



Photo Credit: Varkey Foundation

Effectiveness of Interactive Distance Instruction: Experimental Evidence from Ghanaian Primary Schools

Ghana Education Evidence Summit 2017

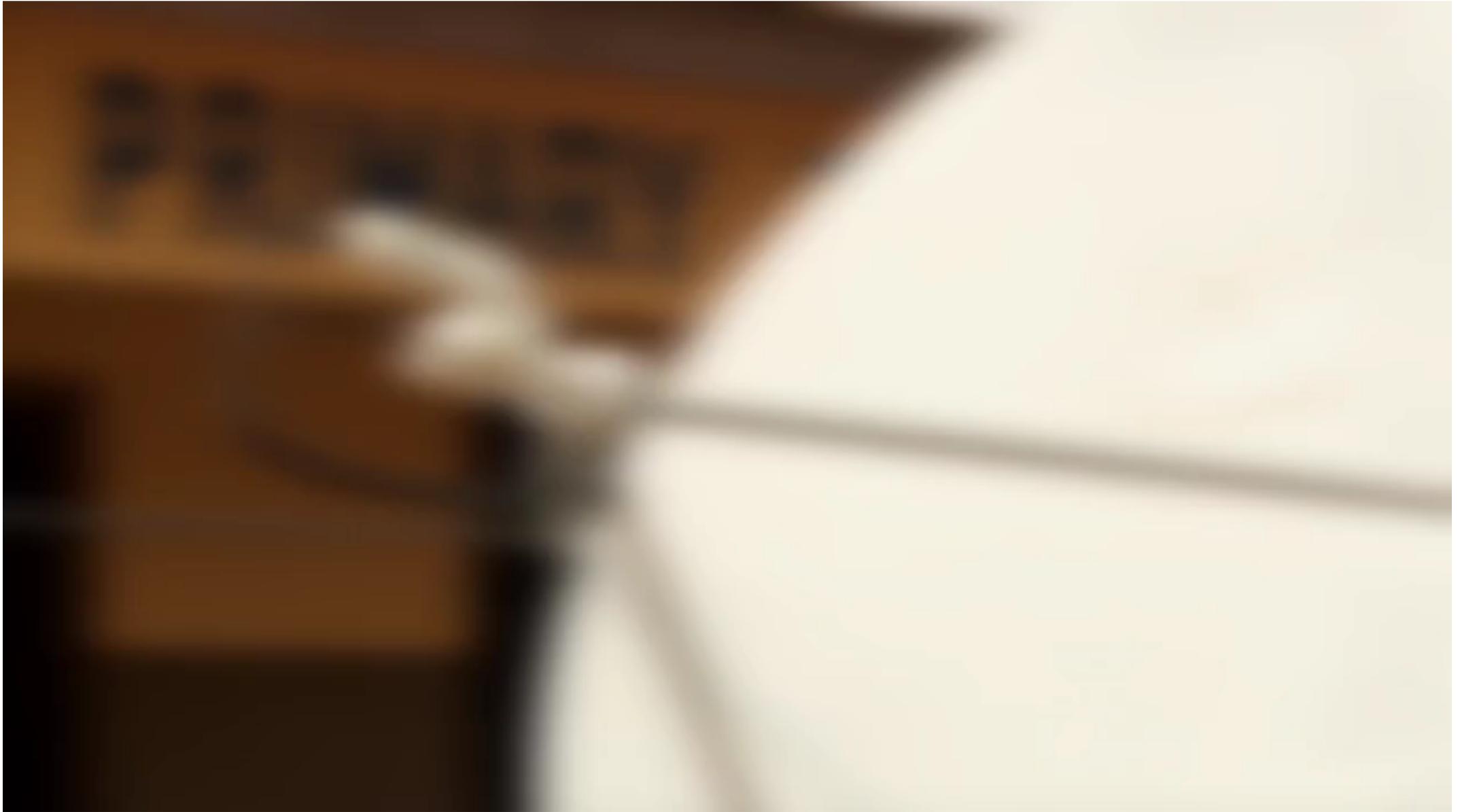
JAMIE JOHNSTON – STANFORD UNIVERSITY

CHRISTOPHER KSOLL – MATHEMATICA POLICY RESEARCH



How can we deliver high-quality teaching to rural students?

