

Improving educational quality and learning outcomes in Ghana: Evidence from three randomized control trials

With some of the highest rates of child poverty in the world, nearly eighty percent of sub-Saharan African children live in families whose income per capita is less than \$2 day (UNICEF, 2014). In Ghana, 28.4 percent of children live below the national poverty line (equivalent to about \$1.83 per day), and 47.0 percent of individuals living on less than \$1.25 are under the age of 18 (UNICEF, 2015). These household economic challenges, along with challenges posed by a poorly trained teacher workforce (Osei, 2006; Akyeompong, 2017), pose threats to children's educational attainment and learning. Despite significant progress in increasing universal primary school enrollment (UNESCO, 2014), educational quality and learning levels remain low in Ghana. The 2013 National Education Assessment in Ghana showed that only 22.1 percent of Primary 3 (P3; equivalent of third grade) achieved proficiency in mathematics. Results worsen as students progressed through primary school, with only 10.9 percent attaining proficiency in Primary 6 (P6; equivalent of sixth grade). In English, 28.1 percent of P3 students and 39.0 percent of P6 students achieved proficiency. For both grades, approximately 40 percent of students fail to achieve even minimum competency in mathematics and approximately 40 percent of P3 students fail to achieve minimum competency in English (Ministry of Education, 2014). To improve learning, multiple aspects of children's school and family contexts need to be addressed.

This panel presents evidence from three randomized trials assessing the impacts of three different programs aimed at improving educational quality and child learning outcomes for pre-primary and primary schoolchildren in Ghana. The first paper evaluates a program designed to augment and improve pre-service training for kindergarten teachers. Impacts are presented on teaching quality and teacher professional well-being during the student-teacher year and the following school-year when teachers are placed as full-time newly qualified teachers (NQTs), in addition to child learning outcomes for NQTs. The second paper assesses an in-service teacher training and coaching program for pre-primary school teachers, examining teacher characteristics, well-being, and support as possible predictors of teacher attendance at the training and implementation of training materials as well as moderators of program effectiveness. Findings highlight the importance of understanding barriers and supports to the effective adoption of new programs, especially those targeting or being implemented by teachers working in under-resourced areas. The third paper considers how the Ghana School Feeding Program impacts children's educational outcomes and finds important heterogeneity of impacts that provide a nuanced understanding of the barriers different children face to educational success. The results underscore the role of school feeding as a key social protection intervention in the pursuit of equitable educational and learning outcomes.

Implications of the results for informing current policy efforts in Ghana, as well as these results might be applied to educational quality and learning improvement initiatives in other low- and middle-income countries, will be discussed by David Seidenfeld, vice president for AIR's international research and evaluation work and an expert in the field. David works at the intersection of policy and research in sub-Saharan Africa.

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Evaluating the Fast-track Transformational Teacher Training in Ghana: Improving Kindergarten Quality through Enhanced Pre-service Teacher Training

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International efforts to increase access to high quality early childhood education (ECE) have risen dramatically in recent years. Ghana has been a pioneer in these efforts, expanding two years of pre-primary education—called kindergarten 1 (KG1) and kindergarten 2 (KG2)—as part of its free, compulsory, universal basic education system in 2008. With some of the highest enrollment rates in ECE on the continent (McCoy et al., 2017), Ghana’s government has turned its attention the issue of quality, including developing a pre-service teacher training track specifically for the KG level. Currently, 7 of the 40 colleges of education in Ghana offer a track for kindergarten teachers. Developing and expanding a high quality and scalable pre-service training program is one of Ghana Education Service’s top priorities. Pre-service certification in Ghana includes two years of coursework and one year as a student-teacher. There is currently no specified training during the student-teaching year. Using a randomized control trial, this study evaluates the impacts of a program designed to support teachers during the student-teaching year by providing mentorship and in-classroom training throughout the year.

By targeting teachers and classrooms, this study assesses the most proximal in-school driver of children’s learning outcomes (e.g., Hanushek, 2011). In addition to poor training, another key barrier to high quality education identified in LMICs (e.g., Chaudhury et al., 2006), and in Ghana specifically (Bennell & Akyeompong, 2007), is that of teacher professional well-being. There is growing concern of a “motivation crisis” among teachers (Bennell & Akyeompong, 2007; Moon, 2007). The role of providing training and support to improve teacher well-being is not yet known.

The Fast-track Transformational Teacher Training (FTTT) Program

The FTTT program was developed in a partnership between the Ghana Education Service (in the Ministry of Education), one of Ghana’s colleges of education, and Sabre Charitable Trust. The program builds on the standard three-year certification program in Ghana’s colleges of education, which includes placement in a standard KG classroom in the third year of training with mentorship from the teacher of that class. FTTT augments the student-teacher placement year with intensive and guided in-service training and support model. Student teachers are placed in schools with “model practice classrooms,” which provide them with enhanced training, coaching and mentoring by FTTT trainers. The enhanced training services include intensive workshops, in classroom coaching, one-on-one feedback meetings with trainers, and a best practice forum for student teachers to share their experiences with each other.

