

1 **Interim Report on a Teacher Attendance Incentive Program in Kenya**

2 **June 2001**

3 Daniel L. Chen, Paul Glewwe, Michael Kremer, and Sylvie Moulin

4 **Abstract**

5 This paper examines an educational program which attempted to professionalize
6 an informal educational system. The program provided teacher training, classroom
7 materials, and incentives for teacher attendance to fifty pre-schools randomly selected
8 from a sample of one hundred pre-schools in rural Kenya. The program established a
9 regular salary system, conditional on measures of performance, provided necessary job
10 materials and offered formal training services to preschool teachers who previously had
11 none. Under the program rules teachers were eligible for bonuses of up to 85% of their
12 pre-program salary depending on their attendance. School headteachers acted as
13 monitors, and funds not paid as bonuses remained with the schools. In practice,
14 headmasters typically paid the entire bonus to teachers regardless of teacher attendance.
15 This tended to crowd out parental contributions to teacher salary. Teacher training
16 significantly reduced the number of minutes spent using the blackboard: the point
17 estimates suggest that the program improved teacher attitude, energy, effort, control, and
18 organization. The program increased progression to grade one by the end of three years;
19 however, it also significantly decreased written test scores after two years.
20

21
22 Teacher absenteeism is widespread in developing countries. In Kenya preschool
23 teachers are typically paid very little, since they often have minimal formal schooling.
24 Preschool teachers receive an average salary of 3,500 Kenyan shillings (\$47)¹ per year²
25 and are absent about 29% of the time.

26 In 1997, one hundred preschools were chosen to participate in the Early
27 Childhood Education (ECE) Project in Kenya. Fifty randomly selected preschools
28 participated in the program and fifty served as a comparison group. The program had
29 three components, teacher training, classroom learning materials, and substantial bonuses
30 for teachers with good attendance. This paper finds that the program marginally
31 increased attendance rates and separation rates, but that neither of these effects were
32 statistically significant. The program also had positive effects on multiple measures of
33 pedagogy, very few of which were significant.

34 The teacher attendance incentive consisted of a salary bonus of up to 85% of the
35 average salary³. The bonus was reduced for each day absent without excuse beyond three
36 days; thirteen or more days resulted in no bonus that term. School headteachers were to
37 monitor the teacher's attendance record. Any money not given to the teacher was to be
38 used for the rest of the school. Teachers in the program also received six weeks of
39 training spread out over one year. The training focused on using more hands-on
40 materials in teaching and class participation. It included seven modules: child
41 development, health and nutrition, parental involvement/community outreach,

¹ This paper uses 75 Ksh/\$1 exchange rate relevant for 1999.

² This statistic comes from 1996 data, a year before the program began.

³ The Kenyan school year consists of 3 terms per year.

42 communications, materials development, preschool center management, and preschool
43 curriculum activities. The teachers also received alphabet and number charts, curriculum
44 books, storybooks, school supplies, and objects for students to use.

45 Before the program began, program and comparison groups did not significantly
46 differ in the number of teachers or their education, prior training, salary, and teaching
47 experience, nor in the number of students and their sex, age, and experience in school,
48 and payment.

49 There is no evidence that the program significantly improved teacher attendance,
50 most measures of teacher pedagogy, pupil test scores, or pupil attendance. In fact, there
51 is statistically significant evidence that the program decreased pupils' written test scores
52 and crowded out preschool fees during the second year.

53 The sample is restricted to active teachers and enrolled students prior to the
54 program to avoid selection bias. Rates of attrition among pupils and among teachers in
55 the two groups are similar.

56 We find that school headteachers frequently gave the entire bonus to teachers
57 regardless of teacher attendance. Since pre-primary schoolteachers are paid by parental
58 contribution, the program, in a sense, replaced a teacher pay system originally conditional
59 on performance with a system that was only theoretically conditional on performance.

60 Few studies in the economic literature have examined the use of bonuses to
61 reduce teacher absenteeism, and there is almost no literature on teacher absenteeism in
62 developing countries (for American studies, see Jacobson, 1989; Ehrenberg, et. al, 1991).

63 It is important to evaluate programs like these on a small scale before implementing
64 them on a large scale, given the amounts of money involved. The Kenyan government is
65 currently planning to train all preschool teachers with a longer version of the training

66 course in this study, using funds from a recently-approved World Bank loan. (XX
67 information from elizabeth king on teacher attendance bonuses in c.America,Have
68 preliminary information about a teacher attendance program that failed in Bolivia. Still
69 trying to track down the information.)

70 Section 1 describes background and motivations of this study, preschool
71 education in Kenya, and the program. Section 2 discusses the methodology used to
72 collect data, the data sets, and the econometric model. Section 3 discusses initial
73 conditions in program and comparison schools. Section 4 discusses the teacher bonus
74 component of the program and teacher outcome variables such as attendance, separation
75 rates, and pedagogy. Section 5 discusses pupil outcome variables like attendance, grade
76 progression, enrollment, and test scores. Section 6 discusses possible crowding effects
77 the program may have had on school finances, and section 7 concludes.

78

79 **1. Background**

80 Teacher absenteeism is a general problem in developing countries. In one
81 detailed study, PROBE team report (1999), the headteacher was absent in one-third of all
82 PROBE report visits to schools.⁴ In our sample of Kenyan preschools, 29% of preschool
83 teachers were absent during any given visit.⁵ One hopes that by simply having more
84 teachers come to class, student learning and achievement can improve.

85 Jacobson (1989) found that an attendance incentive scheme that gave up to \$400
86 bonus for perfect attendance on an average salary of \$37,000 in Western New York
87 significantly decreased teacher absence. Ehrenberg, et. al (1991) found that policies in

⁴ The study does not give statistics for absenteeism of all teachers.

⁵ A teacher was considered absent if she was on unexcused, maternity, sick, or training leave.

88 New York State school districts that “buyback” unused sick days or that pay teachers for
89 unused sick leave help to reduce teacher absence.

90

91 **1.1. Preschool Education in Kenya**

92 Approximately 35% of Kenyan children between ages 3 and 6 attend preschool
93 (Government of Kenya, 1996). Children are enrolled usually for two years, although
94 attendance is sporadic.

95 Preschools are funded through school fees, rather than by the government, and
96 governed by school committees consisting mostly of parents, rather than by the Ministry
97 of Education. Many preschools are located on the premises of primary schools, and the
98 primary school headteacher often has an important role in supervising the pre-primary
99 school teacher. Preschool resources are quite modest. Classes are frequently held under
100 a tree, and preschool teachers have few instructional materials or teaching aids. They
101 often have only a tattered blackboard on which to write and have no charts or objects for
102 students to use, such as bottle tops, sticks, stones, clay, and blocks. Classes are large;
103 prior to the program, schools in our sample had an average of 54 children and 1.4
104 teachers for an average pupil-teacher ratio of 42:1. Primary school pupil-teacher ratios
105 are generally smaller with ratios becoming more favorable as grades increase. – asked
106 Leon to follow up) In contrast, a typical state mandated minimum pupil to staff ratio in
107 U.S. preschools is 16:1.⁶

108 Parents frequently only pay a part of the required fees, if anything at all. While
109 official guidelines call for salaries of about \$90 per term (XX Grant proposal says that

⁶ This is the legally mandated maximum staff to child ratio for four year olds in day school in Maryland. Staff is defined to be all adults including teachers, teacher assistants, and aides.

110 rural teachers in the sample make \$10 a month, preschool teacher in towns paid by
111 municipal authorities get \$40 a month, can't find figure for \$90 per term in the NIH
112 proposal.- Can't find this \$90 a term figure. Should I go with \$30 a term or \$120 a
113 term?) in our sample on average only 1,338 Kenyan shillings (\$18) per term was
114 collected from parents in 1996. Of this, preschool teachers earned on average 1,160
115 Kenyan shillings (\$15) per term.⁷ The Kenyan school year consists of three terms of
116 three months each.⁸

117 Preschool teachers are hired from the local community and usually have primary
118 and some secondary schooling. Further schooling is less common; only about one
119 quarter of the teachers in our sample received some type of education or training beyond
120 secondary school. Average schooling in our sample was ten and a half years (see Table 1
121 for more statistics). Most preschool teachers were female.

