(0.88)	(0.51)
Aged 25-29	0.0842	-0.497***	-0.204	-0.271**	0.0841	0.0374	0.117	0.0164
	(1.24)	(-4.67)	(-1.80)	(-2.99)	(1.55)	(0.50)	(1.57)	(0.21)
Aged 30-34	0.0448	0.184	-0.0819	0.135	-0.0188	0.0630	-0.0793*	0.00918
	(0.62)	(1.51)	(-1.05)	(1.86)	(-0.72)	(1.35)	(-2.38)	(0.18)
Teacher Age (35-39)	0	0	0	0	0	0	0	0
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
Aged 40-44	0.0593	0.0463	-0.124*	0.123	0.0234	0.109**	0.0655	-0.0465
	(1.08)	(0.58)	(-2.25)	(1.26)	(0.71)	(2.97)	(1.93)	(-0.63)
Aged 45-49	0.0373	-0.225	0.157*	0.0910	-0.00812	0.115*	-0.0222	-0.0342
	(0.76)	(-1.50)	(2.48)	(0.99)	(-0.24)	(2.18)	(-0.50)	(-0.58)
Aged 50+	0.101	-0.157	-0.00193	0.168*	-0.0261	0.0370	-0.0258	-0.0201
	(1.70)	(-1.28)	(-0.05)	(2.02)	(-0.62)	(0.58)	(-0.52)	(-0.32)
Teacher Lang Same as LoLT	0.139**	0.0966	0.0684	0.158***	0.192*	0.0457	0.208	0.177*
	(3.32)	(1.21)	(1.45)	(3.38)	(1.98)	(0.15)	(1.66)	(2.53)
Highest Qual. (Grade 12)	0	0	0	0	0	0	0	0
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
< Grade 12	-0.0990	0.576*	0.122	-0.210	0.0353	-0.0781	0.0195	0.123
	(-0.54)	(2.19)	(0.64)	(-1.53)	(0.79)	(-1.34)	(0.34)	(1.56)
Bachelor's Degree	0.0385	0.280*	-0.144*	0.117*	0.00144	0.0118	0.0382	-0.0792
	(0.78)	(1.99)	(-2.22)	(2.16)	(0.04)	(0.27)	(1.10)	(-0.95)
Honours Degree	-0.0221	0.273**	-0.466***	0.269***	0.00804	-0.0644	0.00199	-0.0350
	(-0.33)	(2.66)	(-4.49)	(3.91)	(0.24)	(-1.07)	(0.05)	(-0.81)
Masters Degree		0	0	0	-0.480***	-0.642***	-0.310	0
		(.)	(.)	(.)	(-3.82)	(-3.46)	(-1.87)	(.)
Professional Teacher Training (3+ Years)	0	0	0	0	0	0	0	0
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
< A Year	0.0622	0.910***	0.341	0.924**	0.0914	0.190	0.523***	0.131
	(0.47)	(3.76)	(1.52)	(3.19)	(0.71)	(1.50)	(9.18)	(1.19)
1 Year	0.0749	-0.114	-0.336*	-0.453***	-0.0624	0	0.0231	-0.237*
	(1.21)	(-1.06)	(-2.49)	(-4.14)	(-0.69)	(.)	(0.17)	(-2.43)
2 Years	-0.116	-1.353*	-0.851***	-0.558***	0.0122	-0.0278	-0.0113	-0.0279
	(-0.92)	(-2.24)	(-4.71)	(-3.88)	(0.39)	(-0.45)	(-0.20)	(-0.59)
3 Years	-0.00144	0.231**	-0.0423	-0.164**	-0.00993	0.0243	-0.00525	-0.0827
	(-0.03)	(2.72)	(-0.86)	(-3.20)	(-0.40)	(0.58)	(-0.18)	(-1.80)