The model practice classrooms are given a “starter pack” of materials including paper, activity toys and theme-related storybooks. Teachers also receive a Teacher Resource Toolkit, which provides ideas on making additional items from low-cost and readily available materials in their own classrooms and homes. In addition, the student-teacher receives ongoing training and support from the trained KG teacher, as well 12 days of intensive training and access to KG-specific learning resource templates which can be replicated at minimal cost. These trainings and support focus on a ‘scheme of work’ that links the Ghanaian KG curriculum objectives and child development goals to specific activities, which in turn are linked to a structured daily plan that teachers follow.

One potential barrier to implementation is that after being trained in the methods promoted in the FTTT program occurs when student-teachers become full-time newly qualified teachers (NQTs), and may be discouraged from using these practices in their placement schools. The methods promoted in the KG curriculum and the FTTT program are quite different from the primary school curriculum, and head teachers may discourage this style in favor of a more rigorous and academic focus (Bidwell et al., 2014; Kabay, Wolf & Yoshikawa, 2017). This study also tests the added value of a head teacher training 4-day sensitization program for NQT's placement schools.

Research Design

The evaluation occurred in Ghana's Western Region during the 2015-16 and 2016-17 academic years through a randomized control trial. Participants included the full cohort of KG student-teachers completing coursework from Holy Child College of Education in 2015. A baseline survey was conducted in June 2015 as student-teachers were finishing their coursework prior to their placement year, after which 135 student-teachers were randomized to be placed as student-teachers in either (i) an FTTT treatment school, or (ii) a control school practicing "business as usual".

Results

Impacts are assessed on teaching quality and teacher professional well-being during the student-teacher year and the following school-year when teachers are placed as full-time newly qualified teachers (NQTs). Finally, impacts on kindergarten children's learning and development outcomes for NQTs are also assessed in the spring/summer of the NQT year. Preliminary results show that FTTT improved teachers' implementation of the KG curriculum and knowledge about developmentally appropriate ECE. The program had mixed impacts on teacher professional well-being, increasing sense of personal accomplishment and motivation but decreasing job satisfaction for NQTs, and mixed impacts on teaching quality, with increased in child-led learning but decreases in some other aspects of quality (see Table 1). Finally, there were no impacts on the learning outcomes of NQT students, and no impacts of the Head Teacher training on any outcomes.

Conclusions

A recent analysis of the pre-service teacher training system in Ghana has concluded that what will transform teachers into effective practitioners may not just be simply the result of effective curriculum planning and realization, but must include the support of other policies that together work in concert to promote positive change in becoming a teacher (Akyeompong, 2017). This study contributes to the literature on how to successfully train teachers and highlights the needs of teachers once they are placed in to full-time positions. That is, training must continue beyond simply the pre-service training period, in particular in the first transition year as NQTs.

Table 1. Impacts of FTTT on implementation, knowledge, professional well-being, and classroom quality

	b	(SE)	<i>d</i>	b	(SE)	<i>d</i>	b	(SE)	<i>d</i>
	Student-teachers			NQT-Fall			NQT-Summer		
<u>Implementation</u>									
Fidelity checklist (materials)	4.780	(0.587)	2.40***	0.627	(0.075)	0.31***	1.663	(0.101)	0.60***
Fidelity checklist (activities)	1.833	(0.329)	1.14***	0.548	(0.066)	0.33***	0.413	(0.075)	0.27***
<u>Early Childhood Education Knowledge</u>									
Developmentally appropriate practice	--	--	--	0.174	(0.015)	0.52***	0.183	(0.017)	0.57***
Supporting child social-emotional needs	--	--	--	0.41	(0.026)	0.67***	0.275	(0.019)	0.72***
Family-sensitive practice	--	--	--	0.147	(0.016)	0.39***	0.263	(0.033)	0.39***
<u>Teacher professional well-being</u>									
Motivation	0.122	(0.110)	0.23	0.098	(0.019)	0.21***	0.035	(0.029)	-0.02
Burnout	0.358	(0.028)	0.34+	-0.013	(0.039)	-0.01	0.003	(0.041)	0.00
Job satisfaction	-0.045	(0.069)	-0.11	-0.068	(0.015)	-0.18***	-0.108	(0.019)	-0.27***
Personal accomplishment	0.358	(0.144)	0.42*	0.205	(0.041)	0.20***	0.353	(0.042)	0.38***
<u>Teacher-child interactions</u>									
Child-led learning	0.537	(0.120)	0.90***	0.140	(0.015)	0.38***	0.045	(0.021)	0.11*
Supporting student expression	-0.312	(0.131)	-0.53*	-0.081	(0.023)	-0.14***	0.015	(0.027)	0.02
Emotional support and behavior management	-0.009	(0.084)	-0.02	-0.066	(0.019)	-0.13**	-0.019	(0.025)	-0.03
Sample size = 135									

