

Expert opinion

as an instrument

for assessing investment

in primary education

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Most educational investment is based on untested or partially tested assumptions about the cost-effectiveness of a given course of action. Indeed, the only estimates that have been available have been for the average profitability of each type of education, even though these differ greatly from marginal profitability. This article sets out a new approach to estimating the cost-effectiveness of educational investment.

The authors canvassed the views of ten world-renowned educational researchers on the likely impact on students' learning achievements of a set of forty measures generally regarded as desirable for improving primary education, and supplemented the responses received with their own calculations of the cost of each, the aim being to establish an index of cost-effectiveness. On this basis, they concluded that the educational projects implemented in the region have failed to include many of the measures identified as the most efficient, and this has limited the quality of the education provided and its potential contribution to economic success, despite the considerable increase in educational investment by governments and international bodies in the 1990s. The article concludes with a number of recommendations aimed at remedying this situation, which take account simultaneously of the impact and the cost of the different educational measures.

I

The low quality of education in Latin America

In Latin America, working out the most efficient way of using the limited resources available to schools is critical. The quality of education in the Latin American region is much lower than in the countries it competes with, in terms both of quantity (school completion rates and the average educational level of the workforce) and the degree to which knowledge and learning are made use of (OECD, 2000 and UNESCO, 2000). Recently, the UNESCO/OREALC Laboratorio Latinoamericano de Evaluación de la Calidad de la Educación (Latin American Education Quality Assessment Laboratory) has published comparative information on learning in the third and fourth grades of primary education in the region. Table 1 shows the scores obtained by eleven Latin American countries in the mathematics section of a regional test set by UNESCO, which measures much simpler and less sophisticated skills than the tests used in the industrialized countries. It can be seen that, other than in Cuba, performance is inadequate.

The results of the test also show that performance is worse in rural areas than in urban ones (except in Colombia), that capital cities do better than smaller ones and that private schools (except in the Dominican Republic) achieve better results than State ones.

The results for the Spanish test are similar. Pupils from the half of the population with below-average incomes get around 40% of the questions right. As the tests give four multiple-choice alternatives, pupils who know the right answers to 20% of the questions will also give "correct" (but random) answers to one in four of the other 80 questions to which they do not know the answers, giving a total of a 40% success rate in answering the questions. This means that most pupils do not understand the contents of the written texts presented to them in this test. In other words, the great majority of future workers are functionally illiterate.

The poor results obtained make it necessary to carry out a careful examination of the critical factors

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TABLE 1

Latin America (11 countries): Average scores in the UNESCO regional test for fourth grade mathematics^a

Country	Score
Cuba	353
Argentina	269
Brazil	269
Chile	265
Colombia	258
Mexico	256
Paraguay	248
Bolivia	245
Dominican Republic	234
Venezuela	231
Honduras	226

Source: UNESCO, 1998.

^a Standardized average scores of 250 for third and fourth grades and standard deviation of 50. The average pupil in the region got approximately 50% of the questions right; the average Cuban student got 85% right.

generally considered to determine the level of learning and retention. Among these, mention is often made of the availability and use of text books, the provision of pre-school education, teaching by radio and some in-service training programmes (Lockheed and Verspoor, 1991), even though the effects of these have rarely been calculated and have never been correlated with their costs. Up to 1998, few of the experiments carried out at the primary education level in Latin America had been properly evaluated and publicized. Of experiments where this was done, mention may be made of: mathematics by radio in Nicaragua (Jamison, Searle, Heyneman and Galda, 1981), educational television in El Salvador (Hornik, Ingle, Macanany and Schramm, 1973), North-East Education Programme in Brazil (Harbison and Hanushek, 1992), Escuela Nueva in Colombia (McEwan, 1995; Psacharopoulos, Rojas and Vélez, 1995 and Rojas and Castillo, 1998), P-900 in Chile (Gutman, 1993), Escuelas Fe y Alegría (Swope and Latorre, 1998), EDUCO in El Salvador (El Salvador, Ministry of Education, 1996) and fast-track primary

schools in Brazil (Araujo Oliveira, 1998). Over time, the increase in the number of national programmes for measuring educational attainments will make it possible to determine which measures have had a significant effect on learning.¹

The scantiness of the information available on the factors that influence the results of learning,² despite the

importance of the issue, and the difficulties involved in traditional research into efficiency, led the authors to seek a different strategy to help professional educators and researchers gain a better understanding of the fundamental aspects of the subject and to develop an instrument that may facilitate training, consensus-building and the identification of critical areas of research.