122 Myers (1992) summarizes a variety of studies examining the effects of early
123 childhood development project. (XX citations from NIH proposal? – Myers 1992)We
124 examine the effect of improving preschools which started with very little resources. (XX:
125 other examples of preschool programs that improve informal childcare into more formal
126 programs? – Should I do a literature search to find these types of programs?)

127

128 **1.2. Description of Project**

129 The Early Childhood Education Project, announced in March 1997, was run by
130 Internationaal Christeljik Steunfonds, a Dutch NGO. Of the one hundred schools
131 evaluated in this study, fifty preschools participated in the preschool program and fifty

⁷ In contrast, primary school teachers in our sample are paid at least \$87 a month plus extensive benefits, valued at \$27 a month.

132 preschools served as the comparison group. The program preschools were randomly
133 selected to be half of the preschools in each of four predetermined groups.⁹ These four
134 groups were constructed from a prior study of associated primary schools¹⁰ in which each
135 primary school received textbooks or grants at different times between 1996 and 1999.¹¹
136 ¹²

137 The program consisted of three parts: teacher attendance incentives, teacher
138 training, and classroom learning materials. Teacher attendance incentives were designed
139 to be a salary supplement given for regular attendance. In each of the three terms,
140 teachers were to be given a bonus of up to 1,000 Kenyan shillings (\$13) dependent on the
141 number of unexcused absences. Teachers were to receive the maximum amount if they
142 were absent fewer than three days. For each additional absence, the supplement was to
143 be reduced by 100 Kenyan shillings (\$1.33). Thus, thirteen or more unexcused absences
144 resulted in no bonus. Acceptable excuses included sickness, attending funerals, and
145 attending training sessions. Since preschool teachers before the program began received
146 about \$16 a term, the incentive scheme potentially added 85% to their salaries. Only

⁸ January to March, May to July, and September to November.

⁹ Almost all rural primary schools have an associated preschool class or classes, located near or on the primary school compound.

¹⁰ Glewwe, Kremer, and Moulin 1999.

¹¹ The schools were selected for the four groups by sorting the schools by seven geographic regions and sorting within these regions alphabetically. The first school was assigned to the first group, the second school to the next, and so on. Every fourth school was assigned to the same group. The first group of schools received textbooks in 1996, the second group received an unrestricted grant in 1997, the third group received a restricted grant in 1998, and the last group received a restricted grant in 1999. Restricted grants allowed schools to use the money only for certain projects. For this preschool study, the schools were sorted alphabetically within each of the four groups. Program and comparison groups were determined by assigning every odd-numbered school into the comparison group and every even-numbered school into the program group.

¹² XXIn 1998, a teacher incentive program for teachers at primary schools was also implemented; the fifty schools that participated in this teacher incentive program were the fifty schools that did not receive the early childhood education program. In this new program, if students scored high in a range of subjects compared to other students, their teachers received prizes such as bicycles and suits. However, this program does not have a significant effect after one year. Thus, the measurements of the effect of the preschool program should not be affected. Even if the teacher incentive program had a significant effect,

147 teachers present at the beginning of the year were eligible for the bonus. Teachers hired
148 during the year had to wait until the following school year before becoming eligible for
149 the bonus.¹³ If a teacher separated from the school during the year, the remaining money
150 was to be used for the school. Likewise, whatever bonus was left over after paying the
151 teacher the appropriate amount was also intended to be used for the school. School
152 committees¹⁴ were to manage and administer the funds designated for the salary
153 supplement. The headteacher of each primary school was responsible for keeping
154 attendance records of the preschool teachers. The headteacher was given 3,000 shillings
155 at the beginning of each school year and was expected to disburse the bonus
156 appropriately at the end of each term.

157 Teacher training was held full time for six weeks spread throughout the course of
158 one year. The first three weeks were held in April 1997, the next two weeks in August
159 1997, and the last week in April 1998. The training consisted of seven modules,
160 developed by the Ministry of Education: child development, health and nutrition, parental
161 involvement/community outreach, communications, materials development, preschool
162 center management, and preschool curriculum activities. The training focused on using
163 materials, demonstrations, and tactile objects. The trainers themselves were trained at the
164 National Center for Early Childhood Education (NACECE), a respected institute for early
165 childhood education in Africa.

166 The classroom learning materials consisted of alphabet and number charts,
167 curricular books, storybooks, school supplies, and other objects for students to use. The

the preschool evaluation should be unaffected since preschools are financially separate from primary schools.

¹³ They did not receive any training however.

¹⁴ The school committee includes the headteacher, parents or guardians of children in that school, and a representative from the District Education Board or from the church that sponsors the school.

168 teachers were trained on how to use the materials during the sessions. They received the
169 materials after the first training segment. Additional materials were distributed at the
170 1998 training sessions.

171

172 **2. Methodology**

173 The section below discusses data collection, teacher, pupil, and preschool data
174 and the random effects model used to estimate the effect of the program.

175

176 **2.1. Data Collection**

177 All data were collected through either direct observation of classrooms, teacher
178 interviews, pupil roll calls, pupil examinations, or pupil interviews.¹⁵ School records
179 were not used to measure attendance because they were less reliable. The field workers
180 who collected the data evaluated randomly assigned schools, with each field worker
181 visiting an equal number of program and comparison schools. Field workers had two
182 years of experience on other projects before this data collection effort. The trial was not
183 blind: the schools and the field workers knew which schools were in the program group
184 because of the presence of new classroom materials. However, the visits were
185 unannounced and schools were visited in a random order.

186 Table 1 summarizes the available data. Data from teacher and school
187 questionnaires were more likely to be missing for the comparison schools. One reason
188 may be that some questionnaires were administered during training sessions which only
189 program teachers attended. Alternatively, program teachers may have been more

¹⁵ The sole exception is that we are obtaining official records of salaries given by country or municipal councils in order to clarify the responses of the preschool teachers, some of whom appear to have misunderstood the salary question on our questionnaires.

190 compliant because they were grateful for the program. Therefore, regressions using
191 teacher or school covariates are less reliable.

192

193 **2.2. Teacher Data**

194 In February of 1997, each school provided a list of the current preschool teachers.

195 In 1997, teacher attendance was recorded up to two times per school—one visit occurred
196 between May and October and the other, between September and October.¹⁶ In 1998,
197 teacher attendance data was collected five times. In 1999, attendance data was collected
198 three times. Once a year, information on items such as education and teaching
199 experience was also collected.

200 For each program teacher and for each term that he or she was in the bonus
201 program, data on the number of days absent and the amount of bonus received was
202 collected from the teacher. This information was often corroborated with a letter co-
203 signed by the headteacher, chairmen, or preschool teacher. Other teachers had their
204 claims confirmed by a conversation between the headteacher and program evaluator. To
205 check the reliability of these reported absences, we examined the arrival and departure
206 logs, that teachers were supposed to sign each day that they were present. Program
207 teachers were also required to take a test at the end of the 5th week of training in August
208 of 1997, to see whether they had mastered the subject areas.

209 Classrooms were observed once a year. Minute-by-minute logs, on average for
210 18 minutes, were recorded detailing the classroom time spent by teachers and pupils on

¹⁶ Some schools did not get visited because time ran out. For the first visit, between May and October, fourteen schools were not visited due to a teacher strike that shut down schools for three weeks. Five of these were program schools and nine of these were comparison schools. The second visit, between September and October took place in less than half the schools. 68% of program schools and 74% of comparison schools did not receive the second 1997 visit. Since the schools were visited in random order, the data should not be biased.

211 the board, charts, pictures, and hands-on objects¹⁷. The extent of teachers' caring
212 behavior, helpfulness towards students, energy level, classroom control, preparation, and
213 pupil participation was also recorded. Of these, all measures used a rating where 5 was
214 the best and 1 was the worst. Classroom control and preparation used a rating with 3
215 being the best and 1 the worst.