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The Supports and Barriers Teachers in Resource-Poor Communities Face in Effectively Implementing Interventions: Ghana as a Case Study

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Background: Teachers are the most consistent and strongest school-level predictor of student learning outcomes (Hanushek, 2011; OECD, 2005). Yet, there is a dearth of research examining teachers' professional and personal experiences and how these influence their teaching quality and ability to implement new educational practices. This is of particular importance in pre-primary settings, where teachers receive lower pay and less respect (Sun et al. 2015; Whitbook & McLean, 2017) and work in contexts with fewer resources and less pedagogical support (Raikes et al., 2015). This leads, in part, to a shortage of well-trained and skilled pre-primary teachers (Neuman, Josephson, & Chau, 2015), particularly in resource-poor communities.

Purpose/Objective/Research Question: This study uses data from Quality Preschool for Ghana (QP4G) to explore how teachers' experiences influence the implementation and effectiveness of educational interventions. We examine, first, whether specific aspects of *teacher ecology* (e.g., skills/knowledge; poverty/health; supports/barriers) are associated with teacher take-up of, adherence to, and implementation of a teacher training intervention (Figure 1). Then, we causally test whether teacher ecology moderates the impact of QP4G on classroom quality and children's learning. We hypothesize greater impacts for teachers with more positive ecology. Last, we test whether this moderation takes place via increased adherence (Figure 2).

Setting: QP4G is a pre-primary teacher training program created by the National Nursery Teacher Training Center in Ghana. It was implemented in six of the most disadvantaged urban/peri-urban districts of Accra, Ghana. Less than 33% of Ghanaian pre-primary teachers are trained (Aheto-Tsegah, 2011) and, despite a solid pre-primary national curriculum, many schools still push developmentally inappropriate teaching methods such as rote memorization.

Intervention: The goal of QP4G was to develop and test a scalable, low-cost model for improving preschool classroom quality and children's school-readiness in Greater Accra through building capacity and support for the existing, child-friendly curriculum. At one-third of the schools, teachers were offered a 5-day training in September 2015, a 2-day refresher in January 2016, a 1-day refresher in May 2016, and in-classroom coaching (TT arm). At another third, teachers were offered the above plus a parent awareness component centered on play-based learning, parents' role in children's learning, and the benefit of parent-teacher/school communication (TTPA arm). The remaining third received business as usual. The teacher training centered on five topics: 1) how children learn/developing a child-friendly environment; 2) classroom management; 3) language and literacy; 4) math; and, 5) assessment and planning.

Research Design: QP4G is a cluster-randomized control trial (Figure 3). Schools ($j=240$) were sampled from participating districts, stratified by public/private school status. The final sample includes 444 teachers and 3,435 students at baseline. 348 teachers remained in the study through the first follow-up. Given that treatment predicted attrition, with treatment teachers in private

schools less likely to attrite than their counterparts, we imputed missing data prior to treatment but did not impute across the treatment timeframe.

Population/Participants/Subjects: For this study, we use two samples. First, because data on adherence was not collected for comparison teachers, we use a sample of treated teachers present at both baseline and follow-up. In examining moderation effects, we use all teachers present at baseline and follow-up. We run sensitivity analyses weighting the teachers who stay in the study to appear like the full sample.

Data Collection and Analysis: Measures are drawn from administrator records, teacher self-report and head teacher surveys administered prior to treatment, and observations collected throughout the academic year and at the first follow-up (see Table 2). Since randomization was at the school level, we employ a 2-level (teachers within schools) approach for all models except when predicting student learning (for which we use a 3-level model). All models include the complete predictor and covariate list as well as an indicator variable for assigned treatment. Analyses use mi estimate in STATA in order to use all 100 datasets of imputed baseline data.

Preliminary Results: We first ran three separate models predicting take-up, adherence, and implementation. We find that risk and supports do not act cumulatively. Implementation quality is negatively associated with having only one poverty risk ($b=-0.13$, effect size (es)=0.26, $p=0.039$) or one health risk ($b=-0.13$, es=0.26, $p=0.008$), but not two or more risks. It is positively associated with having a secondary degree (e.g., BA: $b=0.35$, es=0.70, $p<0.001$) and early childhood development training ($b=0.17$, es=0.34, $p<0.001$). Adherence is negatively associated with one poverty risk ($b=-0.68$, es=0.40, $p=0.021$), marginally associated with two or more risks ($b=-0.73$, es=0.43, $p=0.021$), and inversely associated with teacher motivation. Teachers who report higher motivation show less adherence to the training materials ($b=-0.43$, es=0.25, $p=0.074$). We do not find significant associations between teacher ecology and teacher take-up. Teacher take-up and implementation quality are, however, both higher for teachers assigned to TTPA as opposed to TT ($OR=1.03$, $p=0.007$ and $b=0.12$, es=0.24, $p=0.047$).