II

Forty strategies commonly used to improve education quality in Latin America

To obtain comparable responses from the panel of ten international experts whose opinion was sought, all of whom are active in universities and international organizations, the authors designed an index of cost-effectiveness (efficiency) which included a precise

definition of each of the possible measures whose impact and feasibility they were being asked to assess, the idea being to reduce variations resulting from differences in the “assumed” scope of each of these measures. Those interviewed had to estimate the impact that each of the 40 primary education measures deemed possible (box 1) might have on learning attainments (as measured by scores in a standardized test to be administered at the end of the sixth grade), then estimate the percentage probability of successful implementation. The authors then brought in their own calculations of the unit cost of the 40 measures. These three pieces of information were used to calculate the cost-effectiveness index value of each.

¹ See Rojas and Esquivel (1998) for a detailed summary of recent experience.

² Besides the studies referred to, other worthwhile efforts have been made in this direction. The sectoral studies of Honduras and El Salvador on failure at school and the repeating of years (Reimers and McGinn, 1997) have resulted in the implementation of a range of programmes designed to reduce the repetition rate. However, the few systematic research initiatives that have been undertaken, particularly those dealing with impact on learning, are riddled with uncertainties and inconsistencies. In the case of the decentralization programme implemented in El Salvador through the EDUCO programme, it has been ascertained that enrolment levels in rural schools have increased and learning attainments and retention rates have improved, but few clear differences can be discerned between the level of learning in EDUCO schools and that in traditional Salvadoran schools. EDUCO schools are better equipped, devote more time to teaching and have greater parent involvement. It is possible, though, that the improvement in learning attainments may be the result of the higher expectations accompanying decentralization, which has indeed included a more learning-oriented approach (Meza, 1997). It is also observed that decentralized schools in Nicaragua show higher retention rates, although other factors may be influencing this finding. Satisfaction levels among teachers and parents are found to be higher, although here again the educational results are not clear (Castillo, 1998). In fact, although there are solid political and social reasons for supporting the adoption of a decentralized system –in particular, the role of such a system in strengthening civil society– there is little evidence worldwide to show that decentralization is accompanied by an increase in learning.

The 40 measures submitted to the experts, which relate to the twelve operational areas of the education system given in table 2, were selected on the basis of seven different types of criterion:

- i) the components of educational programmes and projects applied in Latin America over the last 20 years, successfully or otherwise;
- ii) the priorities and recommendations put forward by international bodies and development banks (Lockheed and Verspoor, 1991; World Bank, 1994 and Carnoy and de Moura Castro, 1997);
- iii) the main conclusions drawn from the regional diagnostic surveys carried out in the 1990s (Schiefelbein, coord., 1998 and Wolff, Schiefelbein and Valenzuela, 1994);
- iv) analysis of existing research studies into the cost-effectiveness of key strategies (Wolff, Schiefelbein

