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WHO GOES TO SECONDARY SCHOOL?
EFFICIENCY, EQUITY AND RELEVANCE
IN SECONDARY SCHOOL SELECTION

By

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ABSTRACT

Because the secondary school selection examination is so crucial to the students' life chances, what is taught in Kenya's primary schools is determined as much by the examination questions as by the formal curriculum. This paper investigates the examination's backwash effects as well as its efficiency in identifying pupils who will make the best use of secondary school opportunities.

At present the examination is mainly a selection instrument geared to identifying secondary school entrants. It largely ignores the interests of pupils for whom primary education is terminal. A high proportion of the items test academic, specialised knowledge and skills which are of little use to primary school leavers, most of whom must create economic opportunities for themselves, in agriculture or self-employment.

But, paradoxically, this reduces rather than improves the efficiency of the examination as a selection instrument. Item analyses of the 1970 and 1971 mathematics papers demonstrated that items which test practical, everyday mathematical skills are more efficient as selectors than items which test secondary-level skills. The main reason for this is that many teachers in low-cost schools (which make up 99% of all primary schools in Kenya) do not themselves have an adequate grasp of the more academic topics. The examination thus becomes as much a test of the teachers as of the pupils. For this reason, the examination is more efficient as a selection tool in high-cost, urban schools than in low-cost, mainly rural, schools.

The intelligent pupil from a low-cost school is at a double disadvantage in competition with a similar pupil from a high-cost school. Because he has been less well educated, his total mark is likely to be lower, by at least one standard deviation. In addition, his chances of being identified as a pupil of high potential are much reduced because of the lower efficiency of the examination in low-cost schools. Some ways in which both the efficiency and the relevance of the examination might be improved are suggested.

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Last week I spent quite some time trying to console my friend Joe over a misfortune that has befallen him. Joe's misfortune is that he has a son who did his C.P.E. last year, passed but was not accepted into any high school.....

"The trouble with you, Joe, is that you think too much", I said to Joe..... "You are a simple man. Thinking is for more intelligent people. The Ministry says that your son did not pass well enough to go into Form I. Who are you to say otherwise?

"Who am I?. I am Joe".

"I know you are Joe. But who are you? I mean what do you know about things? It takes a lot of training and education to weigh one child's results against those of another and come to the right decision about who shall go into Form I and who shouldn't. Its not just a matter of looking up the performance list and finding out who came first and who came last. There are certain imponderables.....

"Certain what? Joe screamed at me.

"Imponderables" I said

"What have imponderables to do with whether my child goes into Form I or not?

"Everything Joe. Everything".

Hilary Ng'weno. Daily Nation, February 27th, 1972.

INTRODUCTION

Most parents in Kenya share Joe's problem at some time or another. The Certificate of Primary Education (CPE) determines the whole destiny of a child. If he passes well and enters a Government Secondary School he has a good chance of ultimately entering a job where his income may reach ten, twenty or even one hundred times the national per-capita average. But if he fails, his lifetime earnings may not amount to much more that those of someone with no formal education. It is hardly surprising that the examination produces so much anxiety and tension, and the selection process which follows it so much controversy and bitterness.

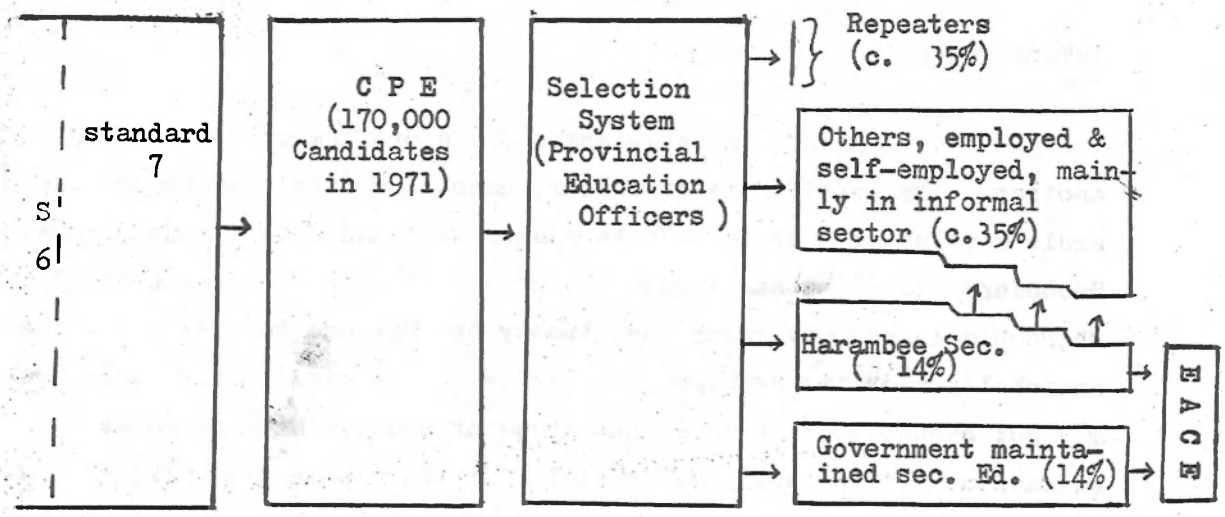
Pupils sit the examination at the end of their primary education nominally after seven years at school. The examination is made

up of three papers, English, Mathematics, and a General paper, each marked out of 100. The General paper consists of five sections, History, Geography, Science, Nature Study, and General Knowledge. In 1971 the English paper contained 20 verbal reasoning items of a type commonly used in intelligence tests. Previously the examination consisted entirely of items designed to measure success in learning.

For each question four alternative answers are provided. The candidate indicates his choice by marking the appropriate box on his answer sheet. It is thus possible for candidates to gain about 25% on each paper entirely by guessing.

The arrangements for processing the results are highly efficient. Within three weeks the 500,000 answer sheets (three from each of 170,000 candidates) have been passed through a document reader linked to a computer, and results lists for each school prepared. These are then sent to the Provincial Education Officer, together with lists sorted by the candidates' secondary school of first preference and, within each secondary school, by order of merit.

The flows of primary school leavers through the examination and selection system can be represented very roughly in the following way:



At present, about 14% of candidates are offered places in Government maintained secondary schools. Most of these continue their formal education for four years and then sit the East African Certificate of Education Examination. Another 14% enter unaided Harambee schools, but drop-out from among this group is very heavy: perhaps as high as 75% over the full four years. A handful of these manage to get places in Government secondary schools after sitting the Kenya Junior Secondary Examination at the end of Form II and a few more enter teacher training colleges.

It is extremely difficult to get reliable estimates of the CPE repeating rate. Many primary school pupils are understandably reluctant to discuss their repeating history, because they fear they may be penalised in the competition for secondary school places. But another part of the problem is that the repeating rate can be defined in at least three different ways, each of which gives a different estimate:

1. The proportion of pupils sitting CPE in any one year who are repeaters. This is the most commonly quoted figure.

2. The proportion of pupils in any one CPE cohort who repeat the examination at the same school or elsewhere in the following year. This figure will, of course, differ somewhat from (1) because of changes from year to year, but much more important, it will differ among geographical areas according to whether the area is a net "importer" or a net "exporter" of repeaters. If pupils tend to move away from the area to repeat elsewhere, then rate (2) will be higher than rate (1); but if they tend to move into the area, then rate (2) will be lower.

3. The proportion of pupils in a cohort moving through the primary school system who sit the examination a second time. Expressed differently, this rate is a measure of the chances that any given primary school pupil will repeat CPE before leaving. This measure of the repeating rate is a good deal higher than the other two.

Later in this paper data from one location in Nyeri district will be presented from which the three repeating rates can be calculated. They

are 31%, 45%, and 61% respectively.[1] A great deal of the controversy as to the seriousness of the repeater problem arises because of confusion between these three quite different methods of estimation.

For our diagram, repeater rate 2 is most appropriate. But as a national estimate our figure of 45% is probably too high, because the sample area is a net exporter of repeaters. For the same reason repeater rate 1 (31%) is probably too low. Our best guess is that for the country as a whole, about 35-40% of CPE candidates repeat the examination in the following year.