We will next run a full SEM model, looking at all of the above simultaneously, followed by a series of sensitivity analyses before turning to our causal moderation question. As there are many potential teacher ecology moderators, we will explore a series of possible models (no moderators, individual moderators, multiple moderators) with the a priori condition that we will present and analyze the findings from the model with the best information criteria (i.e., fit).

Conclusions: Preliminary results suggest that aspects of teacher ecology, especially education/training and experiencing poverty, likely influence the degree to which and how well teachers implement new material. This has implications for educational interventions in resource-poor areas where teachers are less likely to be adequately trained and more likely to experience poverty. It also supports a need to consider teachers working in challenging conditions with the same nuance we extend to students in these settings. To the degree that teachers' professional and personal experiences impact intervention effectiveness and daily practice, such factors must be taken into consideration and addressed both in our research models and measurement work and in how interventions are framed, delivered, and supported. Findings will be discussed in relation to the overall impact of teacher ecology on the effectiveness of this intervention.

Figure 1. Focusing in on Implementation

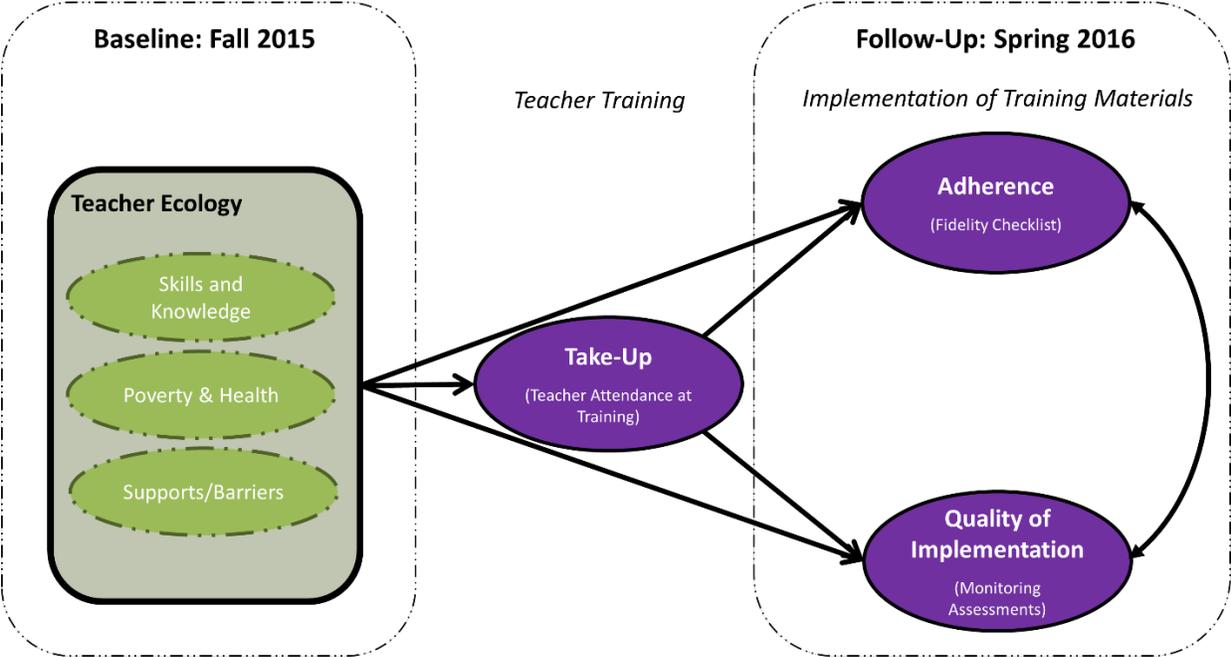
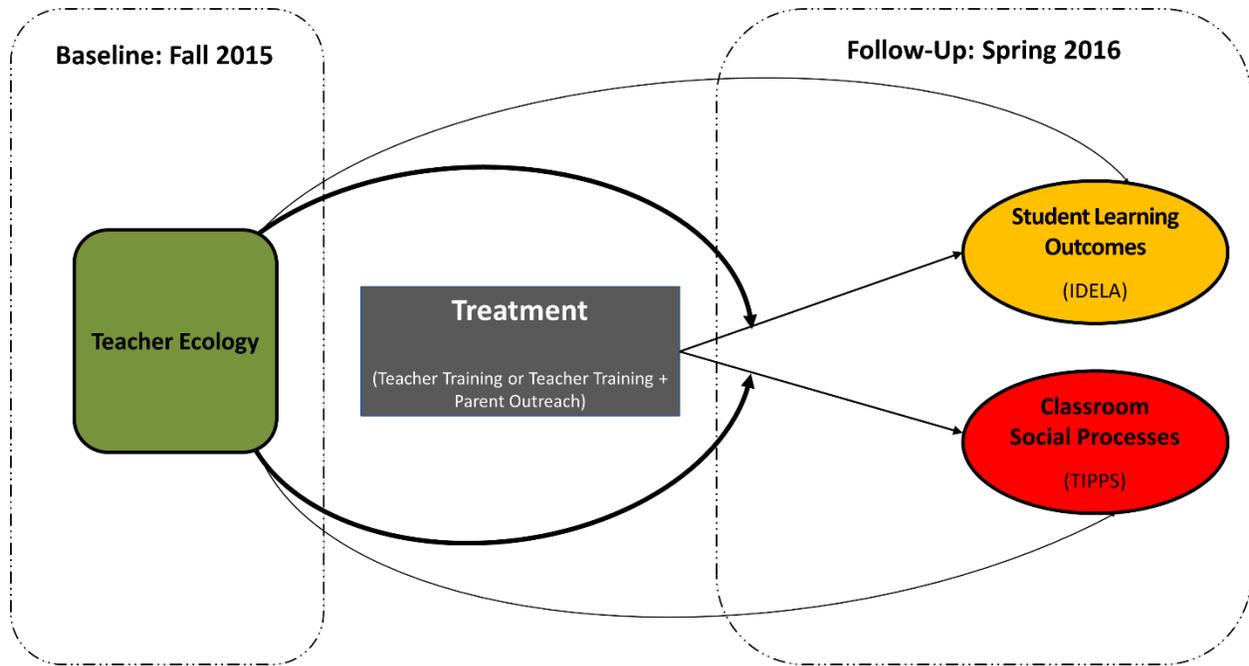