- Students in rural areas significantly underperform (OECD 2013, GES 2012, World Bank 2012)
- In remote rural areas, shortage of trained primary teachers (World Bank 2012)
- Teaching quality matters for student learning (Glewwe et al. 2011, McEwan 2015)
- Structured pedagogy interventions appear to have largest, most consistent positive effects on learning (Ganimian & Murnane 2016, Snilstveit et al 2015, Kremer et al., 2013)
- Little known about effectiveness of interactive distance instruction models



Video Credit: Varkey Foundation

MGCubed Satellite Class Program

- Varkey Foundation MGCubed Program
- Equipped 72 schools with technology package
- Broadcasts live lessons daily to remote classrooms
 - 6 trained studio teachers, each broadcasting to 12 classes at a time
 - 1 hour math and 1 hour English, 5 days a week
- In-person teachers trained as “facilitators”
- Targets most marginalized students within schools
 - Grades 2-5
 - Girls and boys
 - Identified according to criteria: distance to school, number of siblings, truancy, age



Photo Credit: Varkey Foundation

Girls' After School Program

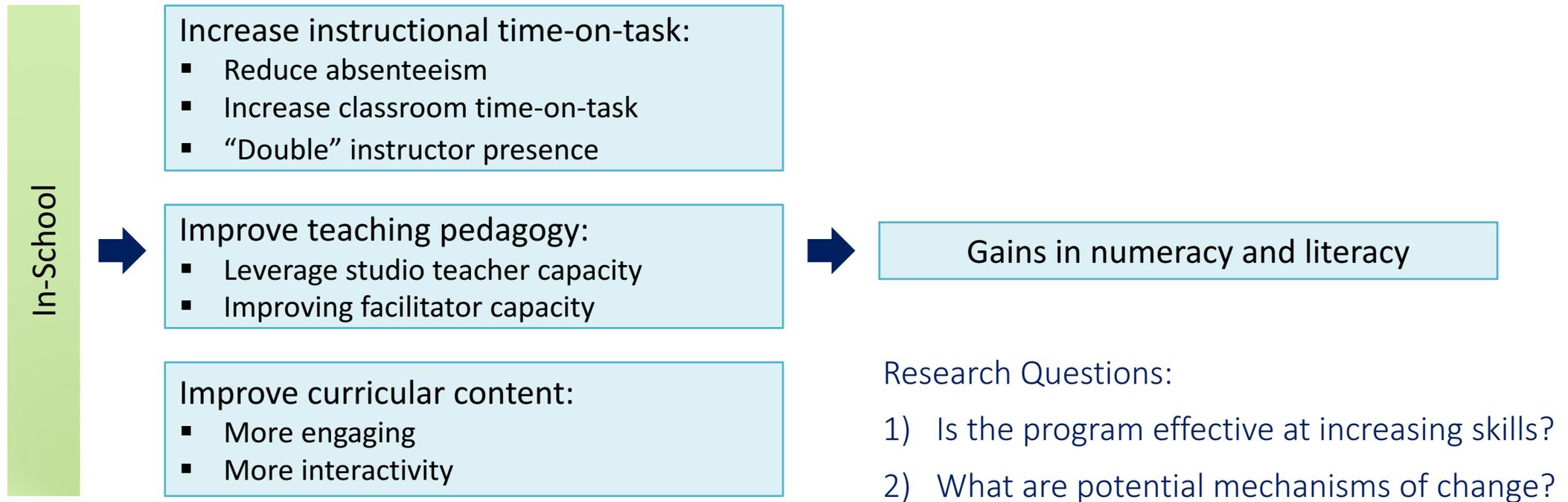
- Provides after-school sessions to in-school girls and out-of-school girls in community (who have left school)
- 1 hour per day, 4 days a week
- Engage girls in topics including
 - Early pregnancy
 - Early marriage
 - Girls' rights
 - Financial literacy
- Provides access to adult female role models
- Boys' monthly after-school program started in response to demand for similar program