None		0	0	0	0.0516	0.254***	-0.0134	-0.324
		(.)	(.)	(.)	(0.39)	(3.43)	(-0.09)	(-1.47)
Curric. Training This Year (< 80 Hours)	0	0	0	0	0	0	0	0
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
80 Hours	0.0850	-0.335*	0.215**	0.350***	0.0426	-0.0390	-0.0718	0.101
	(1.08)	(-2.32)	(3.12)	(4.08)	(0.67)	(-0.30)	(-0.96)	(1.36)
80+ Hours	0.0318	-0.618**	-0.00735	-0.214*	-0.00199	-0.0265	0.0471	0.0557
	(0.55)	(-2.80)	(-0.14)	(-2.49)	(-0.05)	(-0.50)	(0.84)	(1.25)

None	-0.0249	2.146***	0.0146	-0.527***	-0.00860	0.0629	-0.0187	-0.0473
	(-0.16)	(4.89)	(0.09)	(-4.36)	(-0.25)	(1.24)	(-0.48)	(-0.77)
Type of Curric. Training Recognition (Attendance Cert.)	0	0	0	0	0	0	0	0
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
Credits for Further Study	-0.508***	0.144	-0.653***	0	0.0556	-0.0567	0.113	0.187**
	(-4.71)	(0.58)	(-4.33)	(.)	(1.22)	(-0.64)	(1.66)	(3.03)
No Recognition	0.0117	-0.328**	-0.0112	-0.286***	0.0536	-0.0569	0.0828	0.156***
	(0.27)	(-3.21)	(-0.24)	(-5.54)	(1.88)	(-1.23)	(1.92)	(3.58)
No Training	-0.0435	-0.900**	-0.291*	0.404***	-0.0189	-0.151*	0.0910	0.124
	(-0.31)	(-3.01)	(-2.15)	(3.95)	(-0.40)	(-2.26)	(1.13)	(1.73)
Inclusive Education Training	-0.0636	0.113	0.296***	-0.00829	-0.0105	0.131*	0.0204	-0.112**
	(-1.36)	(1.07)	(3.54)	(-0.15)	(-0.36)	(2.50)	(0.57)	(-2.92)
Learning Area Training	-0.0442	-0.242*	-0.298***	-0.303**	0.000988	-0.00130	0.0560	0.0363
	(-0.54)	(-2.42)	(-3.64)	(-3.20)	(0.03)	(-0.03)	(1.12)	(0.77)
Classroom Mgmt. Training	0.0727	0.312*	-0.0350	0.147**	0.000786	-0.0209	0.00376	-0.0149
	(1.34)	(2.50)	(-0.33)	(3.26)	(0.03)	(-0.46)	(0.11)	(-0.35)
HIV/Aids Training	0.0450	0.421***	0.187*	0.0546	-0.00298	0.0417	0.0716*	-0.0332
	(0.78)	(4.94)	(2.13)	(0.97)	(-0.13)	(1.23)	(2.19)	(-1.00)
Race and Values Training	0.0899	-0.879***	-0.121	0.184**	-0.0250	-0.0814	-0.0947	0.0211
	(1.36)	(-4.85)	(-1.78)	(2.90)	(-0.69)	(-1.15)	(-1.79)	(0.33)
Gender Equity Training	-0.0650	0.296**	-0.240***	0.130	0.0198	-0.0341	0.0388	0.0126
	(-1.10)	(2.66)	(-4.92)	(1.58)	(0.61)	(-0.61)	(0.76)	(0.33)
Drug Abuse Training	-0.0440	-0.619***	0.266***	-0.276**	0.0170	0.0274	0.0422	0.00327