Figure 2. Causal Moderation

a. The Causal Description (RQ1)



b. The Causal Explanation (RQ2)

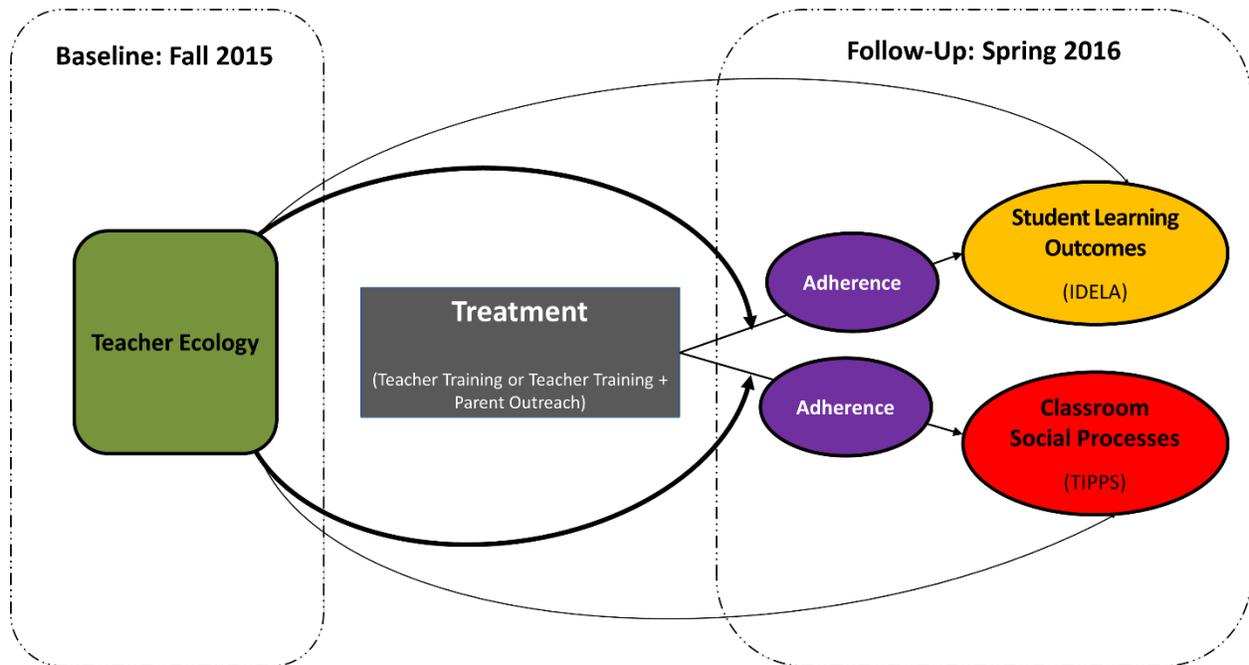


Figure 3.