216

217 **2.3. Pupil Data**

218 In January 1997, the names of enrolled preschool students were collected as well
219 as their age, sex, and year of entrance. Between May through October and September
220 through October a maximum of two attendance checks were made.¹⁸ The attendance
221 checks consisted of a verbal roll call. Students present in school on the day of the visit
222 were considered school participants. Students on the enrollment list who were either
223 absent on the day of the visit or had dropped out were not considered school
224 participants.¹⁹ In 1998, each school received four more attendance checks; the first visit
225 for most schools occurred during the first term (January-March), the second during the
226 second term (May-July), and the third and fourth during the third term (September-
227 November). In 1999, each school received three visits.

228 Up to thirty-six students in each school were randomly sampled to take
229 examinations in October 1997. Students took two exams, one to test oral skills and
230 another to test written skills. Students selected to take the exams were drawn from the
231 list of students participating in October 1997, an updated list including more students
232 than those enrolled in January 1997. However, only the test scores of students enrolled in

¹⁷ Defined as anything students hold or touch, such as bottle tops, sticks, stones, clay, blocks, and so forth.

¹⁸ See footnote 22 for discussion of schools not receiving both visits.

¹⁹ For future reference, we define enrollment during a given term as the sum of the number of students

233 January 1997 are analyzed. This was done to reduce selection bias.²⁰ The following year
234 in September and October, twenty-two students in each school were sampled to take
235 similar examinations. These students were from a random sample based on the original
236 list of students enrolled in January 1997. Tests were conducted in October and
237 November in 1999 and approximately 35 students were sampled. – asked Leon)

238 Teachers of grades 1 through 3 in teams of two from other schools administered
239 the examinations. Ministry of Education staff and an early childhood development expert
240 designed the tests to cover literacy skills, number skills, vocabulary, and general topics
241 about the natural world. The easiest oral and written questions consisted of saying one’s
242 name and copying a simple pattern from the blackboard.²¹

243

244 **2.4. Preschool Data**

245 Information on student fees, on whether the preschool was sponsored,²² on the
246 total amount of money collected in each of the previous four terms, and on the portion of
247 that money given to the preschool teacher was collected each year. In 1997, a teacher,
248 usually the preschool teacher but sometimes the headteacher, filled out these
249 questionnaires. In 1998 1999-asked Leon, the questionnaires were completed by field

present at the school during that term’s visit.

²⁰ Because we sampled students from the October list of students, some of these students were not enrolled in January. Thus, schools that significantly increased their enrollment from January to October have fewer students represented in our sample. To correct for this, and to correct for the fact that our sample is a subset of the entire population, we constructed a sampling weight equal to the October enrollment divided by the minimum of January enrollment and 36. This is because if less than thirty-six students were associated with any school, all the students were sampled for testing. However, weights appear to affect the results by very little in most cases. Thus, to be consistent, we do not use weights for the results presented in this paper.

²¹ This can still be difficult for the youngest and shyest children

²² In a sponsored school the local county or municipal county pays the preschool teacher a regular amount beyond what is already allocated to them from school fees. Sponsored schools are only in townships, and in our sample only constituted 11% of preschools during the period immediately prior to the program.

250 officers who interviewed the preschool teachers. Preschool fees were in Kenyan shillings
251 per family per term or per pupil per term.

252

253 **2.5. Model: Random Effects Error Structure**

254 Since test scores are likely to be correlated among students in the same school due
255 to unobservable characteristics of teachers and the environment, we use an error
256 components econometric model with school random effects.²³ Failing to account for
257 these correlations would lead to underestimates of standard errors of the coefficients.

258 More specifically, the basic model used to estimate the effect of the program on
259 test scores and any other outcome variable was:

$$260 \quad T_{si} = a + bP_s + cX_{si} + u_s + e_{si}$$

261 where i indexes individuals and s indexes schools. T_{si} is the test score or some other
262 variable of interest, a is a constant, b reflects the effect of the program, P_s is a dummy
263 variable that equals one if the school was selected for the program and zero if it was not,
264 X_{si} is a vector of predetermined individual and school level variables, u_s is a school-
265 specific random effect, and e_{si} is a child-specific random error. Because P_s is determined
266 randomly, the error terms (u_s and e_{si}) should be independent of the treatment status. .
267 Thus, this model should yield unbiased estimates of b . Including the variables
268 represented by X_i does not lead to bias and may improve efficiency.

269

270 **3. Initial Conditions in Program and Comparison Groups**

271 There were no significant differences between program and comparison groups
272 prior to the program (see Table 2). (XX Can we just delete the rest of this since program

²³Including school division random effects does not change the results significantly.

273 and treatment schools before the program were statistically insignificant?) Program
274 teachers had on average one more month of formal education, were slightly more likely
275 to have prior training, and had about six months less teaching experience than
276 comparison teachers. Students in the program group also had a greater proportion of
277 boys, were slightly younger, and began preschool slightly earlier. Program schools had
278 greater January 1997 enrollment, greater 1996 fees per term,²⁴ greater likelihood to be
279 sponsored by a local council in 1996, fewer total fees collected per school in 1996,
280 smaller teacher salary from fees collected in 1996, and greater number of teachers. To
281 check whether there are significant differences between both teachers and pupils in
282 program and comparison schools, we estimate teacher-level and student-level regressions
283 with school random effects; to examine differences at the school level, we estimate
284 ordinary least squares regressions.

285

286 **4. Teacher Outcomes**

287 Although headteachers and school committees theoretically had incentives to
288 monitor teachers, in practice, local monitors typically gave the entire bonus, basically
289 raising the salary, regardless of teacher attendance. The program has a significant impact
290 on one aspect of teacher pedagogy but not on attendance, separation rates, or behavior.
291 Program teachers spent less than a third as much time using the board as comparison
292 teachers. Point estimates suggest that the program increased teacher attendance and
293 reduced separation rates, but none of these effects are statistically significant. (XX Check

²⁴ Note: Six preschools collected fees per family per term instead of per pupil per term. For simplicity, it was assumed that a parent has only one pupil in preschool at any given time. Twelve schools apparently collected fees both on a per parent basis and a per pupil basis. XX Until this is confirmed, the per pupil school fee was used.

294 with more recent data and clarify the ambiguous effects for various measures of caring
295 behavior. More recent data does not exist for separation and attendance. .)

296 This section is organized as follows: sub-section 4.1 discusses outcomes of the
297 teacher bonus program, sub-section 4.2 discusses teacher attendance and separation rates,
298 and sub-section 4.3 discusses teacher caring behavior.

299

300 **4.1. Teacher Bonus**

301 In practice, school headteachers typically did not keep careful attendance records
302 or ruled all absences as excusable and frequently gave the entire bonus to the preschool
303 teacher even if actual attendance did not warrant this under the rules. 88% of preschool
304 teachers reported that they got the full 1000 shilling bonus at any given term. A very few
305 of the teachers confirmed their perfect attendance and 1000 bonus with a letter co-signed
306 by the headteacher, chairmen, preschool teacher -asked Leon. Other teachers had their
307 claims confirmed by a conversation between the program evaluator and the headteacher
308 (XX how many? – asked Leon). Between 1997 and 1998, there were nine reports of a
309 bonus of 1000 and being absent for more than 3 days (one teacher reports being absent
310 for 30 days). Several teachers report having a perfect attendance and receiving a bonus
311 of 1000, but were absent at the time of our visit. (XX the exact frequencies will change
312 once we get the 1999 data – still no sign of this data).

313 To check the reliability of these self-reported absences, we compared them with
314 records from our own visits and records from the arrival and departure log that teachers
315 were supposed to sign. The mean days absent reported by program teachers was 1.7
316 days/term and the mean days absent as imputed from the reported bonuses was 2.7
317 days/term. However, the mean of our recorded absence rate was 15.2 days/term and the

318 mean recorded absences in teacher logs was 18.4 days/term (Table 3). It is possible,
319 however, that almost all of our observed absences were granted as leave since excused
320 absences were given for illnesses, funerals, training, and maternity leaves.

321 There was an incentive for the headteachers and school committees to keep the
322 money for their school or for themselves. In seven schools, we observed either problems
323 with headteachers trying to embezzle the bonus allocated for preschool teachers or
324 preschool teachers having to struggle to get the appropriate bonus amount. At one
325 school, a teacher was fired because the school wanted to retain the bonus. Twenty to
326 thirty schools in total had complaints from preschool teachers not receiving their bonus.
327 ICS workers responded to these complaints by meeting with the headteachers. Many
328 headteachers may have decided to give the entire bonus to preschool teachers rather than
329 risk another reprimand by the ICS workers.