Photo Credit: Varkey Foundation

Theory of Change

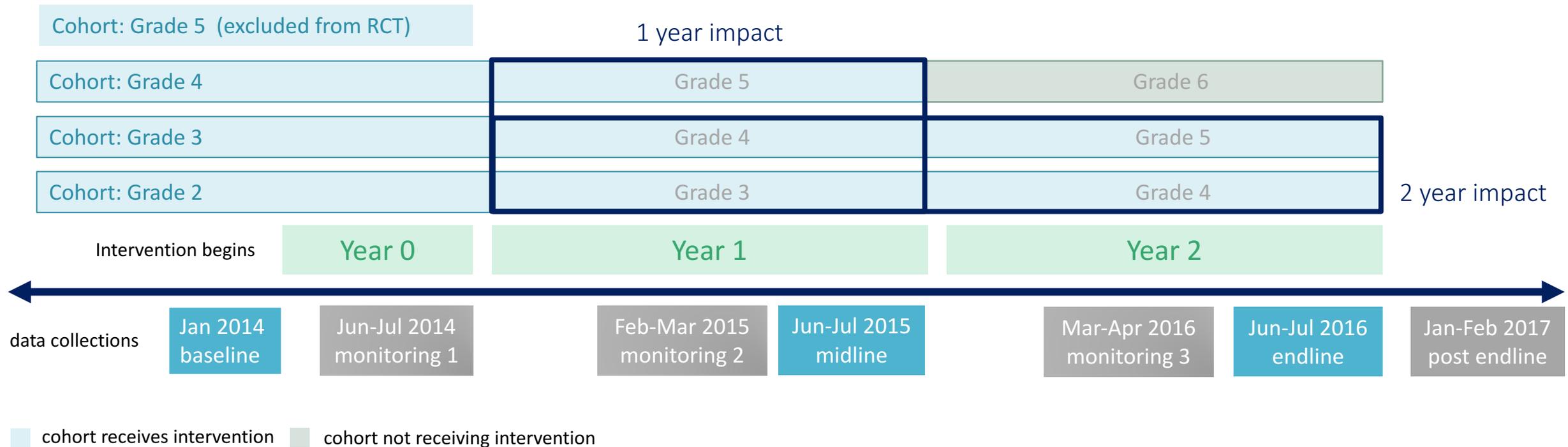
Improve quantity and quality of primary school education



Evaluation Approach

Cluster Randomized Controlled Trial (RCT)

- 70 treatment and 77 control schools, assigned at baseline
- Followed cohort of students (grades 2-4 at baseline) for two full years



Data

1) Skills assessments

- Baseline, midline, and endline
- Literacy: Early Grade Reading Assessment (EGRA)
- Numeracy: Early Grade Mathematics Assessment (EGMA)

2) Student and teacher data

- Student surveys at baseline, midline and endline
- Teacher survey in Year 2
- Attendance measures (records and spot checks) in Years 1 and 2
- Qualitative interviews and focus group discussions with students, teachers and administrators

3) Classroom observations

- Year 2
- Adapted Stallings Observation Protocol
- Snapshots yielding proportion of class time on (1) active instruction, (2) passive instruction, (3) classroom management, and (4) off task activities

Measuring Learning: EGRA & EGMA

- Early Grade Reading Assessment (EGRA)

- Oral test measuring subtasks:
 - Letters per minute
 - **Words per minute (WPM)** <- focal measure
 - Invented words per minute
 - Listening comprehension
 - Oral vocabulary
 - Reading comprehension
- Baseline WPM: 11.5
- Baseline standard deviation: 21.2

EGRA WPM Example Passage:

My name is Pat. I live on a farm with my mother, father, and brother Sam.	16
Every year, the land gets very dry before the rains come. We watch the sky and wait.	33
One afternoon as I sat outside, I saw dark clouds. Then something hit my head, lightly at first and then harder.	54
I jumped up and ran towards the house. The rains had come at last.	68
<i>Time remaining on stopwatch at completion (number of SECONDS):</i> <input type="text"/>	
<i>Check this box if exercise stopped due to no correct answers in the first line.</i> <input type="checkbox"/>	

SOURCE: RTI International, 2009

- Early Grade Mathematics Assessment (EGMA)

- Oral test, measuring subtasks:
 1. Number identification (20%)
 2. Quantity discrimination (20%)
 3. Missing number patterns (20%)
 4. Addition / subtraction / word problems (40%)
- Baseline mean score: 46.0 percent correct
- Baseline standard deviation: 20.1

} focal measure: combined total

Sample Characteristics

- N=5485 at baseline
 - 60% girls
 - Average age = 10.9
 - ~ 8 household members
 - 50% mothers attended school
 - 60% fathers attended school
- Treatment and control balance checks
 - Balance on observables at baseline, midline, and endline
 - Midline attrition = 13%
 - Endline attrition = 16%
 - No difference in attrition between treatment and control groups

Main Results

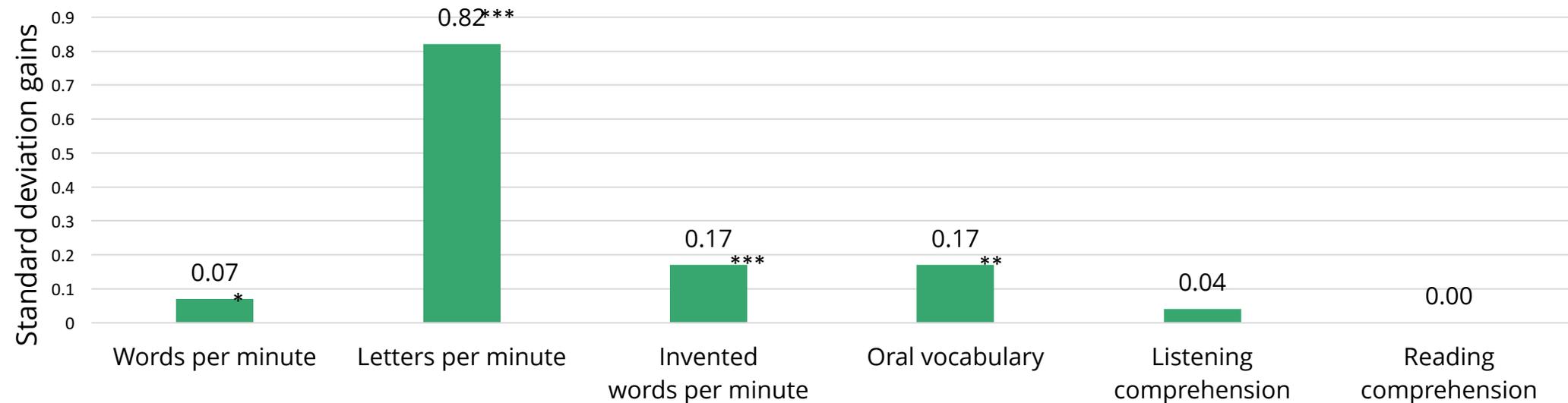
What is the effect of satellite program on literacy and numeracy skills?