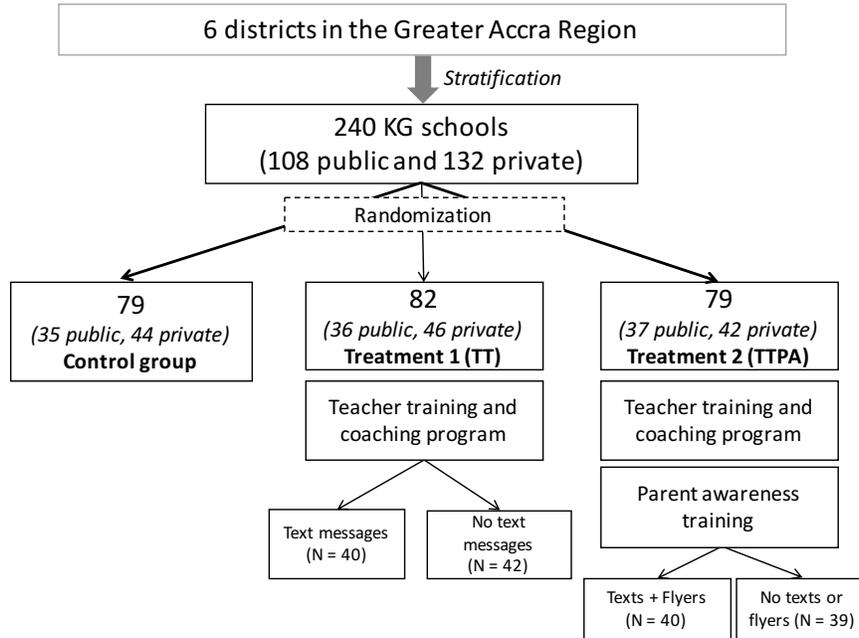


Table 1. Measures

Construct	Measure	Method	Reliability	Mean ¹	SD ¹	Min	Max
<u>Outcome Variables</u>							
Take-Up	Dummy variable indicating: 1) attended at least 4/5 sessions of main training, and 2) attended <i>either</i> one session of 1st (2-day) refresher and 2nd (1-day) refresher <i>or</i> complete 1st refresher	Administrative Record	N/A	0.70	0.46	0	1
Adherence Mediator: Final Research Question	Implementation Fidelity Checklist (13 items)	Observation	N/A	4.63 4.21	1.69 1.75	0	10
Quality of Implementation	QP4G ECE Monitoring Tool (22 items) [avg. teacher received 4.5 monitoring/coaching visits]	Observation	w/in $\alpha = 0.898$ b/w $\alpha = 0.909$	3.75	0.50	2.35	4.77
Classroom Social Processes	Teacher Instructional Practices and Processes System (TIPPS: Seidman et al., 2013, 2017) Emotional Support and Behavior Management (ESBM) Supporting Student Expression (SSE)	Observation	TBD ² 0.85 0.63	1.96 1.00	0.48 0.67	-0.14 0.25	2.57 2.75
Student Learning	International Development & Early Learning Assessment (IDELA: Pisani et al., 2015) ³	Student Assessment		0.57	0.18	0	1
<u>Teacher Ecology</u>							
<i>Skills and Knowledge</i>							
Experience	Experience as a preschool teacher 0 = 12 or fewer months experience 1 = 13-36 months experience 2 = 37-119 months experience 3 = 120+ months experience	Teacher Report	N/A	1.69	0.96	0	3
Education	Degree (HND, BA/BS, or higher: y/n)	Teacher Report	N/A	0.47	0.50	0	1
ECD Training	0 = no ECD, 1 = workshop/seminar, 2 = certificate/diploma	Teacher Report	N/A	1.12	0.84	0	2
English Skills	Oral and written (average of) English skills 0 = none; 1 = basic; 2 = intermediate; 3 = proficient	Teacher Report	$\alpha = 0.73$	1.35	0.57	0	2
Reading Knowledge	Kindergarten reading knowledge test (8 items)	Assessment	N/A	4.47	1.45	0	8
<i>Poverty and Health</i>							
Poverty Risks	Count indicating 0, 1, or 2+ of below are true: 1) Mother with no education (29.2%) 2) 60% + likelihood of living on \$5 a day or less based on global purchasing power parity (10.36%) ⁵ 3) < 500 GH (~\$113 USD) / month salary (55.66%)	Teacher Report	N/A ⁴	0.84	0.68	0	2