It is equally difficult to get information as to what happens to primary school leavers who neither continue their formal education into secondary school nor repeat standard 7. Such information as is available, however, suggests that most settle down quite quickly to some form of useful activity. But because these activities are mainly within the informal sector the leavers may continue to regard themselves as unemployed.

So much, then, for the flows. What of the effectiveness of the examination and the associated selection system? It may be useful to consider this from two points of view:

(A). What are the output effects of the examination/selection system? In other words what intellectual characteristics does it identify in the pupils passing through it, and how efficiently does it allocate pupils to appropriate outcome categories?

(B). What are the backwash effects of the system on the primary schools? In other words, what effects does the examination/selection system have on the way the primary schools function? Does the system engender, as well as identify intellectual characteristics?

For the purpose of analysis, we can divide these two principal questions into a number of subsidiary questions, although as we shall see, the distinctions are by no means hard and fast.

(A). The system and primary school leavers (output effects)

1. Efficiency as a selection device. Does the examination identify those pupils who will make best use of further formal education? How successful is it in predicting future attainment?

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1. For a more detailed explanation of the repeating rates see P. 21 ff.

2. Reliability. Does the examination measure efficiently those skills which it sets out to measure?

3. Appropriateness as a terminal examination. Does the examination test skills and knowledge which will be useful and relevant for those who will not continue with formal education? Does it provide them with a capacity for continued informal learning and for effective work within the informal sector?

4. Equity effects. Is the examination fair? Does it identify with any success pupils of high but underdeveloped potential, resulting from poor teaching or socio-economic handicaps?

B. The system and the primary schools (backwash effects)

1. Teaching methods effects. What effect does the content and structure of the examination have on teaching methods?

2. Repeater effects. Does the nature of the examination influence the repeating rate?

3. Morale effects. What effects do the examination and selection system have on the morale of teachers and pupils, and hence on the efficiency of the primary school system?

It is striking how fragmentary the available information is. We know a great deal about the structure of the educational plant that has been built up in Kenya, but virtually nothing about the nature or value of the product. An industrial organization run on similar lines would long ago have been submerged by more efficient competition. In the following pages we shall deal with several of the above points.

THE EFFICIENCY OF THE EXAMINATION AS A SELECTION DEVICE.

So far no study has been completed in Kenya in which a cohort of secondary school entrants has been followed through to the end of their secondary education and their performance in CPE and EACE ("O" Level) compared. An investigation in Uganda yielded correlations of 0.374 and 0.428 for boys and girls respectively.[2] The selection examination and

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2. H.C.A. Somerset Predicting Success in School Certificate (Nairobi: East African Publishing House, 1968).

the O level examination thus had well under 20% common variance. Moreover the regression of O level performance on selection examination performance was curvilinear for both sexes; most of the common variance was accounted for by a small group of highly talented pupils who performed well in both examinations. Among average and borderline entrants, the selection examination had virtually no predictive validity. A high proportion of the most successful O level candidates had been lucky to get into secondary school at all on their selection examination marks and there seemed no reason to suppose that borderline candidates who had been excluded would have been any less successful.

Preliminary and unpublished results obtained by G.K. Annand from a study carried out in the Rift Valley of Kenya indicate that the correlation between the 1966 Certificate of Primary Education and the 1970 East African Certificate of Education was as low as 0.335. Furthermore the regression was curvilinear in much the same way as it was in Uganda. These results suggest a serious loss of high-level talent.[3]

A great deal could be done in various ways to improve the selection efficiency of the Certificate of Primary Education, and this will be discussed later. But there is a limit beyond which this approach cannot be pushed. Human beings have an enormous and often unrecognised capacity for intellectual change and development; so any prediction based on performance at one point of time is bound to be subject to a wide margin of error. What is needed is a change so that the examination is no longer the sole arbiter of a child's educational destiny. There are a number of ways in which this might be achieved, some involving more radical changes than others. The method which could be most easily and quickly implemented would be to use the Kenya Junior Secondary Examination (KJSE) as a subsidiary selection tool. The KJSE, set at the end of Form II, is mainly an examination for Harambee school pupils. It was originally conceived of as a leaving certificate for pupils with a partial secondary education which would be useful for seeking employment in jobs which do not require a full secondary education. With the recent substantial rise in the numbers of EACE holders, however, very few employers or training institutions now recruit pupils who have passed only the KJSE. The result is that many Harambee schools attempt to offer a full EACE course, although few have the teachers or equipment to do so.

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3. I am most grateful to Mr. Annand for permission to quote these results of his study.

In theory it has always been possible for a Harambee school KJSE leaver with superior results to obtain a place in a Government Form III class. In practice, however, this seems to happen rarely. If each year new places were made available at the Form III level in maintained schools sufficient to absorb, perhaps 10%, of KJSE graduates from Harambee schools, there would be at least three major benefits:

1. Selection efficiency would be greatly improved. The KJSE covers a wider range of subjects than CPE, and pupils have had two years more education, so that their attainment is likely to be a more accurate indication of their ultimate level.

2. The repeater problem at the top end of the primary school would be eased considerably. Harambee school education would be a much more attractive alternative to repeating than it is at present.

3. Harambee schools would acquire a real and distinctive role within the educational system, and one which they would be capable of filling. They would become two year "second chance" junior secondary schools, rather than pale imitations of government secondary schools, as they are at present. There would be for the first time a real return to the huge inputs of capital and organizational skill which have gone into their construction.

Over time, the KJSE intake into Form III could be progressively increased and the CPE intake into Form I reduced. Ultimately, when resources were available, it might be possible to abolish CPE altogether, convert Harambee schools into low-cost maintained junior secondary schools, and offer every pupil a nine-year basic education in his home area.[4]

THE RELIABILITY AND FAIRNESS OF THE EXAMINATION.

In this section we shall discuss results from an item analysis of the 1970 mathematics paper. The basic purpose of an item analysis is to find out whether each item in a test or examination discriminates between pupils in the way it should do. Most tests are designed to measure some relatively homogeneous intellectual characteristic; mathematical ability, for instance, or English comprehension. In a well-designed test, all or most of the items will discriminate among the pupils efficiently: the more able pupils will answer the item correctly, the less able incorrectly. But in a badly designed test, many of the items discriminate inefficiently, or not at all.

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4. But extension of the period of basic education is, in my view, very much a second priority, which should be pursued only when universal enrolment in the present seven-year course has been achieved.

Sometimes an external criterion for the skill being measured is available, but more often the total score on the test itself is used as the criterion. Obviously this latter approach will not work if a high proportion of the items in the test are inefficient, or if the intellectual skills being assessed are heterogeneous. If there are too many inefficient items, the analysis can be repeated several times, progressively eliminating the weakest items until the total score reaches an acceptable level of validity.

Here are examples of good and bad items from the 1970 mathematics paper. The data for the first three examples come from a random sample of 332 boys in 12 low-cost rural schools in Nyeri District.

Example 1 (a good, easy item):

My sister is half my age and I am one-third of my father's age. My father is 48 years old. How old is my sister?

Answers:	A: $5\frac{1}{3}$ years	B: 8 years	C: 12 years	D: 16 years.
Number of candidates giving each answer	19	257	32	24
Average marks of these candidates in whole mathematics paper	23.8	40.3	27.1	23.7

Two hundred and fifty-seven pupils (77%) gave the correct answer (B). In the whole mathematics paper, these pupils averaged 40.3 marks, which is 13 marks higher than the total marks gained by pupils giving any other answer. For a valid comparison, however, we should deduct the marks gained from the item being considered. In the mathematics paper, candidates were credited with two marks for each correct answer, because there were only 50 items in the paper, as compared with 100 in the English and general papers. The pupils who answered correctly thus averaged 38.3 marks on the other 49 items, which is still 11 marks higher (nearly one standard deviation) than the marks gained by pupils giving any incorrect answer. Hence, if we accept the total test mark as a usable criterion of mathematical ability, this item was highly efficient, because it discriminated sharply between more-able and less-able pupils.

Example 2 (a good, difficult item).

What number increased by 25% becomes 60?