330 The attendance incentive was much smaller in practice because bonus payments
331 did not follow the guidelines closely. School headteachers did not keep careful records
332 of teacher attendance, did not pay attention to the rules of the bonus, and counted many
333 absences as excused. Of the teachers not being paid the full bonus, which were very few
334 (21 out of 291 reported bonus amounts), only three teachers were paid according to the
335 rules.

336 An ordinary least squares regression of bonus payment on teacher reported
337 absences suggests that teachers received a base of 951 shillings and lost 11.7 shillings for
338 every absence, with a standard error 2.0 shillings. A regression of the bonus on
339 absenteeism as measured by school records suggests teachers received a base of 882
340 shillings and each absence *raised* the bonus by 1.3 shillings with a standard error of 2.4
341 shillings. Using data on absences gathered by school visits for the study, teachers

342 received an average bonus of 954 shillings and lost 1.1 shillings for every absence with a
343 standard error of .6 shillings.

344 (XX: Lay out chronology of complaints. Are there trends in enforcement over
345 time? Perhaps it was painful for headteacher to get into fight with preschool teacher, and
346 the headteacher became a 'softie' after the fight. – asked Leon)

347

348 **4.2 Teacher Attendance and Separation Rates**

349 The program did not have a significant impact on either teacher attendance or
350 teaching separation rates. A teacher was considered separated if he or she quit or was
351 fired. After two years, the effect of the program on teacher attendance and separation
352 rates is not statistically significant (Tables 5-7). Program teachers were present during
353 our visits about 74% of the time, and comparison teachers were present 71% of the time.
354 Of the comparison teachers 27% had separated by the end of the third year while only
355 25% of program teachers had separated during the same period.²⁵

356 (XX: Are there subgroups with a significant program effect on separation? I.e.
357 suppose older teachers never separate. Then among younger teachers, maybe 40% of
358 comparison teachers separate but only 20% of program teachers do. Possibly significant.
359 Possible groups: by age, marriage, tenure, education (to do this we need more complete
360 information on the teachers). If there are such subgroups, then see if program has
361 differential effects on pupils of these teachers. – This was done with tenure and
362 education. Find no significance on treatment even if we restrict the regression to older or

²⁵ It is not possible to include covariates such as education and teaching experience for these estimates because the percentage of comparison teachers missing information on these covariates is almost twice the percentage among program teachers. From the data available, teachers who separate tended to be younger, more educated, and less experienced (Table 8).

363 younger teachers or teachers with more or less education. Other variables like age and
364 marriage are not available.)

365

366 **4.3 Teacher Caring Behavior and Pedagogy**

367 Although the differences are minute, the program seems to have had a negative
368 impact on caring behavior for the first three years (Table 9). For most questions, most
369 teachers received the best or second best rating.²⁶ One should note, however, that
370 judgements on caring behavior are subjective.

371 Program teachers spent 3.5 minutes less than comparison teachers using the
372 blackboard, and this difference is significant at the 5% level (see Table 10). There are no
373 significant differences in time teachers spent on charts, pictures, and objects or on time
374 pupils spent on objects, papers, or the board. The program had a slight negative impact
375 on time teachers spent on charts and pictures and time pupils spent writing, drawing and
376 demonstrating answers in front of the class. The program had a slight positive impact on
377 time teachers and pupils spent using objects.

378 The program had no significant effect on attendance, even when controlling for
379 sex, age, and experience.²⁷ Both program and comparison students were present 56% of
380 the time (Table 11).

381

382 **5.1 Test Scores**

²⁶ Since ratings are given on a scale of 1 to 5 or 1 to 3, we ideally would have used an ordered probit model with school random effects since some schools have more than one teacher. Due to software limitations, we could only consider teacher ratings as a continuous variable if I wanted to use random effects. In any case, random effects is not critical since there were very few schools with data on more than one teacher.

²⁷ We analyze attendance rate instead of enrollment because enrollment is very difficult to define. There are no official enrollment lists and attendance is typically sporadic.

383 The program seemed to reduce test scores, although by a difference that was not
384 statistically significant. This analysis, as others in this paper, was limited to students
385 enrolled in January before the program was announced to avoid selection bias. Data on
386 test attrition and dropout rates suggest that attrition bias is not significant.

387

388 **5.1.1 Test Scores After 1 Year**

389 The estimated effect of the program on 1997 test scores was negative, but
390 statistically insignificant in most specifications. The point estimate in the basic model
391 (see section 2.5) was -0.07 standard deviations for oral and written test scores (Table 12).

392 Controlling for sex, age, experience, as well as January enrollment size and 1996
393 school mean suggests a stronger negative effect of the program on test scores (Column
394 (ii)), although the estimated effect is still insignificant. The point estimates on the
395 program then become -0.12 and -0.11 standard deviations for oral and written test scores
396 respectively.²⁸

397

398 **5.1.2 Test Scores After 2 Years**

399 In 1998, the negative impact of the program on test scores increased, although it is
400 significant at the 10% level for only the written test scores for most specifications (Table
401 13). The point estimate in the basic model is -0.13 standard deviations and -0.17
402 standard deviations for the oral and written test scores, respectively. Controlling for sex,
403 age, experience, January enrollment and 1996 school mean score increases the negative
404 impact to -0.13 and -0.17 standard deviations for oral and written test scores.

²⁸ Quantile regressions indicate that there is no evidence that the program significantly benefitted the best or the worse students on either the oral or written test scores. Note also that as more covariates are included the missing data problem becomes worse.

405

406 **5.1.3 Test Scores After 3 Years**

407 In 1999, the negative impact of the program on test scores is similar to that of the
408 first and second years (Table 14). The point estimate in the basic model is -0.1 standard
409 deviations and -0.06 standard deviations for the oral and written test scores, respectively.

410 Controlling for sex, age, experience, January enrollment and 1996 school mean score
411 increases the negative impact to -0.16 and -0.08 standard deviations for oral and written
412 test scores. T

413 After pooling together all test scores across year and subject with dummy variables and interaction terms
414 for each year and for each subject, the program still appears to have had a negative but insignificant effect
415 on test score. Summing English and Math test scores and pooling together the data for all years with
416 appropriate year dummies and interaction terms again imply that the program had a negative and
417 insignificant effect on test score. These results are not displayed.

418 **5.2 Enrollment**

419 The effect of the program on test scores is probably not due to attrition bias.
420 Enrollment figures are given in Table 15. The difference in the drop in enrollment
421 between program and comparison schools is not significant. The average original class
422 size is 55 for program schools and 53 for comparison schools. At the middle of the third
423 year, the average class size is 40 and 44, respectively, for program and comparison
424 schools. The pupil-teacher ratio drops from approximately 40:1 to 30:1 for both groups
425 of schools.

426

427 **5.3 Test Attrition**

428 Test attrition is similar between the two groups. 37% of the program students and
429 38% of the comparison students did not take either 1997 test. In 1998, the test attrition

430 rates were 30% for program students and 31% for comparison students. In 1999 the
431 analogous numbers were 34% for program students and 35% for comparison students.
432 (Table 16)²⁹.

433

434 **5.4 Grade Progression**

435 After three years, the program increased progression to grades 1, 2, or 3 but not
436 significantly.³⁰ About 52% of program pupils progressed to grades 1 to 3 while 47% of
437 comparison pupils progressed to grades 1-3 (Table 16). It is possible that students
438 advanced to the next grade not because of achievement but because they were trying to
439 escape the preschool system. Grade progression decisions are usually a joint decision
440 between both teachers and parents. – asked Leon

441

442 **5.5 Training Program**

443 Teachers in the program were also required to take a test at the end of five weeks
444 of training, in August of 1997, to see whether they had mastered the subject areas. There
445 was no statistically significant correlation between teachers scores on post-training tests
446 and students' subsequent test scores. The teacher training program did not appear to have
447 important effects upon student performance. There was no statistically significant
448 correlation between student normalized test scores and teacher separation, even though
449 teachers who left their classes were replaced with new teachers who had not participated
450 in the training program. Finally, there was no statistically significant correlation between
451 student test scores and preschool teacher average bonus amount, although one might

²⁹ Note that test attrition is expected to decline as students become older, because they are more likely to be in school to take the test.