Health Risks	Count indicating 0, 1, 2, or 3+ of below true: 1) HH member recently sick to point of not attending work/school for > 4 weeks (20.88%) 2) Rates own physical health as poor or fair (10.89%) 3) Household is food insecure ⁶ (8.8%) 4) Has moderate-severe to severe depression (46.99%)	Teacher Report	N/A ⁴	0.87	0.89	0	3
<i>Supports/Barriers to Teaching</i>							
Infrastructure/Financial/Material Barriers	Count indicating 0, 1, 2, or 3+ of below true: 1) HT reports school sometimes or often has trouble paying its bills, HT reports school resources/materials are obstacle to providing learning, <i>and</i> teacher reports lack of financial resources as problem (22.36%) 2) Observer reports classroom lacking 1+ of following: walls, tables/chairs for students, writing materials, books, adequate seating, adequate writing space, table/chair for teacher, adequate lighting (29.72%) 3) Observer reports lacking 2+ of above (11.65%) 4) Observer indicates or teacher reports 26+ students 5) Observer indicates that outside noise affects communication in classroom (28.11%)	Head Teacher (HT) Report, Teacher Report, Baseline Observation	N/A ⁴	1.25	1.25	0	4
Professional Supports	Count indicating 0, 1, 2, 3, or 4+ below true: 1) Teacher rates quality supervision as excellent (37.90%) 2) Parental involvement/support moderate to high (10.50%) ⁷ 3) HT has six plus years experience as a head teacher and at least three years at current school (47.69%); 4) HT averages 3.5+ (3 = mostly true; 4 = very true) on 15-item scale ($\alpha = 0.80$) on school outreach to and partnerships with community members/families (19.83%) 5) HT reports school has at least two KG attendants (16.16%) 6) HT reports school has formal system in place where senior teachers mentor junior teachers (24.29%)	Head Teacher (HT) Report, Teacher Report	N/A ⁴	1.58	1.17	0	4
Time Demand Barriers	Count indicating 0, 1, 2, or 3+ of below true: 1) Average one-way commute of 45 mins plus (32.53%) 2) Works a second job (20.89%) 3) Is expected to work 50+ hrs/week, this job (18.47%) 4) Spends > 20% class time on admin. tasks (26.49%) 5) Spends > 30% keeping order in classroom (14.70%)	Teacher Report	N/A ⁴	1.13	0.89	0	3
Low Status	Count indicating 0, 1, 2, or 3+ of below true: 1) Parents and leaders in community have none to very little respect for teachers (24.32%) 2) Citizens and leaders of Ghana value teachers none or very little (42.12%) 3) Position is temporary (10.46%)	Teacher Report	N/A ⁴	0.99	0.89	0	3

Personal Supports	4) Is paid on time under 50% of the time (24.52%) Count indicating 0, 1, or 2+ of below are true: 1) Teacher lived in community currently teaching in before began teaching at current school (61.85%) 2) Some to most of their closest family members live nearby (as compared with none or very few: 21.69%) 3) Some to most of closest friends live nearby (9.24%)	Teacher Report	N/A ⁴	0.89	0.71	0	2
Job Satisfaction	Adapted from Bennell & Akyeompong (2007)	Teacher Report	$\alpha = 0.65$	3.22	0.63	1.33	4
Motivation	Adapted from Bennell & Akyeompong (2007)	Teacher Report	$\alpha = 0.77$	4.67	0.50	1.8	5
Burn-out	Maslach's Burn-out Inventory. Appendix B	Teacher Report	$\alpha = 0.76$	2.01	0.93	1	7
<u>Covariates</u>							
Baseline Adherence	Fidelity Checklist score at baseline	Observation		2.99	1.39	0	8
Teacher Age	Age, in years, of Teacher	Teacher Report		35.29	10.85	18	69
Teacher Marital Status	Two dummy variables indicating:	Teacher Report					
Married	Teacher is married or cohabitating			0.55	0.50	0	1
Divorced/Widowed	Teacher is divorced, separated, or widowed			0.10	0.30	0	1
Head Teacher (HT) Age	Age, in years, of Head Teacher	HT Report		50.77	11.55	21	78
Head Teacher (HT) Gender	Dummy variable indicating HT is female	HT Report		0.49	0.50	0	1
District	District in Accra, Ghana				N/A		
Age of School	# years ago school was established	HT Report		21.55	16.23	2	155
Age of KG Program	# years ago KG program was established	HT Report		14.94	9.30	1	53
Private School	Indicates school is private (yes/no)	HT Report		0.51	0.50	0	1
Religious School	Indicates school ran by a religious body (y/n)	HT Report		0.19	0.40	0	1
School part of Government Cluster	Indicates school is part of a cluster of schools managed by the government (y/n)	HT Report		0.28	0.45	0	1
Open Enrollment School	Indicates school admits all children who wish to enroll in KG (y/n)	HT Report		0.62	0.49	0	1

¹ Descriptives come from main analytic sample (n = 249; j = 148 for implementation questions and n = 348; j = 213 for causal moderation analyses)

² We are exploring use of an overarching measure here in addition to sub-domains

³ We are still calculating IDELA scores by teacher for this analytic sample. Descriptives given here are from Wolf et al., under review

⁴ This is a count measure with one point assigned for each item indicated

⁵ Likelihood that household (HH) lives on < \$5 per day is calculated using simple poverty scorecard for Ghana (Schreiner, 2015): takes into account HH size, school status of school age children, literacy of male head of HH, home construction material, toilet type, fuel source, and goods owned (e.g. video player, mobile phones).

⁶ Listed as food insecure if in the past 30 days any of the following were true: no food of any kind to eat in the house because of a lack of resources to get food; a member of HH went to bed hungry because not enough food; a member of the HH went whole day and night without eating because not enough food.

⁷ Parental involvement and support is moderate to high the following are true: HT reports 3+ meetings between school and PTA in past school year (76.50%); HT predicts that half or most of PTA members would attend if something came up requiring a meeting in next three days (55.25%); HT does not indicate lack of parental support as obstacle to providing learning for KG students (55.67%); and teacher averages a three ("sometimes") or higher on a 7-point parent support scale (44.58%).