	(-0.73)	(-3.95)	(3.55)	(-3.28)	(0.60)	(0.63)	(1.03)	(0.08)
Teacher Resource Centre	0.0314	-0.487***	-0.380***	0.000322	-0.0246	-0.0451	-0.0781	0.0288
	(0.54)	(-5.39)	(-6.28)	(0.00)	(-0.80)	(-0.92)	(-1.67)	(0.51)
Library	0.111	-0.392	0.165*	0.0951	0.00652	-0.00541	-0.0552	0.0588
	(1.17)	(-1.06)	(2.18)	(1.26)	(0.26)	(-0.12)	(-1.50)	(1.45)
Internet	0.0737	0.134	-0.0242	-0.0891	0.0122	0.0168	0.0337	0.0408
	(1.58)	(1.44)	(-0.37)	(-1.84)	(0.33)	(0.21)	(0.72)	(0.67)
Classroom Electricity	0.0126	-1.339	0.123	-0.0957	-0.0929	-0.200**	-0.192*	-0.0335
	(0.11)	(-1.90)	(0.89)	(-0.60)	(-1.75)	(-2.72)	(-2.40)	(-0.40)
Classroom Accommodates Special Needs	-0.0567	0.00227	0.133**	0.0799	-0.0282	-0.0935*	-0.0146	0.0347
	(-1.40)	(0.04)	(3.25)	(1.46)	(-1.04)	(-2.24)	(-0.43)	(0.84)
Attendance Register	0.131	-0.380	0.0601	0	0.197	0.194	-0.155	0.501**
	(0.79)	(-1.01)	(0.16)	(.)	(1.44)	(0.83)	(-1.41)	(2.81)
Lesson Plans	0.109	1.205*	-0.204	1.027***	0.0738	0.211	0.0449	0.126
	(0.54)	(2.36)	(-1.36)	(5.08)	(1.26)	(1.73)	(0.42)	(1.35)
Learner Performance Records	0.488**	0	0.697**	0.842**	0.0675	0.146	-0.00534	0.119
	(2.78)	(.)	(3.02)	(2.73)	(0.89)	(1.17)	(-0.05)	(0.79)
Reports Signed by Caregivers	-0.000492	0.0691	0.424***	-0.343***	0.0696	0.118	0.0257	0.0661
	(-0.01)	(0.61)	(4.13)	(-5.44)	(1.80)	(1.65)	(0.64)	(1.04)
Learner Portfolios	0.215	-0.342	0.655***	0.621***	0.0000813	-0.0386	0.0727	0.0389
	(1.63)	(-1.30)	(6.35)	(3.80)	(0.00)	(-0.69)	(1.47)	(0.60)
Learner Profiles	-0.0642	-0.130	-0.166*	-0.167	-0.0384	-0.00593	-0.0525	-0.0346
	(-1.01)	(-1.32)	(-2.21)	(-1.86)	(-0.96)	(-0.12)	(-1.19)	(-0.56)
Curriculum Documents	-0.728**	-0.703	0	-2.514***	-0.0162	-0.0510	-0.0746	-0.0288

	(-2.64)	(-1.12)	(.)	(-4.88)	(-0.31)	(-0.59)	(-1.16)	(-0.33)
No Class Library Books	0	0	0	0	0	0	0	0
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
1-10	0.209***	-0.0398	0.276**	-0.0605	-0.0299	0.0175	-0.0193	-0.0532
	(3.71)	(-0.41)	(2.94)	(-0.70)	(-0.74)	(0.32)	(-0.30)	(-0.97)
10+	0.117*	0.159	0.0813	-0.278***	0.0103	0.0263	0.0125	0.0168
	(2.35)	(1.81)	(1.49)	(-5.21)	(0.41)	(0.57)	(0.32)	(0.46)
Learner Attendance (< 50%)		0	0	0	0	0	0	0
		(.)	(.)	(.)	(.)	(.)	(.)	(.)