Answers:	A . 35	B : 75	C : 48	D : 15
Number of candidates giving each answer	71	59	89	107
Average marks of these candidates in whole mathematics paper	29.4	33.8	49.6	32.7

This item was much more difficult: only 89 pupils, or 27%, answered correctly which is not significantly better than chance. But the distractors (incorrect answers) were well chosen and must have appeared more plausible to pupils who were guessing than the correct answer. The item thus identified a small but highly able group of pupils.

Example 3 (a bad, difficult item):

Simplify $\dfrac{10c^3 + 5c^2}{15c^5}$

Answers:	A : $\frac{2c+1}{3c^3}$	B : $\frac{10c}{3}$	C : $\frac{2c^3+c^2}{3c^5}$	D : 1
Number of candidates giving each answer	66	62	78	122
Average marks of these candidates in whole mathematics paper	40.1	28.8	34.8	40.7

Only 66 pupils (20%) gave the correct answer (A) and on the other 49 items these pupils were less able than those giving answer D, averaging 38.1 as compared with 40.7 for those giving answer D.

What seems to have happened is that in many schools in our Nyeri sample pupils had not been taught how to simplify this type of algebraical expression. The more intelligent pupils from these schools used their natural ability and tried to work out the answer from first principles. Most of those pupils chose D, which is the logical

answer if one does not know that different powers of a term cannot be added. Thus the chances of these pupils getting the item right were zero, whereas duller pupils who simply guessed had a 25% chance.

We can test this interpretation by looking at the way boys in high-cost Nairobi schools answered the same item:

Answer:	A	B	C	D
Number of candidates giving each answer	24	30	53	62
Average marks of these candidates in whole mathematics paper	67.2	50.5	57.7	55.0

Teachers in high-cost schools have had more training and experience, and are generally of much higher calibre than teachers in low-cost schools. They had almost certainly taught their pupils how to handle this kind of problem. Notice that even in high-cost schools the item was a very difficult one, but the ablest pupils had mastered the tools needed to tackle it and so answered correctly. Thus the item was an efficient selector.

What of the possibility that the differences in item efficiency are due to rural - urban differences rather than to teacher quality? We can check this by looking at the patterns found among boys in low-cost Nairobi schools:

Answer:	A	B	C	D
Number of candidates giving each answer	55	70	75	106
Average marks of these candidates in whole mathematics paper	39.4	35.1	35.7	39.5

The patterns are virtually identical with those found in Nyeri.

Example 4: Through what angle does the hour hand of a clock move from 9.a.m. to 9.45 a.m.?

Answers:	A : $7\frac{1}{2}^{\circ}$	B : $22\frac{1}{2}^{\circ}$	C : 45°	D : 270°
Nairobi high-cost boys:				
Number of candidates giving each answer	13	41	17	99
Average marks of these candidates in whole mathematics paper	54.5	71.7	41.8	53.5
Nairobi low-cost boys:				
Number of candidates giving each answer	32	24	109	141
Average marks of these candidates in whole mathematics paper	36.6	39.0	30.7	43.0

Our next example illustrates the same difference in item efficiency between high-cost and low-cost schools, but in this case the handicap to low-cost pupils probably derives mainly from their lack of familiarity with the products of industrialised societies and with everyday English. Most pupils in high-cost schools almost certainly knew which hand on a clock is the hour hand; a high proportion of them were probably wearing a watch while they were sitting the examination. Even so, more than half of them did not think through the problem carefully enough, and gave answer D, which is, of course, the angle covered by the minute hand. But the most intelligent pupils saw through this trap, and worked out the answer correctly. The item was thus a highly efficient, although very difficult one.

For pupils in low-cost schools, however, the problem was much more confusing. Which hand of the clock is the hour hand - the one which travels around the clock once every hour, or the one which moves from one number to the next? It would be interesting to find out how many of their teachers could have told them. For an intelligent pupil who does not know, answer D is the most rational choice; he at least demonstrates that he knows how to measure an obtuse angle. Thus the pupils who chose answer D scored five marks higher on the other 49 items than those choosing any other answer, including the correct one.

Example 5: In the bill below, the shopkeeper forgot to enter the price of the rice:

	Shs.	cts.
5 kg. sugar	7	50
3 kg. rice		
4 cakes Lux soap	4	00
	16	90

What was the price of one kilogram of rice?

Answers: A: 1/50 B: 1/00 C: 5/40 D: 1/80

Nairobi low-cost boys:				
Number of candidates giving each answer	25	16	169	97
Average marks of these candidates in whole mathematics paper	33.1	30.6	33.1	47.7
Rural low-cost boys:				
Number of candidates giving each answer	20	9	172	130
Averange marks of these candidates in whole mathematics paper	30.5	21.8	34.1	42.5

Our discussion of examples 3 and 4 may have left the impression that any distractor which traps pupils who succeed in working half-way through the solution will inevitably reduce the efficiency of the item. Example 5 demonstrates that this is not necessarily so. On the face of it, listing three kilos of rice in the shopkeeping bill and then asking for the price of one kilo in the question seems unfair. Certainly a high proportion of pupils did not spot the change of unit; in both low-cost samples more than half gave answer C(5/40) which is the price of three kilos. But in sharp distinction to examples 3 and 4, the pupils falling into this trap were below-average in ability, while those who reached the correct answer were much above-average. The use of the distractor C thus increased the difficulty of the item without reducing its efficiency.

The difference lies, of course, in the nature of the trap. In examples 3 and 4 the knowledge required to avoid the trap was inaccessible even to the most intelligent low-cost pupils, whereas in example 5 all that was needed was a careful reading of the question. The more able pupils were more careful.

This leads us to an important point. There is nothing intrinsically wrong with examples 3 and 4 as examination questions. Used as part of an examination for second-year secondary pupils, they probably would have worked well. After two years' further formal education it would be appropriate to expect pupils to know how to add powers of a quantity, and to have a sufficient grasp of idiomatic English to be able to identify correctly the hour hand of a clock. Examples 3 and 4 were bad items because they made unrealistic assumptions as to the level which pupils can,and should, reach within a seven-year basic course.

It is perhaps worth mentioning that example 5 worked rather better in urban than in rural low-cost schools. In the urban sample, pupils answering correctly averaged more than 12 marks higher on the other 49 items than those falling into the trap, whereas in the rural sample the difference was only 6 marks. This may have been because urban pupils were provided with an extra cue. Rice is becoming quite a common item of diet in Nairobi, whereas it is eaten hardly at all in the rural areas. A price of 5/40 per kilo for rice was unrealistically high, in 1971 at least, so a Nairobi pupil had a better chance of spotting the trap. The item would have been fairer to rural pupils if it had involved the price of sugar or maize-meal.

These results suggest an important clue as to a possible reason for the inefficiency of the examination as a predictor of secondary school success, already discussed in the previous section. If many of

the items penalize intelligent children in the same way as examples 3 and 4, then it is highly unlikely that the examination as a whole will be an effective selection tool.[5]

The table which follows compares the efficiency of the 50 items of the mathematics paper among the pupils of six sub-samples. Efficiency is measured in terms of a rather crude Discrimination Index:

$$D = \frac{M_R - M_W}{SD}$$

where M_R is the mean total score of pupils answering the item correctly M_W is the mean total score of those answering incorrectly and SD is the standard deviation of the total score for the sub-sample.

Arbitrarily, the items have been classified into three efficiency categories according to their D indices:

Good	D	=	1 or > 1
Fair	D	<	1 but not < 0.5
Poor	D	<	0.5 or negative.

Table I: CERTIFICATE OF PRIMARY EDUCATION: MEAN MARKS AND EFFICIENCY OF ITEMS IN 1970 MATHEMATICS PAPER

SAMPLE	N	MEAN	STANDARD DEVIATION	ITEM EFFICIENCY		
				Good	Fair	Poor
Nairobi High Cost: Boys	170	56.77	15.1	16	29	5
: Girls	171	53.31	14.7	13	29	8
Nairobi Low Cost: Boys	307	37.57	13.0	4	32	14
: Girls	154	30.64	10.2	0	23	27
Nyeri Low Cost : Boys	332	36.91	14.7	11	24	15
: Girls	241	33.19	13.6	4	34	12

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5. The "internal" efficiency of an item, as measured by item analysis, and its "external" efficiency, as measured by its power to predict future achievement, are not necessarily the same thing, of course. An item may well measure the same skills as the other items on a test, but if these skills are not relevant for secondary school success, then that item, like the test itself, will be a poor predictor. It would be most unusual, however, for an item with low internal efficiency to have high predictive efficiency.