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Food for thought? Experimental evidence on the educational impacts of the Ghana School Feeding Program

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Background: Almost every country in the world offers school feeding. In Sub-Saharan Africa, since the early 2000s an increasing number of countries has been investing in national school feeding programmes (usually from education budgets) as a multisectoral strategy to improve children's education and nutrition outcomes (Bundy et al., 2009). These are usually implemented through the provision of a free, hot meal at school, with a strong education-sector lead. School feeding programs can improve school enrolment, attendance and progression. These effects are highly context-specific and heterogeneous, with impact also depending on the quality and modality of implementation. With regards to learning and cognition, the extant evidence is more mixed (Kristjansson et al., 2015).

A critical knowledge gap relates to the evaluation of Government-led programmes operating at scale, as most studies focus on either small-scale programmes or food assistance implemented by the World Food Programme or other NGOs. Considering the financial and economic investments by national governments in school feeding, estimated at over USD 70 billion annually, this lack of evidence poses a key challenge for policymakers prioritising different intervention options to pursue the Sustainable Development Goals related to quality education for all.

Purpose: We assess the educational impact of the Government of Ghana's flagship Ghana School Feeding Programme (GSFP) through new data from a large-scale, population-based, cluster randomised control trial. Children's educational outcomes include schooling access and progression, learning and cognition.

Setting: Ghana is a lower-middle income country in West Africa. Over the past few decades, the country made tremendous progress in terms of economic growth and income poverty reduction. During this time, Ghana achieved the Millennium Development Goals on universal gross primary enrolment and gender parity in primary education. These impressive achievements in access, however, have not been matched by corresponding increases in learning levels, which remain overall low.

Intervention: The GSFP is a complex intervention and was designed as a strategy to increase child education and nutrition, alongside household food production. GSFP co-ordination and implementation are undertaken by a National Secretariat, with programme oversight provided by the Ministry of Local Government and Rural Development (MoLGRD). The GSFP service delivery is provided through private caterers who are awarded contracts by the GSFP to procure, prepare and serve food to pupils in the targeted schools. Each caterer is responsible for procuring food items from the market, preparing school meals and distributing food to pupils. Cash transfers are made from the District Assemblies, under the supervision of the District Implementing Committees (DICs), to caterers based on 40 Ghana pesewas (circa US\$0.33) per child per day.

Research design: This evaluation relies on an experimental and prospective design in which school catchment areas (hereby called "villages") were randomly assigned to school feeding and control groups. The latter will have school feeding at the end of the evaluation. The study was designed around the scale-up of the GSFP to all the ten regions of Ghana. The selection of the new

intervention districts was guided by poverty and food insecurity rankings (see Gelli et al., 2016 for the detailed sampling procedure). In turn, 58 districts were randomly selected from this initial set. Given the overall evaluation focus on both child-level outcomes (e.g. nutrition and education) and agricultural outcomes (small-holder farmers food security), the design followed a two-level randomisation(Gelli et al., 2016).

Data collection and analysis: Data on household were collected in June-September 2013 before the start of the intervention and then the same households were interviewed in January 2016. Data were collected at the child, household, caterer and school levels. The randomised design allows for the identification of causal impacts of the interventions using comparisons of mean outcomes between the randomised treatment arms. We start our analysis by the estimation of intention-to-treat (ITT) approach using both waves of data through a difference-in-difference design. As the intervention was offered at the level of the communities, only about 55% of children of target age (5-15 years at baseline) in school feeding areas took up the programme at endline. Given partial treatment take-up, the ITT estimates represent the average impact of offering free school meals in the communities, independently of whether the eligible children actually received school feeding. This is policy relevant as programme offering can only partially influence uptake. On the other hand, the parameters provided through ITT represent a lower bound for true programme effect as partial uptake of the programme dilutes these estimates. Accordingly, we compute propensity score matching (PSM) estimates in order to address the issue of selection on observable child and household characteristics. The combination of PSM with the difference-in-difference estimator should also address the issue of unobservable fixed household characteristics. Following our pre-analysis plan(Gelli et al., 2016), we conducted heterogeneity analysis by child gender and age, as well as household poverty status. Further, we explored some intermediate potential channels for program impacts, such as child time use and variation in program implementation.

Preliminary results:

The ITT estimates consistently found positive impacts on indicators of educational access, progression, cognition and learning, but they were not significant for the whole sample of children aged 5 to 15 years at baseline, perhaps due to the partial take-up and to the very large age variation in our target population. Strong heterogeneities in the impact of the offering of school feeding in treatment communities were observed by age, gender and household poverty status. Stronger and more homogenous programme effects were observable in the PSM-difference in difference estimates. The latter highlighted that the intervention led to increased enrolment and lower age at entry in primary school, as well as wide improvements in Maths, literacy, Raven backwards digit span and aggregate learning scores for the initial target sample.

Conclusions:

The preliminary results suggest that no-frills, Government-led schemes such as the GSFP can positively affect not only children's educational access but also their learning and cognition.

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