³⁰ Pupils are considered as progressed to grade 1, 2, or 3 if in the first visit of 2000, pupil is in that grade.

452 expect that teachers expecting higher bonuses might have increased morale and
453 enthusiasm in their teaching.

454

455 **5.6 Possible Explanations**

456 It is remarkable that the program appears to have had a negative impact on student
457 test scores. Perhaps higher salaries retained bad teachers, lowered morale, or attracted
458 less enthusiastic teachers to what had previously been a semi-volunteer occupation.
459 Alternatively, it may be that teacher training was inappropriate for the environment or
460 that lower quality teachers, wanting to take advantage of the bonus, were hired through
461 connections. It is also possible that the program crowded out preschool fees which
462 resulted in lowering pupil test scores. While we have anecdotal evidence suggesting all
463 these hypotheses may partly explain the results, we only have statistically significant
464 evidence corroborating the hypothesis on crowding out.

465 **6 Preschool Finances Crowding-Out Effect**

466 The program appears to have crowded-out parents' contributions to preschool
467 finances. Among schools that are not sponsored by municipal or county councils,³¹ the
468 average total fees collected from parents for preschool per term after the ECD program
469 began is 634 Kenyan shillings less for program schools after one year and 941 shillings
470 less after two years. The average money given to preschool teachers per term after the
471 ECD program began is 606 Kenyan shillings less among program schools after one year
472 and 889 shillings less after two years. The program appears to have reduced funding for
473 preschools and teachers by a third, and this effect is statistically significant during the

³¹ In sponsored schools the local county or municipal council paid the preschool teacher a regular amount beyond what was already allocated to them from school fees. Sponsored schools are only in townships, and in our sample 11% of preschools were sponsored prior to the program.

474 second year.³² The results are reported in Table 18.³³ Note that before the program
475 began, program schools were receiving only three-quarters the amount comparison
476 schools were receiving from parents. It is important to note that parental contributions
477 were often very sporadic and inconsistent. Parental contributions usually depended most
478 on whether parents had the cash during that time of the year and less on the qualities of
479 the teacher. The results of table 17 confirm this idea as none of the explanatory variables
480 on teacher pay are significant and the overall regressions have very low R² values.

481 Although schools collected less fees from parents under the program, and, hence,
482 teachers received less in salary, teachers in the program when including salary and bonus
483 tended to earn slightly more than their counterparts in the comparison group. However,
484 because under the program the portion of teacher pay provided by parents decreased, the
485 program seemed to have replaced a pay system where parents originally held teachers
486 accountable with a system where headteachers theoretically held teachers accountable
487 and chose not to do so. The difference in parental contributions to teacher salary between
488 program and comparison groups, however, is only statistically significant after one year.
489 Table 19 shows that the difference in teacher salary was usually more than compensated
490 by the bonus. It appears that the program did not actually have a strong effect at raising
491 teachers' overall pay by the second year of the program. The extra pay given by the
492 bonus was almost completely crowded out by parents' contributing less to teacher
493 salaries. In year one 57% of the average attendance bonus was crowded out by a
494 reduction in parental contribution. This figure rose to 93% in year two. Given such

³² We also investigated possible factors for teacher pay and found that both before and after the program began, age, education, and experience had no effect on portion of parents' fees given to the preschool teacher (Table 17).

³³ Note that year 0 preschool finance information is not usable due to highly different rates of missing data between program and comparison groups. So we cannot directly examine whether any individual schools experienced crowding out, only whether the program schools appear to have different finances than

495 severe crowding out, headmasters may have felt more obligated to give the entire
496 attendance bonus since, otherwise, program teachers would have earned less money than
497 before. In addition, before the implementation of the program, when parents paid more of
498 the teacher's salary, parents may have demanded a better quality of education for their
499 children and could withhold payment as a form of punishment and accountability. Once
500 the attendance bonus replaced some of the parental contribution, teachers may have been
501 subject to less accountability and scrutiny from parents.

502 Upon close examination of the data, however, it does not appear that program
503 teachers received less accountability for their teaching. When regressing total teacher pay
504 (parental contribution plus the ECD attendance bonus) on teacher attendance and
505 treatment, total pay of program teachers seemed to be more sensitive to absences than
506 comparison teachers. This result is driven by the fact that parental contribution for
507 program schools seemed to be much more dependent on teacher attendance than in
508 comparison schools. (Table 20

509 **7 Conclusion**

510 After two years, the program showed no evidence of a large positive impact on
511 teacher attendance, caring behavior, pupil test scores, or pupil attendance. Only a
512 significant increase in a few measures of teacher pedagogy and reduction in time spent
513 using the blackboard were observed. There is some indication that the program had a
514 negative and significant impact on pupil test scores. One possible explanation is the
515 statistically significant crowding out of preschool fees by the program.

516 The attendance incentive program relied on local monitors, who essentially turned
517 the incentive program into a pay raise. Considering the fact that more program pupils

comparison schools.

518 than comparison pupils were attending higher grades at the time the tests were
519 administered and that program schools had higher teacher continuity, it is remarkable that
520 the program has such an apparently strong negative impact.

521 There are several various hypotheses why the program did not have better effects.
522 Perhaps higher salaries retained bad teachers, lowered morale, or attracted less
523 enthusiastic teachers to what had previously been a semi-volunteer occupation. The
524 crowding out of parental contribution may have reduced the accountability and incentive
525 structure that used to exist for the teachers. After the pay raise was implemented, a type
526 of adverse selection may have arisen so that the new preschool teachers were no longer
527 those who cared about kids, but were those who were friends of authority. It is also
528 possible that the new teachers at program schools were less qualified, since school
529 headteachers may have wished to hire friends and family members. There may be some
530 incentive for this since new teachers who came in to replace those that had left were
531 eligible for the bonus at the beginning of the following year.³⁴ We have some anecdotal
532 evidence for this, but there is no statistically significant negative correlation between test
533 scores and either turnover rates or bonus amounts.

534 Alternatively, it may be that teacher training was inappropriate for the
535 environment. First, training focused heavily on materials and displays, which require
536 supplies. While there was some instruction on how to make materials with locally
537 available supplies, making materials may have required large amounts of initiative.
538 Second, the training may have been too complicated for the teachers, many of whom had
539 low education levels.

³⁴ We have one anecdote: After the program was announced, one headteacher fired his previous preschool teacher and hired his wife as replacement. His wife was not given the training and bonus. Other teachers may also have been fired or pressured to separate at a later time. While we do not have direct evidence of

540 Many other countries and the World Bank are considering implementing similar
541 programs focused on early childhood development and education. The results of this
542 program on teacher absenteeism and training, however, indicate that caution is warranted
543 before pursuing similar strategies on a larger scale.

this, we do have complaints from preschool teachers from 20-30 schools about not getting their bonus.
Only after ICS staff spoke with the school headteachers did some of these teachers get their bonus.

544 **References**

545

546 Ehrenberg, Ronald G, et al. "School District Leave Policies, Teacher Absenteeism,
547 and Student Achievement," *Journal of Human Resources*. Vol. 26 (1). p 72-105. Winter
548 1991.

549

550 Government of Kenya. "Kenya Population Census 1989: Analytical Report Volume III:
551 Population Dynamics of Kenya." Office of the President, Nairobi. 1996.

552

553 Jacobson, Stephen L. "The Effects of Pay Incentives on Teacher Absenteeism," *Journal*
554 *of Human Resources*. Vol. 24 (2). p 280-86. Spring 1989.

555

556 Kemmerer, Frances N. and Thiagarajan, Sivasailam. "The Role of Local Communities in
557 Teacher Incentive Systems." in Teachers in developing countries: Improving
558 effectiveness and managing costs. Farrell, Joseph P. Oliveira, Joao B., eds., EDI Seminar
559 Series. Washington, D.C.: World Bank. p 145-56. 1993.