Gains in Numeracy and Literacy

- Classes significantly improved **numeracy**
 - 0.22 standard deviation improvement in year 1
 - 0.26 standard deviation improvement in year 2
- Gains in math scores **lasted** one year after the program ended
 - 0.23 standard deviation gains for students tested one year after program ended
- After two years, marginally significant improvement in **literacy**
 - 0.07 standard deviation gains after two years

Literacy Subtasks

- After 2 years of classes, large and significant improvement in **foundational skills**
 - 0.82 standard deviation gain in letters per minute
 - 0.17 standard deviation gain in invented words per minute
 - 0.17 standard deviation gain in oral vocabulary

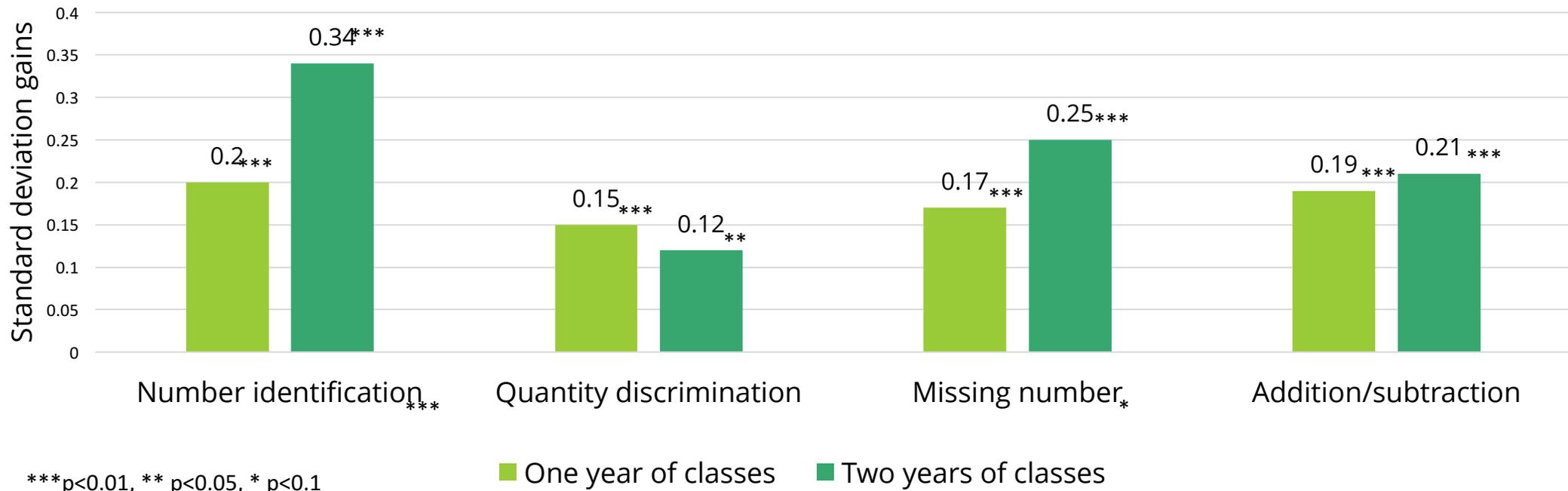


***p<0.01, ** p<0.05, * p<0.1

■ Two years of classes

Numeracy Subtasks

- After one year of classes, significant improvement in **all numeracy subtasks**
- After two years of classes, greater gains in **number identity** and **missing number tasks**



Mechanisms

What are the potential drivers of learning gains?

Theory of Change

Improve quantity and quality of primary school education

In-School

Increase instructional time-on-task:

- Reduce absenteeism
- Increase classroom time-on-task
- “Double” instructor presence

Improve teaching pedagogy:

- Leverage studio teacher capacity
- Improving facilitator capacity

Improve curricular content:

- More engaging
- More interactivity

- -> No evidence of effects on attendance
- -> No evidence of effects on time-on-task
- -> BUT: In-classroom facilitators engaged in on-task activities (including active instruction) more than half of the time that the video was being shown, essentially increasing classrooms’ teacher-student ratio

Gains in numeracy and literacy

Theory of Change

Improve quantity and quality of primary school education

In-School

Increase instructional time-on-task:

- Reduce absenteeism
- Increase classroom time-on-task
- “Double” instructor presence

Improve teaching pedagogy:

- Leverage studio teacher capacity
- Improving facilitator capacity

Improve curricular content:

- More engaging
- More interactivity



Gains in numeracy and literacy

- -> No quantitative evidence of improved teaching methods
- -> Qualitative evidence suggests improvements