Several trends are strikingly apparent from this table. In the first place, pupils in high-cost schools perform much better than pupils in low-cost schools. The mean difference is well over one standard deviation. Differences of this order are to be expected from the greatly superior quality of education high-cost schools provide, although no doubt socio-economic factors also play some part.[6] Secondly boys perform rather better than girls in all three samples. Thirdly there are huge differences in the efficiency of the items. In Nairobi high-cost schools, about 30% of the items discriminated well between more-able and less-able pupils, and only about 15% discriminated poorly. In Nyeri low-cost schools only about half as many items were good discriminators, while the number of poor discriminators was roughly double. In Nairobi low-cost schools there were virtually no good discriminators at all. There is also a clear tendency for the items to be more efficient with boys than with girls.

Item difficulty and item efficiency are necessarily correlated to some extent. It is much easier to construct good easy items than good difficult items. As the difficulty level rise, the part played by random guessing increases, unless the writer of the test is highly skilled at devising good distractors. But even with item difficulty controlled the efficiency differences are still substantial: the items work better in high-cost schools than in low-cost schools, better in Nyeri than in Nairobi low-cost schools, and better among boys than among girls.

What are the reasons for these differences in item efficiency? We can gain insight into this problem by looking at which kinds of items work best in our various sub-samples. In the high-cost samples there was no discernable pattern. Among boys the five inefficient items consisted of two extremely difficult questions (e.g. "How many factors does 48 have?"), two questions which were somewhat ambiguous (e.g. "Write 8.25 as a percentage."), and one question which had two correct answers. In the low-cost samples, by contrast, there were definite and

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6. We have no follow-up data for this sample and so do not know how much advantage high-cost pupils had in securing secondary school places because of their better performance. In 1972, however, the Nairobi City Education Office issued statistics from which the trends among 1971 leavers can be calculated. About 19% of pupils from Nairobi low-cost schools gained maintained secondary places, as compared with 53% of those from medium-cost schools, and as many as 69% of those from high-cost schools. The fees charged in the three types of school are about £3, £10, and between £30 and £45 respectively. The most important factor constraining entry to high-cost primary schools nowadays is not so much inability to pay fees as shortage of places. Many parents now provide their children with 2-3 years of English medium pre-primary education to help them pass the informal tests which high-cost primary schools use to select new entrants.

consistent trends. In all samples, efficient items tended to be of the following types:

1. Most items requiring numerical reasoning, with the exception of number series (see examples 1 and 2 quoted earlier in this paper).

2. Items requiring straightforward arithmetical computation (e.g. averages, volumes, areas).

3. Shopkeeping problems, and other problems involving the handling of money (especially in urban samples).

Inefficient items were mainly of the following types:

1. Geometrical problems, especially where solution depended on knowledge of a particular theorem or a technical term (e.g. external angles, Pythagoras, angles of elevation).
2. Most Algebraical problems, including equations (e.g. "Solve the following equation for t : 1.8t - 3 = 0.3t.)
3. Certain problems in proportions and fractions.

In short, most of the items which worked well in low-cost schools did not need highly specialized knowledge for their solution. Some of them required only basic arithmetical operations (averages, areas, volumes); others could be worked out from first principles (reasoning problems); while others drew on skills to which out-of-school experiences contributed substantially (money problems). Most of the inefficient items, on the other hand, required specialized knowledge.

These trends point strongly to an interpretation which has already been hinted at: a major reason for the inefficiency of the examination in low-cost schools may be that many items test the teachers rather than the pupils. No matter how intelligent a pupil may be he will be unable to work through a mathematical problem successfully unless he has been introduced to the necessary knowledge and techniques. Indeed, where the problems are of multiple choice type, the intelligent pupil may even be penalized; he may be attracted towards plausible distractors, and may thus have a lower chance of answering correctly than less-able pupils who simply guess.

The inefficiency of many CPE mathematics items, then, may be due to deficiencies in the knowledge or skills of the teachers. To check this hypothesis further, we examined the variations in item difficulty among the 12 schools in our Nyeri (low-cost) sample. The results are

too complex to present in detail, but the trends are clear.

Among the 12 schools there were quite strongly defined differences in overall performance. The best school averaged 41.42 marks, and the poorest 26.90, or about one standard deviation lower. But these overall differences were by no means consistently reflected in the individual items. As many as eight schools did better than all other schools on at least one item, and of these, seven performed poorer than any other school on at least one other item. The ten most difficult items were excluded from the analysis, so chance variations are not a major reason for these differences.

A common pattern, especially among items requiring specialized knowledge, was for one or two schools to perform much better than all other schools. A question involving knowledge of external angles of triangles, for instance, was answered correctly by 49% of pupils in one school (No. 11), whereas in all other schools the proportion was 26% or lower. But school No 11 did not fare so well in other items; on a question involving numerical reasoning, for instance, the proportion answering correctly was lower than in any other school. To take another example: 65% of pupils in school No. 9 answered correctly a question involving the areas of geometrical figures, as compared with only 39% in the next best school. School No 9 was also top school in four other items. But in three further items it was bottom.

The overall difficulty range among schools was for some items enormous. In one question involving the properties of equilateral triangles for instance, 72% of the pupils in the best school answered correctly, as compared with only 24% of the pupils in the poorest school. By comparison, in a problem involving the change received from buying stamps, the range was much smaller — between 59% and 33%.

This type of analysis cannot be pushed too far, because the percentages are based on rather small groups (they range between 23 and 70) and are hence somewhat unstable. The general conclusion to be derived from the analysis is, however, quite clear: the quality of mathematics teaching received by these pupils in low-cost Nyeri schools is extremely variable, not only between teacher and teacher, but also between topic and topic. No teacher seems to have managed to cover the entire syllabus adequately; all have concentrated to some extent on certain topics

and ignored others. This patchiness is most apparent in parts of the syllabus requiring specialized knowledge, which suggests that in some cases at least, teachers have not mastered all the material themselves. Under these circumstances, it is hardly surprising that so many items differentiate so poorly between the abler and less able pupils.

While working on these results one gradually builds up perceptions of the strengths and weaknesses of the different teachers. The teachers in schools No. 10 and 11 provide a particularly interesting contrast. Both teachers are successful -- the mean scores of their pupils are higher than in any of the other ten schools. But the types of question from which they build up their total marks are quite different. There are only a few items in which pupils from both schools perform particularly well.

The teacher in school 11 is clearly efficient and conscientious, but rather unimaginative. He has probably covered the syllabus better than any other teacher, and has certainly drilled his pupils well in the types of problem which recur frequently in the paper. The teacher in school 10, by contrast, is less systematic, and has obviously spent less time revising old examination papers with his pupils. For instance, only 17% of his pupils answered correctly a problem in fractions, of a type often asked before, as against 47% of the pupils in school 11. Similarly, he has not taught his pupils how to read distances from a grid diagram; so on an item testing this skill their performance is poorer than that of pupils in any other school.

But on the other hand, the teacher in school 10 has succeeded in engendering in his pupils an attitude of intellectual self-reliance that is not matched in any other school. They tackle particularly well problems with a practical bias - problems involving money, for instance. When faced with a difficult question, they do not retreat into random guessing, as happens in some other schools, but attempt to tackle it from first principles. They are thus especially successful in numerical reasoning problems. In one such problem they turned the tables decisively on the pupils in school 11. The problem was difficult, but could be solved successfully without special knowledge, by using commonsense and careful reasoning. In school 10 as many as 46% answered correctly, the highest proportion of any school; whereas in school 11 the proportion was only

22%, below chanoe level and lower than any other school. The evidence suggests that the drilling and rehearsing which pupils in school 11 had received may have dulled their intellectual flexibility and reduced their capacity to cope with new and unanticipated situations.