560

561 Myers, R. G. Early Childhood Development Programs in Latin America: Toward
562 Definition of an Investment Strategy, Reoirt Bi, 32, Human Resources Devision, Latin
563 America and the Caribbean Region, 1992b. Washington, D.C.; World Bank.

564

565 The Probe Team. "Public Report On Basic Education in India." Oxford University Press.
566 1999.

Table 1--Available Data

	Mean	Standard Deviation	Number of Observations	% Missing Data in Program	% Missing Data in Comparison
Teachers					
Number of teachers per school at program start	1.32	0.53	97	4.0	2.0
Education ⁴	10.40	1.95	119	1.5	13.1
Experience	5.75	4.74	114	6.0	16.4
Age in year 1 ³	29.73	6.24	55	17.9	100.0
Students					
Number of students: program			2619		
Number of students: comparison			2600		
Gender (1=Male)	0.52	0.50	5030	3.6	3.7
Age in year 1	5.59	1.31	4646	11.9	10.1
Year student began preschool	1996.70	0.52	5219	0.0	0.0
Year 1 Oral test score of 55.5 max	29.05	12.17	1801	37.0 ⁶	37.9 ⁶
Year 1 Written test score of 72 max	29.19	19.26	1801	37.0 ⁶	37.9 ⁶
Year 2 Oral test score of 100 max	69.39	15.68	1465	30.2 ⁶	31.4 ⁶
Year 2 Written test score of 95 max	37.41	24.36	1464	30.2 ⁶	31.4 ⁶
Year 3 Oral test score off 100 max	69.00	16.92	2063	34.1 ⁶	35.4 ⁶
Year 3 Written test score of 95 max	60.64	26.78	2189	34.1 ⁶	35.4 ⁶
Progression to grade 1 or 2 or 3 by start of Year 4	0.49	0.50	5219	0.0	0.0
Schools					
January enrollment year 1	53.80	26.64	97	4.0	2.0
Enrollment year 3 term 2	41.58	26.37	95	0.0	10.0
Sponsored year 0	0.11	0.32	80	8.0	32.0
Fees per pupil or parent per term year 0	85.20	37.13	77	12.0	34.0
Fees per pupil or parent per term year 1	170.47	413.47	87	12.0	14.0
Fees per pupil or parent per term year 2	130.75	55.20	91	6.0	12.0
Total fees collected for preschool year 0 ^{1,5}	1337.73	1205.84	57	25.0	48.9
Total fees collected for preschool year 1 ^{2,5}	1630.52	2125.24	80	8.7	19.1
Total fees collected for preschool year 2 ^{2,5}	2253.86	2520.07	85	6.4	14.6
Portion given to preschool teacher year 0 ^{1,5}	1160.28	892.73	56	27.3	48.9
Portion given to preschool teacher year 1 ^{2,5}	1494.15	1900.71	80	8.7	19.1
Portion given to preschool teacher year 2 ^{2,5}	2080.22	2043.83	84	8.5	14.6
Classroom was observed in year 1			86	10.0	18.0
Classroom was observed in year 2			96	4.0	4.0
Classroom was observed in year 3			97	4.0	2.0
	Year 1 Visit 1	Year 2 Visit 2			
Program Schools Visited	40	19			
Comparison Schools Visited	40	15			
	Year 2 Visit 1	Year 2 Visit 2	Year 2 Visit 3	Year 2 Visit 4	
Program Schools Visited	48	46	46	45	
Comparison Schools Visited	47	44	44	45	
	Year 3 Visit 1	Year 3 Visit 2	Year 3 Visit 3		
Program Schools Visited	49	49	49		
Comparison Schools Visited	47	47	48		

¹These are averages over year 0 terms 1-3.

²Fees in years 1 and 2 are averages over terms 2, 3 of that year and term 1 of the following year respectively.

³Note that ages were only recorded for teachers who took ICS training

⁴Note that under old system, form 1,2,3, and 4 is actually one less year than the equivalent in the new system

⁵ Figures and % Missing is calculated out of only those schools not sponsored by county or municipal councils.

⁶These numbers represent percent attrited.

Table 2--Difference between Program and Comparison Groups before Intervention

	Program (i)	Comparison (ii)	Difference (iii)	Sample Size (iv)
Teachers				
Years of education	10.46 (0.24)	10.32 (0.28)	0.13 (0.37)	119
Prior training: yes/no	0.54 (0.06)	0.47 (0.08)	0.07 ¹ (0.09)	127
Years of teaching experience	5.57 (0.61)	5.98 (0.65)	-0.41 (0.90)	114
Students				
Male	0.52 (0.01)	0.51 (0.01)	0.01 ¹ (0.01)	5030
Age in year 1	5.63 (0.10)	5.64 (0.10)	-0.01 (0.14)	4646
Year student began preschool	1996.65 (0.05)	1996.73 (0.04)	-0.08 (0.06)	5219
Schools⁴				
January enrollment	54.54 (3.69)	53.08 (3.99)	1.46 (5.44)	97
Fees per pupil or parent per term for year 0	85.80 (5.68)	84.39 (6.42)	1.40 (8.61)	77
Whether preschool is sponsored for year 0	0.13 (0.05)	0.09 (0.05)	0.04 ¹ (0.07)	80
Total fees collected from parents for preschool for year 0 ^{2,3}	1183.44 (154.94)	1549.87 (313.38)	-366.42 (322.66)	57
Amount paid to preschool teacher for year 0 ^{2,3}	1135.54 (151.65)	1193.27 (194.92)	-57.73 (243.159)	56
Number of teachers	1.37 (0.08)	1.27 (0.07)	0.10 (0.11)	97

Each row in columns (i) and (ii) represent a random effects regression on a constant unless otherwise indicated. Each row in column (iii) represents a random effects regression on a dummy variable for the program.

¹Represents a dprobit regression with a dummy variable for the program.

²Explained in Table 1.

³Teachers at schools sponsored by council or municipal are not in this sample.

⁴Columns (i), (ii), and (iii) represent ordinary least squares regressions unless otherwise indicated. Standard errors are in parentheses.

* Significant at 10% level.

** Significant at 5% level.

*** Significant at 1% level.

dprobit estimates maximum-likelihood probit models. Rather than reporting coefficients, dprobit reports the change in the probability for an infinitesimal change in each independent, continuous variable and, by default, the discrete change in the probability for dummy variables.

Table 3--Number of Days Absent for Program Teachers

Days Absent per Term according to:	Our Visits ¹	School Records ²	Preschool Teacher	Bonus Amount ³
Mean	15.2	18.4	1.7	2.7
Standard Deviation	25.7	19.9	6.6	4.1
Number of Observations	202	37	253	255

¹Note that teachers are visited only once or twice a term so the standard deviation is very high.

²School records are only available for 1997.

³Days absent according to bonus amount is calculated by imputing the days absent from the teacher's report of the bonus. A bonus of 1000 is treated as 1.5 days absent, 900 as 4 days absent, 800 as 5 days absent, and so on. A bonus of 0 is treated as 20 days absent.

Table 4--Actual Relationship between Bonus and Days Absent

Dependent Variable: Bonus Amount Paid ¹			
Days Absent according to:	Our	School	Preschool
Variable	Visits	Records ²	Teacher
	(i)	(ii)	(iii)
Days Absent	-1.1 (0.6)	1.3 (2.4)	-11.7*** (2.04)
Constant	954*** (17.2)	882*** (64.8)	951*** (14.1)
Sample Size	202	37	253
Adjusted R ²	0.013	-0.021	0.111

¹Represents ordinary least squares regressions of bonus amount paid on days absent.

²School records are only available for 1997.

Standard errors are in parantheses.

* Significant at 10% level.

** Significant at 5% level.

*** Significant at 1% level.

Table 5--Difference in Teacher Outcomes

	Program (i)	Comparison (ii)	Difference (iii)	Sample Size (iv)
Attendance years 1-3 ¹	0.74 (0.03)	0.71 (0.04)	0.03 (0.05)	128
Separated by the end of year 3	0.27 (0.05)	0.25 (0.06)	0.02 ² (0.08)	128

Columns (i) and (ii) represent a random effects regression on a constant.