50 - 59%	0	0	0	0.166	-0.0386	-0.444*	0.0820	-0.298
	(.)	(.)	(.)	(1.07)	(-0.50)	(-2.30)	(0.60)	(-1.60)
60 - 69%	-0.731	-2.753***	0	0	0.0571	-0.233	0.0468	0.155
	(-1.47)	(-5.00)	(.)	(.)	(0.88)	(-1.57)	(0.51)	(1.24)
70 - 79%	0.0490	-0.457	0.970***	0.245	0.0678	-0.189	0.205*	-0.0203
	(0.13)	(-1.12)	(4.10)	(1.54)	(1.12)	(-1.39)	(2.28)	(-0.15)
80 - 89%	0.213	-0.300	1.121***	-0.374***	0.0186	-0.122	0.107	-0.121
	(0.58)	(-0.91)	(7.19)	(-5.40)	(0.31)	(-1.11)	(1.11)	(-0.90)
90 - 100%	0.249	-0.277	1.100***	0	0.0406	-0.149	0.162	-0.110
	(0.69)	(-0.87)	(6.58)	(.)	(0.73)	(-1.24)	(1.84)	(-0.85)
School Management Team Assistance (Always)	0	0	0	0	0	0	0	0
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
Most of the Time	0.0136	-0.206**	0.134*	-0.0549	0.0121	-0.0462	0.0774*	0.00550
	(0.25)	(-2.71)	(2.20)	(-0.74)	(0.48)	(-1.08)	(2.31)	(0.14)
Sometimes	-0.0225	-0.185	0.217**	-0.147	0.0109	-0.00259	0.0754*	-0.0166
	(-0.35)	(-1.51)	(2.63)	(-1.74)	(0.37)	(-0.05)	(2.19)	(-0.33)
Never	-0.258	-0.865***	-0.0543	-0.759***	-0.00707	0.0522	-0.0190	-0.0570
	(-1.83)	(-5.13)	(-0.31)	(-4.69)	(-0.18)	(0.70)	(-0.36)	(-0.68)
Total Time Allocated to Learning Area (4 - 9 Hours)	0	0	0	0	0	0	0	0
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
< 4 Hours	-0.127**	-0.153	-0.245***	-0.187	0.0143	0.0138	-0.0326	0.0267
	(-3.14)	(-1.77)	(-4.39)	(-1.49)	(0.59)	(0.38)	(-0.95)	(0.56)
9+ Hours	-0.0305	-0.0138	-0.116	0.0220	-0.0499	-0.0209	-0.0616	-0.0264
	(-0.65)	(-0.19)	(-1.73)	(0.36)	(-1.77)	(-0.39)	(-1.54)	(-0.67)
School Fees Collected in Teaching Time	-0.0238	-0.540*	-0.209***	0.0256	-0.0307	-0.139**	-0.00309	0.0661
	(-0.57)	(-2.38)	(-6.31)	(0.48)	(-0.95)	(-3.11)	(-0.08)	(1.23)
Programmes Planned in Teaching Time	-0.129	0.553***	0.0185	-0.245*	0.0157	0.0237	-0.0115	-0.0355
	(-1.82)	(3.31)	(0.23)	(-2.41)	(0.45)	(0.43)	(-0.26)	(-0.76)
Homework Marked in Teaching Time	0.0419	-0.0630	0.115**	0.0524	0.0282	-0.0463	0.0248	0.0652
	(0.92)	(-0.89)	(2.73)	(1.17)	(1.19)	(-1.01)	(0.78)	(1.83)
Remedial Support in Teaching Time	-0.0590	-0.275*	-0.202*	-0.0312	-0.0232	-0.00280	-0.0436	-0.0674
	(-1.25)	(-2.52)	(-2.53)	(-0.57)	(-1.00)	(-0.06)	(-1.53)	(-1.72)
Studying (Professional) in Teaching Time	0.233	0.552**	0.232	-0.0409	0.0142	0.0659	0.0482	-0.133
	(1.56)	(2.59)	(0.86)	(-0.14)	(0.32)	(1.14)	(0.74)	(-1.40)
Class Sharing During Teaching Time	-0.205	2.363***	-0.515***	0	0.0362	0.0527	-0.0346	0.0393

	(-1.02)	(4.01)	(-3.53)	(.)	(0.55)	(0.57)	(-0.40)	(0.44)
Constant	0.437	2.471	-1.806*	1.530***	-0.742***	-0.260	-0.437*	-0.919**
	(0.97)	(1.77)	(-2.49)	(5.66)	(-3.88)	(-0.87)	(-2.33)	(-3.00)
Observations	11946	21738	21798	22230	42010	31923	31726	32158
R^2	0.085	0.158	0.193	0.216	0.021	0.038	0.065	0.075

Note: t-statistics in parentheses. Statistical significance at the 0.05, 0.01 and 0.001 level is represented as *, ** and *** respectively. Robust standard errors clustered around schools used.

Source: Own calculations in Stata using 2004 Grade 6 Intermediate Phase Systemic Evaluation.

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