Sometimes, however, the self-reliant, exploratory attitude of the pupils in school 10 leads them into difficulties. As we have already discussed, the examiners included distractors in some items which trapped pupils who tried to work out the answer without the necessary special knowledge. Pupils in school 10 were particularly prone to fall into these traps, and it is partly for this reason that their average total score is lower than in school 11. The best example is an item which has already been quoted (example 3). For convenience the question and alternative answers are repeated here.

Question Simplify $\frac{10c^3 + 5c^2}{15c^5}$

Answers	A	B	C	D
	$\frac{2c + 1}{3c^3}$	$\frac{10c}{3}$	$\frac{2c^3 + c^2}{3c^5}$	1
Proportions choosing each answer				
School 10	6%	22%	15%	57%
School 11	20%	16%	22%	40%
School 5	15%	35%	29%	21%

This item was extremely difficult in all sohools. With only one possible exception, no school had taught its pupils the techniques needed to work it out successfully. Faced with this situation, the pupils in most schools resorted to guessing, and usually 15 - 30% guessed successfully. School No 5, the weakest in the sample, is a good example. But the pupils in school 10 worked away at the problem as best as they could, and 57% came up with the answer D, which as we have seen, is the most logical answer if one has not been taught that powers are non-additive. Thus only 6% answered correctly, which was substantially lower than in any other school.

It would be extremely valuable to make case-studies of schools such as No 10, focussing both on the teaching methods used and on the subsequent careers of graduates. One feels confident that those pupils who did not continue with their formal education will be more successful than most in creating economic opportunities for themselves in agriculture or self-employment. Before they left primary school they had already acquired some of the characteristics of successful innovators and entrepreneurs — and like real innovators and entrepreneurs they sometimes failed because of crucial gaps in their knowledge. As yet we know virtually nothing of the relevance of different teaching styles — as distinct from the content of what is being taught — in promoting economic development.

Nor should pupils in school 10 who were accepted into secondary schools have been at any real disadvantage. Their knowledge of Pythagoras' theorem and the properties of angles of elevation may not have been all that it might have been, but the teaching of such topics in the primary schools is obviously so deficient that every secondary school teacher in the country must have had to go over them again before moving on to new ground. An active, exploratory attitude towards experience is as relevant for success inside the secondary school system as it is outside it.

This brings us to a consideration of what I feel is the central weakness of the CPE. The present examination is almost entirely oriented towards selection for secondary school. It largely ignores the needs of pupils for whom primary education will be terminal. The reasons why this has come about are understandable. Since Independence, competition for secondary school entry has steadily intensified. The simplest way of making the examination more difficult is to increase the proportion of items requiring specialized knowledge. Moreover, most of the people responsible for the examination have been recruited from secondary teaching, and are naturally concerned to ensure a continued supply of high-calibre recruits to the secondary schools. In this they have been bolstered by the manpower planners, who until quite recently have been preoccupied by the need to provide for Kenya's high level manpower needs, particularly in occupations still dominated by expatriates.

Whatever the reasons, the result has been that the upper primary school syllabus, and particularly the selection examination, have become overloaded with topics which are the proper concern of the secondary schools. There would perhaps be a case to be made for this if it could be shown that secondary school selection was thereby improved. It might be argued that by providing, as it were, a preview of secondary-level skills in action, the CPE makes possible more accurate prediction of which pupils will make best use of secondary-level places. But as we have seen, the data contradict this view. In the mathematics examination it is precisely the items which tap secondary-level skills which are least efficient.

In the past there has been a great deal of discussion of the apparent incompatibility of the two functions of the Certificate of Primary Education: as a selection tool and as a leaving examination. It has even been suggested that there should be two separate examinations. Our data, however, suggest that this incompatibility is largely illusory. If the mathematics paper were confined to questions testing basic computational skills, numerical reasoning ability, and competence in solving practical mathematical problems, it would not only be a much more useful terminal examination than it is at present, but it would also, in all probability, be a more efficient selection instrument. The practical part of the paper could include shopkeeping problems, simple farming and business accounts, calculation of crop yields, and a wide range of other problems likely to be met by the school leaver engaged in agriculture or self-employment. It could also include problems encountered in self-help community development projects: the contribution needed from each household in an area to build a cattle dip; the length of piping required for a water project, for example.

The major reason for the inefficiency of CPE as a selection instrument is that it imposes demands on the teachers which they cannot meet. The examination is founded on a vision of the primary school system that is, in fact, only realized with any consistency in the high-cost schools. In these schools, pupils have at least been exposed to the material needed to cope with the questions. The ablest pupils assimilate the material successfully, the less-able pupils, less successfully. In the low-cost schools, by contrast, there are only a certain number of questions in which the intelligent pupil can

demonstrate his ability. He has never been taught the material he needs to know to tackle the other questions. In fact, his chances of answering them successfully may even be reduced below the theoretical chance level by the effects of plausible distractors. Hence, as we have seen, the examination is an efficient discriminator only among pupils who have attended high-cost schools. But these pupils make up only a tiny minority — less than 0.5% of all candidates.

The intelligent pupil from a low-cost school is thus doubly discriminated against. In comparison with a pupil of similar ability from a high-cost school, his total score on the examination is likely to be at least one standard deviation lower because of the effects of poorer teaching. But even if he is competing for a secondary school place only with pupils from similar low-cost schools, his chances of being identified as a pupil of high ability are much reduced, because of the lower efficiency of the examination.

The reasons why this situation has come about are understandable. Since Independence, the resources of the Ministry of Education have been fully extended simply in coping with the problems of growth. The number of candidates sitting the examination has expanded tenfold. As well as this, there has been a complete changeover from an essay-type to a multiple-choice examination, marked by computer. The devising of efficient multiple choice questions is highly skilled work. Even the most experienced test constructors cannot continue to write good items unless they are continuously provided with information as to how successful their items have been. In Kenya, this feedback has been almost entirely lacking. Clearly, the establishment of an Examinations Research Unit within the Ministry of Education is a matter of the highest priority.

A word must be said about the particularly low discriminative efficiency of the Mathematics paper among girls in low cost schools. The reason is obviously not to be found entirely in teacher quality, for the girls are being taught in the same classes and by the same teachers as the boys. Some possible explanations spring to mind, but further research is needed. Whatever they may be, it seems highly likely that the continuing shortage of girls qualified to take up opportunities in scientific training and employment after Form Four is at least partly a result of the failure of the Certificate of Primary Education

to identify the girls with the most potential. Some Form Five science classes for girls were in 1972 enrolled to less than 25% of capacity.

The General Paper.

Although the general paper has not been item analysed, examination of the content of the questions suggests that it has much the same deficiencies as the mathematics paper. The range of factual material tested is enormous, and knowledge of a large number of technical terms is required. Here are two items chosen almost at random from the science and nature study sections:

The part of a seed which becomes the root system is the
A. Cotyledon B. Plumule C. Radicle D. Axis
When sugar is dissolved in a cup of tea, sugar is said to be the
A. Solution B. Solvent C. Mixture D. Solute

Other technical terms tested in papers over the past five years include hygrometer, penumbra, refraction, electrolysis, culex, plasmodium, saprophyte, ungulate, lenticel. At least another 100 technical terms were also tested, many of them just as specialized as these! In the History and Geography sections, most of the questions are concerned with names, places and dates. In Geography, for instance, candidates are often given an outline map of Kenya or East Africa containing virtually no details and then asked a series of questions about it. Two of the questions asked in the 1971 examination were as follows:

1. The equator marked A on the map passes between the two towns
   A. Nairobi and Mombasa.
   B. Kakamega and Kisumu.
   C. Nyeri and Embu.
   D. Isiolo and Thomson's Falls.

(The correct answer is B. Isiolo and Thomson's Falls are both just North of the equator, Thomson's Falls by about three miles. None of the towns is shown on the map).

2. The area marked I has an annual rainfall of:
   A: Over 80" B. 60"-80" C. 40"-60" D. Under 40"

(A tiny area - the highlands between Kericho and Londiani - is shaded in).