Column (iii) represents a random effects regression on a dummy variable for the program.

¹Attendance is based on data collected from actual visits.

²Represents a dprobit regression with a dummy variable for the program.

Standard errors are in parantheses.

* Significant at 10% level.

** Significant at 5% level.

*** Significant at 1% level.

Table 6--Impact of Program on Teacher Attendance

Sample Variable	Dependent variable ¹ : Teacher Attendance Year 1-3				
	full (i)	full (ii)	full (iii)	full (iv)	> 11 yrs educ (v)
Program	0.03 (0.05)	-0.05 (0.05)	-0.06 (0.04)	-0.05 (0.04)	-0.14 ^{2**} (0.07)
Education		-0.02 (0.01)		-0.02 (0.01)	
Experience			0.007 (0.005)	0.01 (0.005)	
Sample Size	128	119	114	114	59
R ²	0.00	0.03	0.03	0.05	0.07

¹Represents a random effects regression on a dummy variable for the program.

²Has a T-statistic of 1.62.

Includes school random effects.

Standard errors are in parantheses.

Column (v) represents a sample limited to teachers having 12 years of education.

Separating the data by experience does not show differences in program impact.

* Significant at 10% level.

** Significant at 5% level.

*** Significant at 1% level.

Table 7--Impact of Program on Teacher Separation

Sample Variable	Dependent variable ¹ : Teacher Separating by end of Year 3				
	full (i)	full (ii)	full (iii)	full (iv)	< 4 yrs exp (v)
Program	0.02 (0.08)	0.10 (0.07)	0.10 (0.07)	0.10 (0.07)	0.63* (0.36)
Education		0.06*** (0.02)		0.06*** (0.02)	
Experience			-0.03** (0.01)	-0.02** (0.01)	
Sample Size	128	119	114	114	59

¹Represents a dprobit regression with a dummy variable for the program

Standard errors are in parantheses.

Column (v) represents a sample limited to teachers having less than 4 years of experience.

Separating the data by education does not show differences in program impact.

* Significant at 10% level.

** Significant at 5% level.

*** Significant at 1% level.

Table 8--Characteristics of Teachers who Separate by end of Year 3

Variable	Dependent variable: Teacher Separates		
	(i)	(ii)	(iii)
Age ¹	-0.03*** (0.01) [55]		
Highest Education		0.05*** (0.02) [119]	
Experience			-0.02*** (0.01) [114]

These are random effects regression on a dummy variable for (i) age, (ii) highest education, and (iii) experience.

* Significant at 10% level.

** Significant at 5% level.

*** Significant at 1% level.

Standard errors are in parantheses.

¹Note that age was only available for program teachers.

**Table 9--Difference Between Program and Comparison for Years 1-3
Classroom Observations**

Dependent Variable	Program (i)	Comparison (ii)	Difference ¹ (iii)	Sample Size (iv)
Caring Behavior	1.69 (0.06)	1.84 (0.08)	-0.16 (0.13)	274
Helpfulness towards Students	2.34 (0.09)	2.51 (0.12)	-0.13 (0.13)	275
Energy Level	1.95 (0.08)	2.20 (0.09)	-0.20 (0.13)	276
Pupil Participation	1.74 (0.08)	1.81 (0.08)	-0.09 (0.13)	273
Classroom Control	1.41 (0.05)	1.55 (0.06)	-0.25 (0.14)	275
Preparation and Organization	1.60 (0.06)	1.76 (0.07)	-0.25 (0.14)	274

Columns (i) and (ii) represent a random effects regression on a constant.
 Column (iii) represents an ordered probit regression with a dummy variable for the program.
 Standard errors are in parantheses.

The questions asked were:

- 1 How caring does the teacher behave towards the pupils, during this lesson?
- 2 How helpful is the teacher when individual pupils need assistance?
- 3 How would you describe the teacher's energy level?
- 4 How would you describe the pupils' participation?
- 5 Did the teacher(s) have control over the class?
- 6 Did the teacher seem prepared and organized?

For the first four questions, 1 is the best rating, 5 is the worst.

For the last two, 1 means yes, 3 means no.

¹Note that a positive coefficient implies negative actual impact.

* Significant at 10% level.

** Significant at 5% level.

*** Significant at 1% level.

Table 10--Impact of Program on Year 1 Classroom Activities

Variable	Dependent Variable: Minutes Spent by:						
	Teachers on				Pupils on		
	Board (i)	Charts	Pictures	Objects	Objects	Paper/Books	Board
Program	-3.53** (1.65)	-0.09 (1.45)	-0.47 (0.83)	0.34 (1.56)	1.92 (1.64)	-1.60 (1.87)	-0.99 (0.89)
Sample Size	86	86	86	86	86	86	86
Adjusted R ²	-0.04	-0.02	-0.01	-0.01	0.004	-0.003	-0.003

Standard errors are in parantheses.

* Significant at 10% level.

** Significant at 5% level.

*** Significant at 1% level.

	Program (n=45)		Comparison (n=41)	
	Mean	Standard Deviation	Mean	Standard Deviation
Teacher				
Board	1.4	3.9	4.9	10.3
Charts	3.1	7.0	3.2	6.3
Pictures	0.6	3.0	1.0	4.6
Objects	3.0	6.2	2.7	8.1
Pupils				
Objects	4.3	8.6	2.4	6.4
Paper/Books	3.2	8.3	4.8	9.1
Board	0.7	2.4	1.7	5.4
Total minutes:	16.3		20.7	

Table 11--Difference between Program and Comparison Students in Attendance

	Program (i)	Comparison (ii)	Difference (iii)	Sample Size (iv)
Participation over 3 years	0.56 (0.02)	0.56 (0.02)	0.002 ¹ (0.03)	4761

Columns (i) and (ii) represent a random effects regression on a constant.

Column (iii) represents a probit regression with school random effects and a dummy variable for the program.

¹Represents a random effects regression on a dummy variable for the program.

Standard errors are in parantheses.

* Significant at 10% level.

** Significant at 5% level.

*** Significant at 1% level.

Table 12--Impact of Program on Year 1 Student Test Scores

Variable	Oral		Written	
	(i)	(ii)	(iii)	(iv)
Program	-0.068 (0.097)	-0.117 (0.093)	-0.074 (0.116)	-0.112 (0.111)
Male		-0.025 (0.041)		-0.150*** (0.038)
Age in year 1		0.248*** (0.020)		0.213*** (0.019)
Experience		0.147*** (0.043)		0.104*** (0.041)
Class size in Jan year 1		0.002 (0.002)		0.003 (0.002)
1996 School Mean Score		0.033*** (0.011)		0.034*** (0.013)
Sample Size	1801	1695	1801	1695
R ²	0.0008	0.121	0.001	0.090

Test scores were normalized to make the mean of comparison test scores zero and standard deviation equal to one.

Sample limited to students enrolled in January and sampled to take the test, regardless of present grade.

Includes school random effects.

Test attrition is 37% for program students and 38% for comparison students.

* Significant at 10% level.

** Significant at 5% level.

*** Significant at 1% level.

Standard errors are in parantheses.

Table 13--Impact of Program on Year 2 Student Test Scores

Variable	Oral		Written	
	(i)	(ii)	(iii)	(iv)
Program	-0.131 (0.103)	-0.169 (0.106)	-0.170* (0.102)	-0.186* (0.104)
Male		0.050 (0.050)		-0.052 (0.050)
Age in year 1		0.262*** (0.030)		0.235*** (0.030)
Experience		0.214*** (0.058)		0.150*** (0.058)
Class size in Jan year 1		0.001 (0.002)		0.000 (0.002)
1996 School Mean Score		0.026** (0.012)		0.020* (0.012)
Sample Size	1465	1258	1464	1257
R ²	0.004	0.082	0.008	0.052

Test scores were normalized to make the mean of comparison test scores zero and standard deviation equal to one.

Sample limited to students enrolled in January and sampled to take the test, regardless of present grade.

Includes school random effects.

Test attrition is 30% for program students and 31% for comparison students.

* Significant at 10% level.

** Significant at 5% level.

*** Significant at 1% level.

Standard errors are in parantheses.