Mechanisms: Teaching Pedagogy

- Student focus groups / interviews suggest improvements in learning experience

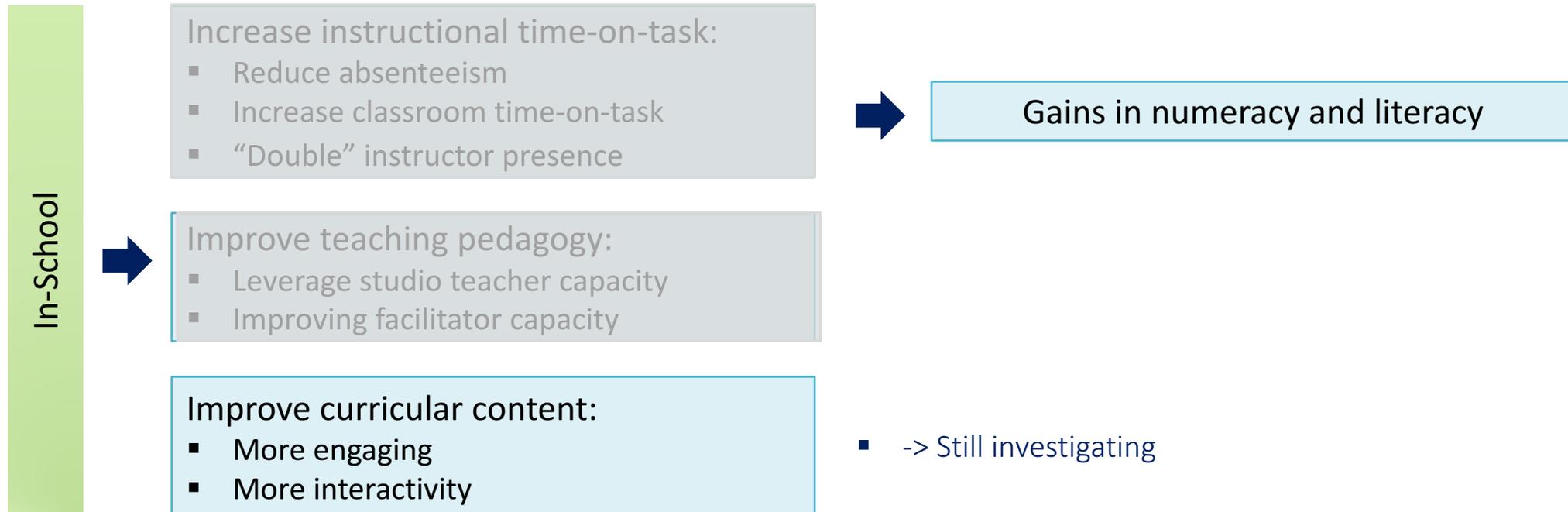
“Sometimes teachers leave you behind if you don’t understand and even cane us. MGCubed teachers try their best to make us understand lessons.”
- Facilitators seen as effective teaching intermediaries

“The facilitator in the MGCubed class explains what the studio teacher teaches if we are finding it difficult to understand the studio teacher.”
- New teaching methods and approaches learned as part of facilitator role

“And they taught us ways we can use to teach them... Though we were taught ‘think pair share’ at the training college I was not using it so when we had the programme recently I went back and am now using it.”

Theory of Change

Improve quantity and quality of primary school education



Policy Implications and Next Steps

- Interactive distance model effective at increasing literacy and numeracy skills
- Increased instructor presence in form of distance *and* in-person instructor an important lever to explore – **are there ways to make roles more complementary?**
- Forthcoming is a **cost effectiveness analysis** to determine how intervention compares to other heavier-handed structured pedagogy programs
- Relevance of interactive model increasing as **costs of internet and distance instruction decreasing** and institutions increase use of online / blended instruction

Link to Working Paper

cepa.stanford.edu/sites/default/files/wp17-08-v201708.pdf

Thank You

Questions and feedback welcome!

jamie.johnston@stanford.edu