Most questions in all sections require the candidate to reproduce remembered facts. The few that try to tap his understanding of causes and reasons are sometimes ambiguous or debatable:

African communities used to be warlike because:

A. They had many different religions

B. This enabled them to practice for raids to capture cattle

C. Their leaders were not powerful enough to control them

D. This was their method of securing adequate protection against hostile neighbours.

It is doubtful whether low-cost primary school teachers are any better equipped to prepare their pupils for the General paper than they are for the Mathematics paper. Here again it seems highly likely that drastic revision could make the paper not only a more efficient selection tool, but also a more useful terminal examination for school leavers. As with the Mathematics paper what is needed is a heavy reduction in the number of items testing knowledge of technical terms and specific facts, and a corresponding increase in items testing relevant and practical knowledge, and also the ability to understand cause and effect relationships. There should be at least as many items asking the questions how or why as there are items asking what, when and who.

While it is certainly not feasible or desirable to teach general agriculture as a full subject in primary schools, there seems no reason why the science and nature study sections of the General paper should not include a substantial number of items on such topics as the causes and treatment of coffee berry disease, the use of fertilisers, soil erosion, and the effects of tick-borne diseases on cattle. Topics such as these are part of the concern of every progressive farmer in Kenya, whether educated or uneducated. They are well within the comprehension of upper primary school pupils.

In recent years observers of Kenya's primary education system have often commented that the exploratory, activity-oriented methods which have been successfully introduced into many junior classrooms give way, in the upper primary school, to a much more traditional approach, with emphasis on rote memorisation and endless practice in answering multiple-choice questions. Practically without exception, these observers have stressed that discovery methods should continue

right through the primary school, with teachers and pupils seeking the raw materials for their learning in the world around the classroom.

Looking at the content of the Certificate of Primary Education papers, especially the general paper, it is easy to see why this has never come about. We have said that the CPE determines the whole destiny of a school pupil,but equally it determines the destiny of his teacher. Parents, pupils, education officials, and the community at large all judge his efficiency at his job by the examination results he achieves. The boundaries of what is educationally relevant are defined for him not by the formal curriculum but by the content of previous CPE papers. If what he must teach his pupils is to remember whether it is the plumule or the radicle of a seed which becomes the root system, then there is no advantage whatsoever in growing maize in the classroom or in taking pupils to look at bean plants in the nearest garden. The time would be better spent in memorising technical terms from one of the numerous CPE guide books, which are brought up-to-date each year and incorporate all the answers to the previous years' questions.

And yet it is not difficult to imagine questions about plant growth formulated in such a way that it would be the pupils who had carried out the experiments and made the observations who would have the advantage. For example:

"The pupils in a certain school planted beans and maize in glass jars and watched them growing.

1. The pupils noticed that when the main root from each bean was about one inch long, other roots began to develop. What did these other roots look like?

2. What is the purpose of these other roots?

3. The pupils also noticed that when the stems appeared above the ground, the maize stem were different from the bean stem. How were they different?

4. After a few days the stems of all the plants began bending towards the nearest window. Why did they do this?

When a pupil leaves primary school after the examination, he needs above all to have a firm grasp of the basic intellectual skills.

He should be able to read with understanding and write with clarity. He should be able to carry out straightforward mathematical calculations accurately. And he should have developed the ability to reason clearly, both in numerical and verbal contexts, along with an attitude of confidence that he can use his reasoning powers to devise successful answers to real problems. Besides these basic skills, he should have a substantial body of relevant factual knowledge. This knowledge should not be confined entirely to facts about his immediate environment; he also needs to know something about the wider world. The general paper certainly cannot be criticized on the grounds that it fails to test facts. But it is impossible to avoid the impression that a great deal of the factual material is intellectual maridadi; attractive enough for display on occasion as evidence of one's educational status, but otherwise not much to the purpose.

PUPILS REPEATING THE SELECTION EXAMINATION.

Analysis of the effects of repeating on performance in the selection examination could not be carried out with the 1970 sample because reliable data were not available. In 1971, however, it was possible to collect information on repeating from all candidates in a single location in Nyeri district.[7]

Table 2: NUMBER OF PUPILS REPEATING IN STANDARD 7, COMPARED WITH THE NUMBER WHO REPEATED IN LOWER STANDARDS. ALL PUPILS IN ONE LOCATION, NYERI DISTRICT 1971

	Never repeated in standard 1-6		Repeated in standard 1 - 6				Total
			Once		Twice/more		
Repeating standard 7	52	(62%)	28	(33%)	4	(5%)	84
Not repeating std. 7	101	(53%)	69	(36%)	21	(11%)	191
TOTAL	153		97		25		275

7. It is most unlikely, of course, that data from one location in one district represent with any accuracy the picture in the country as a whole. Reliable information on repeating can only, however, be obtained by intensive fieldwork, in an area where the research worker is well known. Accurate data from a small area is much preferable to inaccurate data from a larger area. I feel confident that the amount of distortion in the data presented here is small.

Table 2 shows the numbers of pupils who were repeating and not repeating standard 7, broken down according to whether they had or had not repeated classes between standards 1 and 6. It will be seen that 84 out of 275 pupils, or 31%, were repeating standard seven. This figure is not, of course, a measure of the proportion of pupils passing through the primary system who repeat their final year, which can be calculated only from a cohort analysis. As many as 117 of the 191 pupils who sat the certificate of primary examination for the first time in 1971 were back at school in 1972 attempting the examination for a second time. Eighty-six of these pupils returned to same school, six went to another school in the same location, and 23 were at schools outside the location, mostly in new settlement areas where places are easier to find. Thus the repeating rate for the cohort of pupils who moved up into standard seven from standard six at the beginning of 1971 was as high as 61%.[8]

If we include pupils who repeated between standards one and six, the rate is of course much higher. Only 101 of the 191 new entrants to standard seven in 1971 had passed through the bottom six standards without repeating any class. Fifty-nine of these 101 pupils repeated standard seven in 1972; so the overall repeating rate is 78%.[9] In other words, only 22% of the cohort completed primary education in seven years, the nominal duration of the course. The median period taken was about 8.2 years. Fifty-five pupils (29%) took at least nine years and another 12 pupils (6%) at least ten years.

Another point to notice from this table is that the propensity to repeat in standard seven is quite uncorrelated with the propensity to repeat in lower classes. In fact, if anything the trend is in the reverse direction: repeaters in standard seven tend to be pupils who have passed through the lower classes without repeating. This suggests that there must be different reasons for repeating, affecting different pupils at the two levels.

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8. This is repeating rate 3, as defined at the beginning of this paper. Repeating rate 2 is the number of 1972 repeaters as a proportion of the total 1971 CPE cohort : that is, 123 ÷ 275, or 45% (see Table 4). The number of repeaters in the 1971 CPE cohort (31%) is repeating rate 1.

9. $\frac{90 \times 59}{191} = 78\%$.

Table 3. MEAN CERTIFICATE OF PRIMARY EDUCATION MARKS OF 1971 REPEATERS AND NON-REPEATERS.

	Never repeated in std. 1 to 6	Repeated in standards 1-6 Once	Twice or more	TOTAL
(a) English				
Repeating standard 7	65.08	62.39	55.25	63.71
Not repeating Std. 7	56.50	51.10	50.62	53.91
TOTAL	59.42	54.36	51.36	56.90
(b) Mathematics				
Repeating standard 7	60.35	54.50	46.00	57.71
Not repeating std. 7	44.91	36.93	35.71	41.02
TOTAL	50.16	42.00	37.36	46.12
(c) General paper				
Repeating standard 7	58.92	56.82	52.00	57.89
Not repeating std. 7	50.78	46.25	43.19	48.31
TOTAL	53.55	49.30	44.60	51.24
(d) Total examination mark				
Repeating standard 7	184.35	173.68	153.25	179.31
Not repeating std. 7	152.20	134.30	129.33	143.22
TOTAL	163.12	145.67	133.16	154.24

Note: The standard deviations for the English, Mathematics, General and total marks are 12.99, 17.65, 11.76 and 37.83 respectively.

The data in Table 3 point to the major reason why repeating is such a problem in Kenya: there is a huge payoff to it. Pupils sitting CPE for the first time average nearly one standard deviation lower than those repeating. The 1971 repeaters did not, of course, include many of the ablest non-repeaters from the 1970 cohort, because most of these went off to secondary schools. But it is also unlikely that many of the weakest pupils from the 1970 cohort are in the 1971 repeater group, because they were probably not allowed to repeat. On balance, the two trends may roughly cancel each other out.