Table 14--Impact of Program on Year 3 Student Test Scores

Variable	Oral		Written	
	(i)	(ii)	(iii)	(iv)
Program	-0.139 (0.010)	-0.156* (0.097)	-0.062 (0.088)	-0.076 (0.087)
Male		0.016 (0.042)		-0.140*** (0.042)
Age in year 1		0.192*** (0.019)		0.221*** (0.019)
Experience		0.137*** (0.046)		0.077* (0.046)
Class size in Jan year 1		-0.002 (0.002)		-0.002 (0.002)
1996 School Mean Score		0.024** (0.011)		0.034*** (0.010)
Sample Size	2063	1857	2189	1939
R ²	0.004	0.083	0.000	0.087

Test scores were normalized to make the mean of comparison test scores zero and standard deviation equal to one.

Sample limited to students enrolled in January and sampled to take the test, regardless of present grade.

Includes school random effects.

Test attrition is 34% for program students and 35% for comparison students.

* Significant at 10% level.

** Significant at 5% level.

*** Significant at 1% level.

Standard errors are in parantheses.

**Table 15--Enrollment, Growth in Enrollment,
and Change in Class Size**

	Program (i)	Comparison (ii)	Difference (iii)	Sample Size (iv)
	Mean	Mean	Mean	
Original Class Size	54.5 (3.7)	53.1 (4.0)	1.5 (5.4)	97
Number of Students Present year 3 term 2	39.8 (3.3)	43.6 (4.4)	-3.8 (5.4)	95
% Change in Enrollment Jan year 1 to year 3 term 2	-13.3% (9.0%)	-9.6% (8.8%)	-3.7% (12.6%)	93
Original Pupil-Teacher Ratio	43.0 (3.0)	43.2 (2.2)	-0.2 (3.7)	95
Pupil-Teacher Ratio year 3 term 2	27.8 (3.0)	32.2 (2.9)	-4.4 (4.3)	76
% Change in Pupil-Teacher Ratio, Jan year 1 to year 3 T2	-21.0%** (10.1%)	-17.8%** (8.7%)	-3.3% (13.7%)	73

Columns (i) and (ii) represent an ordinary least squares regression on a constant.

Column (iii) represents an ordinary least squares regression on a dummy variable for the program.

Standard errors are in parentheses.

* Significant at 10% level.

** Significant at 5% level.

*** Significant at 1% level.

Table 16--Difference between Program and Comparison Students in Test Attrition and Grade Progression

	Program (i)	Comparison (ii)	Difference (iii)	Sample Size (iv)
Year 1 Test attrition ¹	0.37 (0.02)	0.38 (0.02)	-0.03 (0.09)	2894
Year 2 Test attrition ¹	0.30 (0.02)	0.31 (0.02)	-0.04 (0.09)	2116
Year 3 Test attrition ¹	0.34 (0.02)	0.35 (0.02)	-0.04 (0.08)	3401
Progression to Grade 1, 2, or 3 ² By start of year 4	0.52 (0.02)	0.47 (0.03)	0.12 ³ (0.11)	5219

Columns (i) and (ii) represent a random effects regression on a constant.

Column (iii) represents a probit regression with school random effects and a dummy variable for the program.

¹Students are defined as attriting if they were supposed to take the tests but did not take either one.

²Considered progressed if in first visit of Year 4, pupil is in standard 1, 2, or 3.

³Represents a dprobit regression with a dummy variable for the program.

Standard errors are in parantheses.

* Significant at 10% level.

** Significant at 5% level.

*** Significant at 1% level.

Table 17--Factors Affecting Teacher Pay

Variable	Dependent Variable: Teacher Salary Before Program began, per term ¹				
	(i)	(ii)	(iii)	(iv)	(v)
Age ³	-4.9 (18.03)				6.11 (22.42)
Education		-13.10 (52.25)			65.67 (58.51)
Experience ⁴			-0.68 (21.86)		-22.92 (26.52)
Prior Training				-173.192 (221.08)	-207.23 (242.75)
Constant	1149.81** (538.81)	1364.26** (543.20)	1261.15*** (170.14)	1282.28*** (126.15)	379.45 (920.12)
Sample Size	43	85	82	86	42
Adjusted R ²	-0.023	-0.011	-0.013	-0.005	-0.050

Variable	Dependent Variable: Teacher Salary After Program began, per term ²				
	(i)	(ii)	(iii)	(iv)	(v)
Age ³	-12.73 (23.23)				-24.37 (27.94)
Education		99.11 (115.59)			21.90 (78.94)
Experience ⁴			-19.15 (48.87)		27.60 (35.86)
Prior Training				-107.56 (498.87)	-43.23 (333.84)
Constant	1800.63** (705.44)	1046.92 (1220.76)	2209.21*** (364.61)	2068.81*** (253.18)	1789.64 (1203.71)
Sample Size	55	116	113	124	54
Adjusted R ²	-0.013	-0.002	-0.008	-0.008	-0.055

¹These are averages over Year 0 terms 1-3.

²These are averages over Year 1 terms 2, 3 and Year 2 term 1.

³Age is only collected for program teachers.

⁴Experience is defined as the number of years a teacher has taught at that school.

Standard errors are in parentheses.

* Significant at 10% level.

** Significant at 5% level.

*** Significant at 1% level.

Table 18--Impact of Program on PreSchool Finances in Years 1 and 2¹

	Program (i)	Comparison (ii)	Difference (iii)	Sample Size (iv)
Total fees collected from parents for preschool per term for year 1 (Ksh)	1329 (173)	1963 (460)	-634 (473)	80
Preschool teacher salary per term for year 1 (Ksh)	1206 (156)	1812 (410)	-606 (423)	80
Total fees collected from parents for preschool per term for year 2 (Ksh)	1800 (208)	2741 (514)	-941* (541)	85
Preschool teacher salary per term for year 2 (Ksh)	1646 (193)	2535 (400)	-889** (438)	84

¹Schools sponsored by county or municipal council are not in this sample.

Columns (i) and (ii) represent an ordinary least squares regression on a constant.

Column (iii) represents an ordinary least squares regression on a dummy variable for the program.

Standard errors are in parentheses.

* Significant at 10% level.

** Significant at 5% level.

*** Significant at 1% level.

Table 19 -- Impact of Program on Teacher Pay in Years 1 and 2¹

	Year 1				Year 2			
	Program (i)	Comparison (ii)	Difference (iii)	Sample Size (iv)	Program (v)	Comparison (vi)	Difference (vii)	Sample Size (viii)
Preschool teacher salary per term (Ksh) ²	1132 (117)	1606 (187)	-474** (213)	99	1673 (169)	2442 (263)	-769** (303)	109
Preschool teacher average bonus per term (Ksh) ²	926 (19)			61	921 (26)			46
Preschool teacher total take home pay per term (Ksh) ²	2003 (117)	1606 (187)	397* (216)	95	2506 (189)	2442 (264)	64 (338)	89
s	57%				93%			

¹Schools sponsored by county or municipal council are not counted in this sample for computing salary per term, but are counted in computing average bonus per term since sponsorship should have no effect upon how bonuses are given.

²Average by teacher, instead, of by school.

Columns (i) and (ii) represent an ordinary least squares regression on a constant.

Column (iii) represents an ordinary least squares regression on a dummy variable for the program.

Standard errors are in parentheses.

* Significant at 10% level.

** Significant at 5% level.

*** Significant at 1% level.

Table 20 -- Effect of Teacher Attendance on Total Teacher Pay

	(i)	Program (ii)	Comparison (iii)
Program	530.49* (300.13)		
Days Absent	-0.01 (7.40)	-17.84** (8.07)	-0.01 (8.73)
Program * Days Absent	-17.83 (12.68)		
Constant	1869.35*** (205.83)	2399.84*** (171.10)	1869.35*** (243.02)
Sample Size	107	54	53
R ²	0.02	0.09	0.00

(i) Dependent variable is total teacher pay which is parental contribution plus bonus for program teachers and just parental contribution for comparison teachers.

(ii) Dependent variable is parental contribution.

(iii) Dependent variable is parental contribution.

* Significant at 10% level.

** Significant at 5% level.

*** Significant at 1% level.