We cannot investigate this point empirically because the necessary data from the 1970 certificate of primary education are not available. We can, however, use the 1971 data to demonstrate the probable

situation in the 1972 cohort. Among the pupils who entered standard seven for the first time in 1971, those who repeated the class at the same school or in the same location in 1972 (who therefore would have been in a 1972 sample) averaged 142.84 marks in the 1971 examination. The remaining pupils, comprising those who entered secondary school, those who repeated in another location (who would therefore have been outside the sample) or who left school altogether, averaged 143.58 marks. As measured by the 1971 examination, then, the two groups were almost identical in average ability, although, of course, the scatter of marks was much greater in the latter group. Thus, if we can assume that the new entrants to standard seven have roughly the same ability each year, it is most unlikely that the repeaters in our sample differ substantially in average intellectual potential from the non-repeaters. Hence the difference in performance between the two groups is probably a fair indication of the benefit to be gained by sitting the examination a second time.

But when we come to look at the effects of repeating in lower classes, the results are in sharp contrast. The more often a pupil has repeated between standard one and six, the lower his mark in all examination subjects is likely to be. This is true regardless of whether or not he is repeating standard seven. Pupils who have repeated lower classes twice or more than twice score nearly one standard deviation lower than those who did not repeat. The most successful pupils of all are those who came straight through the lower standards, and then repeated standard seven.[9]

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9. It is interesting that pupils who first repeated a class in the middle years of their primary education perform less well in the selection examination than those who first repeated in the lowest classes, despite the fact that more of the latter group repeated twice. The mean total scores are : Repeated standard 1 or 2 : 157.17; repeated standard 3 or 4 : 138.09; repeated standard 5 or 6 : 141.15. These results are, of course, consistent with the fact that children's educational performance begins to stabilise only slowly, after several years at school. Poor performance in the infant classes may indicate difficulties in the transition from home to school, rather than low educational potential.

TABLE 4: 1972 FOLLOW-UP INFORMATION BY PUPILS REPEATING HISTORY

What the pupil did in 1972	Not repeating standard 7 in 1971						Repeating standard 7 in 1971						ALL PUPILS	
	Never repeated in stds. 1-6		Repeated in stds. 1-6		All standard 7 non-repeaters		Never repeated in std. 1-6		Repeated in stds. 1-6		All standard 7 repeaters			
	N		N		N	Mean CPE mark	N		N		N	Mean CPE mark	N	Mean CPE mark
Went to an "old" Government maintained sec.sch.	10	10%	1	(1%)	11	(6%) 224.36	3	(6%)	4	(12%)	7	(8%) 227.29	18	(6.6%) 2
Went to a "new" Government sec. school	9	9%	3	(3%)	12	(6%) 192.00	24	(46%)	11	(34%)	35	(42%) 191.46	47	(17.1%) 1
Went to an experimental maintained junior sec. school	2	2%	2	(2%)	4	(2%) 142.50	4	(8%)	4	(12%)	8	(10%) 172.25	12	(4.4%) 1
Went to a Harambee or other unaided sec. sch.	4	4%	8	(9%)	12	(6%) 134.83	9	(17%)	4	(12%)	13	(16%) 168.77	25	(9.1%) 1
Repeated at the same primary school, or another sch. within same location	53	52%	41	(46%)	94	(49%) 142.84	1	(2%)	1	(3%)	2	(2%) -	96	(34.9%) 1
Repeated at primary school outside location	6	6%	17	(19%)	23	(12%) 132.09	2	(4%)	2	(6%)	4	(5%) 145.25	27	(9.8%) 1
Employed	1	1%	3	(3%)	4	(2%) 97.75	1	(2%)	2	(6%)	3	(4%) 142.33	7	(2.5%) 1
"At home"	14	14%	14	(16%)	28	(15%) 112.04	5	(10%)	2	(6%)	7	(8%) 158.57	35	(12.7%) 1
Not traced	2	2%	1	(1%)	3	(2%) 134.00	3	(6%)	2	(6%)	5	(6%) 146.20	8	(2.9%) 1
TOTALS	101		90		191	142.22	52		32		84	179.31	275	1

It thus seems clear that there are two quite different patterns of repeating. In the lower standards pupils who repeat are the slow learners; those who find it difficult to keep up with the others in their class. But in standard 7 the repeaters are the abler pupils, who find the hurdle of the selection examination too high to clear at a first attempt. This interpretation is supported by the data of Table 4, which shows what happened to the pupils in our sample in the year after they sat the certificate of primary education.

The results demonstrate strikingly how the improved examination performance of the repeaters gives them an enormous advantage over non-repeaters in the competition for post-primary opportunities. Only about 12% of non-repeaters were accepted for entry to Government-maintained secondary schools in 1972, whereas the comparable proportion for repeaters was no less than 50%.[10] The mean mark needed to gain a secondary school place was almost identical for the two groups. The only indication that non-repeaters are given any preference was that a relatively higher proportion of them were accepted by older secondary

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10. It will be noticed that the proportion of candidates accepted into Government Secondary schools from this location is nearly double the national average of 13%. A major reason for this is that a Harambee (self-help) school in the location had started receiving Governement aid the previous year. If pupils who enrolled at this school are omitted, the proportion accepted from the location drops from 24% to 16%. Some of these pupils would have been accepted by other, more distant, secondary schools, but because most of them had borderline marks the proportion would probably not have been high.

Judged by merit criteria, there is no doubt whatsoever that the school fully deserved to be accepted for Government aid. The buildings, which had been erected almost entirely from local contributions of money and labour, included three teacher's houses, a library and a laboratory as well as the usual classrooms. Examination results in the EACE were far superior to those obtained in most Harambee schools and better than in some Government schools.

But if the criterion for selection had been equity in the distribution of secondary school provision, then the school would not have been aided. The location is economically better developed than most rural areas in Kenya, which means that existing secondary provision is above the national average: well over 13% of primary school leavers entered Government secondary schools even before the Harambee school was aided. But relative prosperity also means that more resources are available for self-help projects. This was certainly a major factor in the success of the Harambee school. There is a real dilemna here : if government secondary school development is based on local self-help activity, then existing disparities in provision are likely to be exacerbated; but if development is based on considerations of equity, then many of the most vigorous self-help initiatives are likely to be stifled.

schools (established before Independence) where they have better chanoes of performing well in the East African Certificate of Education four years later. If we include pupils who entered a newly-established junior secondary school, which will provide education to Form II level, the proportion of repeaters who started government-maintained secondary education in the year after sitting the selection examination reaches nearly 60%. Of the remaining 40%, only a handful managed to repeat standard 7 a second time. Obviously the methods used to prevent multiple repeating are quite effective, in this location at least. Most of the others entered Harambee schools, and their average calibre, as measured by the selection examination total mark, was relatively high.

Among the 1971 non-repeaters the patterns are quite different. Only 6% went to Harambee schools in 1972, whereas by contrast, nearly half repeated standard 7 at the same school or in the same location. Moreover, these 1972 repeaters were, for the most part, pupils of relatively high achievement; they averaged eight marks higher in the selection examination than the Harambee school entrants. It is obviously becoming the established and expected pattern for pupils in this location to spend two years in the seventh standard - and sit the examination twice. Hence it is true only in a restricted sense that standard-seven repeaters are failures. They failed to enter secondary school at their first attempt, of course, and this is important. But because repeaters from the previous year preempted such a high proportion of the available places, this was something that could be avoided only by the most talented. They are the pupils who nearly succeeded, not the pupils who failed.[11]

One way of breaking into this vicious circle might be to identify certain types of examination itemsthat give a bigger advantage to repeaters than other types. It seemed possible, for instance, that repeaters might tend to do better on items measuring specialized or technical knowledge, or rote memory, whereas first-attempters might be more successful on items tapping reasoning ability, problem solving, and comprehension. If this were the case the payoff to repeating might be reduced by increasing the proportion of items of the latter types. This might do something

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11. If we consider follow-up data from pupils who obtained borderline marks in the 1971 CPE, this point becomes even stronger. The borderline zone fell between 150 and 199 total marks : all pupils with 200 marks or more were accepted into government secondary schools, while below 150, none were accepted. Forty-six of the pupils who were sitting for the first time in 1971 obtained borderline marks but failed to gain secondary places. All but two of these pupils repeated in 1972, and these two went to Harambee schools. Not a single non-repeater with borderline marks left school altogether at the end of 1971.

towards reducing the seriousness of the problem.

The data, however, gave no support whatever to the hypothesis. It can be seen from Table 3 that it is in the Mathematics paper, which puts most emphasis on problem solving and reasoning ability, that repeaters have the biggest advantage over non-repeaters. Their marks average 0.95 of a standard deviation higher, whereas in the General paper, which depends most heavily on memory and recapitulation, their advantage is only 0.81 of a standard deviation.

To pursue the matter further, response patterns in the Mathematics paper were analyzed item by item. It was found that repeaters tended to do better than non-repeaters on problems of all types: practical, day-to-day problems as well as theoretical problems in algebra and geometry, problems tapping reasoning ability as well as problems measuring achievement. There was not a single item in the entire paper in which non-repeaters were more successful. Moreover, most of the pupils with exceptionally high marks in Mathematics were repeaters. One repeater, for instance, obtained a score of 96, which must place him among in the top 10-20 pupils in the country.

But the most striking results came from the English paper. One of the sections in this paper consisted of 20 verbal reasoning questions, similar to items commonly used in intelligence tests. Items of this type had not been included in the selection examination previously, so neither repeaters nor non-repeaters had had practice in answering them. Despite this, repeaters had an average mark which was 0.63 of a standard deviation higher than non-repeaters. In another section testing knowledge of grammar and syntax, where repeaters had a marked practice advantage, they averaged only 0.61 of a standard deviation higher.[12]

There is only one possible explanation for these results. For many pupils, the benefits of repeating must derive from the opportunity for an extra year's intellectual maturation rather than from the extra period of "cramming" for the examination. Our stereotype of the repeater

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12. For the English paper as a whole the difference in performance was 0.76 of a standard deviation. A section of a test always has weaker discriminating power than the full test, because of its lower reliability.

as the over-age pupil sitting at an under-sized desk in the back row, looking rather bewildered, painfully trying to amass enough facts to scrape through the examination into secondary school, is no longer generally valid, at least in educationally advanced areas such as Nyeri. Instead, he is just as likely to be an intelligent or even highly intelligent 14 or 15 year old, who failed to gain entrance to secondary school at his first attempt because he was competing with pupils who had had the advantage of at least one more year's intellectual growth. Clearly it would be inefficient as well as inequitable to deny him a secondary school place.

The problem derives in large part from the steadily declining age at which pupils now present themselves for secondary school selection. Less than ten years ago, the typical candidate was 16 or 17 years old. At this age, intellectual growth as measured by tests of reasoning ability (though not by tests of attainment)is nearing completion. By most tests, reasoning ability reaches a plateau at about 18 years and may thereafter even start to decline slightly. Until quite recently it was certainly the case that the typical repeater improved his mark mainly by endless memorization and recapitulation. Now, however, the situation is different. Many candidates sit the examination for the first time when they are only 14 years old, and some are only 12 or 13. At these ages growth in reasoning ability is still extremely rapid. Any reasoning test score for a person 15 years of age or younger is virtually meaningless as a measure of ability unless it is related to chronological age, expressed in years and months.

Our results should not have been as unexpected as they were. In those parts of the United Kingdom where secondary school selection still survives, the age at which pupils sit the examination is strictly controlled. Only those born within a specified twelve-month period may sit in any given year. Even so, it has been found that there are small but consistent increases in performance with each one-month increase in age, the overall effect of which is to give a clear advantage to the older pupils inside this narrow range. In Kenya, where the age range is four or five times as large, the effects must be much greater.

Clearly there is no short term solution to this problem. Given the existing age disparity among pupils entering standard seven, any attempt to prohibit repeating would be both inefficient and inequitable, even if

it were feasible. In time it will be possible to insist that every primary school entrant produce a birth certificate, so that an accurate record of his age can be made. If places were available, pupils might still be permitted to repeat, but a correction for age could be made to their total score before secondary school entrants were selected. The current campaign for birth registration would receive a big impetus if Government were to announce that in, say, seven years' time the date of birth would have to be proved before pupils could enrol in a primary school.

In the meantime, the harmful effects of age heterogeneity on the efficiency and equity of secondary school selection could be reduced somewhat if the average age at which selection takes place were increased to something like its former level. This could be achieved in two ways: either by increasing the period over which pupils receive non-selective education from seven to perhaps nine years, or by increasing the age of primary school entrance. The latter proposal would be much less expensive, but it is doubtful whether it could be made to work efficiently without creating undesirable side effects. Increasing the school entry age would mean reversing the present trend, which is for a higher and higher proportion of pupils to start school as soon as possible after their sixth birthday, or even earlier. Parents, particularly educated parents, are so concerned about their children's education that it is doubtful whether they would accept the later starting age voluntarily. Enforcement might well have to be delayed until birth registration was compulsory.

Of course, this argument would lose its force if it were possible to establish nursery schools for pre-primary pupils on a national basis. But here again there are serious problems. The difficulties of establishing a distinctive pattern of nursery education and of training teachers to carry it out would be such that a high proportion of the nursery schools might well degenerate into downward extensions of the primary schools, teaching pupils of much the same age, in much the same subjects, by much the same methods, as are found at present in the bottom two primary standards. The major difference might well be that the teachers were of lower calibre. There is already far too strong a tendency to push the weakest teachers into the lowest classes; children who are receiving their first exposure to education need to be taught by teachers who are at least as skilled as those teaching the higher standards. Research in Uganda

has shown that the effects of inferior elementary education are largely irreversible at the secondary level: the quality of the early educational experience tends to set a limit to the level the pupil will ultimately attain.[13] We cannot afford to dilute any further the quality of instruction received by pupils in the 5 - 7 year age range.

The most effective way of mitigating the unfortunate consequences of the inefficiency of the examination would be to remove from the selection process its once-for-all quality. It has already been suggested that this might be achieved by converting Harambee schools into two-year "second chance" schools, with an opportunity for the ablest pupils to re-enter government - maintained education at the Form III level through the Kenya Junior Secondary Examination. The principle is one which should be applied right through the formal education system. At every point where selection occurs, there should always be at least one institutionalized channel through which school leavers who have demonstrated their competence in some other activity (employment, training, non-formal education for instance), can re-enter the formal system if they wish.

More generally, reform of the education system would involve creating freer flows of people: freer flows between education, training, and employment; freer flows between formal and non-formal education; freer flows between teacher education and teacher practice. Similarly reform would involve an increase in participation of various kinds: participation of the school in the life of the community; participation of non-teachers with specialist skills in the teaching of specialist subjects; participation of pupils who are being educated at the secondary and tertiary levels in elementary education and adult literacy.

But these are long-term goals, and progress towards them can only be gradual. In the meantime, a great deal could be done to improve the present structure through reforming the examination and selection systems. The consequences of success or failure in the selection examination are so crucial for both pupils and teachers that changes in the examination give rise immediately to changes in what is taught in the classroom and how it is taught. If the Certificate of Primary Education tested material which was firmly within the grasp of primary school teachers, if it tested

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13. H.C.A. Somerset, op. cit.

the ability to reason and understand relationships of cause and effect, and if, above all, it tested relevant and practical knowledge, it would be not only a more efficient and equitable instrument for selecting secondary school entrants, but also a more useful preparation for those for whom primary education is terminal.

In Education for Self Reliance, Nyerere has written: "We should not determine the type of things children are taught in primary schools by the things a doctor, engineer, teacher, economist or administrator needs to know. Most of our pupils will never be any of these things .... Our sights must be on the majority."[14] If we wish to make a reality out of Nyerere's vision, the place to start with is the secondary school selection examination.

14. J.K. Nyerere. Education for Self Reliance. (Dar es Salaam, Government Printer, 1967).