Box 1

FORTY POSSIBLE EDUCATIONAL MEASURES FOR LATIN AMERICA

1. Enforce a policy of not switching classroom teachers during school year.
2. Implement a policy of assigning best teachers to first grade.
3. Enforce regulations on official length of school year.
4. Extend daily schedule by one hour (40 minutes academic classes, 20 minutes recreational) and pay teachers additional salary in proportion.
5. Extend length of school year by one week and pay teachers additional salary in proportion.
6. Pay teachers in rural schools salary increment of 50% to have better trained teachers and raise the percentage of certified teachers.
7. Raise teachers' salaries by 10% in real terms, with no-strike agreement for two years.
8. Raise teachers' salaries by 20% in real terms, with no-strike agreement for three years.
9. Fire half the staff in the education bureaucracy (currently 5% of unit costs) and establish a new highly trained and motivated bureaucracy paid on average 2.1 times previous salary.
10. Establish management information system (MIS) for identifying low-performing schools and inform school supervisors.
11. Decentralization: give authority to school principals to manage funds and to hire and fire teachers with local council approval, with no improvement in the capacity of the ministry of education for assessment and oversight.
12. Same as above, except the ministry's capacity for assessment and oversight is improved significantly.
13. Test a 10% sample of fourth graders in mathematics and reading and provide numerical results to all fourth grade classroom teachers.
14. Test the same sample, analyse results in terms of remedial strategies, and organize local follow-up seminars for fourth grade teachers (one week).
15. Universal testing of fourth graders (same as above).
16. Provide classrooms with one standard textbook per student in mathematics as well as in reading (200 pages each) and accompanying teacher guide, without training teachers to use them.
17. Provide same as above and also train teachers to use them (one week per year).
18. Produce and provide to each student a set of learning materials for individualized instruction in reading and mathematics (400 pages per student, replaced every three years).
19. Provide small library (100 books) for each classroom (renew every five years).
20. School feeding programmes: free snack (cup of milk and bread) for everyone.
21. School feeding programmes: free snack (cup of milk and bread) provided for half the children, the rest pay.
22. School feeding programmes: free lunch for everyone.
23. School feeding programmes: free lunch for half the children, the rest pay.
24. Yearly check-up and referral by doctor. Not including medical treatment provided by the health system.
25. Eyesight test by school and referral. Not including treatment.
26. Adapt and broadcast high-quality pre-school television programmes such as Sesame Street (250 programmes). For home viewing only.
27. Media campaigns for parents to provide early stimulation to children ("Did you read one page last night to your children?"), 30 one-minute spots in one week.
28. One year of development-oriented pre-schooling for at-risk children (50%), at unit cost equal to one year of primary school.
29. Same as above at unit cost 0.5 times primary.
30. One year of caretaking of pre-schoolers with no educational development content (unit cost 0.5 of primary school).
31. Provide general in-service training for teachers (upgrading), four weeks per year (without follow-up materials for students).
32. Targeted in-service hands-on training focusing on developing classroom strategies for cooperative learning (group work) and students' active use of time (one week per year).
33. Targeted training focusing on using programmed learning materials (one week).
34. Targeted training acquainting teachers with modern curriculum objectives and strategies (one week, as in Venezuela's CENAMEC programme).
35. Establish a government grant programme to improve the quality of pre-service training to meet the challenges of the twenty-first century. Government provides US\$ 50 extra for every teacher trainee to teacher training institutions revising their programmes to emphasize active learning, high standards, commitment and responsibility.
36. Revise curriculum in mathematics and reading using local experts and send a copy to each teacher (without in-service teacher training and without field study of implemented curriculum).
37. Prepare and implement bilingual education curriculum, including materials, training and selection of teachers, in reading and mathematics, first and second grade, as well as adaptation and translation of textbooks.
38. Prepare and implement interactive radio instruction programme for mathematics and Spanish and broadcast by radio to all school children with accompanying teaching/learning materials.
39. Provide one hour per week of computer access to all primary school children at which time they study LOGO.
40. Establish a national consensus on the importance of improving basic education. Then deliver a complete learning package to schools at risk (50% lowest-performing schools): self-learning materials, training in active and cooperative learning, hands-on workshops, community involvement, school-based management, formative evaluation and systematic testing and feedback.

TABLE 2

Educational measures by operational area

Operational area	Measure number ^a
Time on task	3,4,5
Academic management	1,2
Salaries	6,7,8
Management and decentralization	9,10,11,12
Testing	13,14,15
Textbooks and self-learning materials	16,17,18,19
Food and health	20,21,22,23,24,25
Initial education	26,27,28,29,30
Teacher training	31,32,33,34,35
Curriculum	36,37
Radio and computers	38,39
Package of measures	40

^a The numbers of the measures are those assigned to them in table 1, where they are described in detail.

- and Valenzuela, 1994; Lockheed and Verspoor, 1991 and Verspoor, 1989);
- v) research into factors affecting performance (Fuller and Clarke, 1994);
 - vi) the results of the reform implemented in California (Chrispeels, 1997) and
 - vii) the suitability of this information for expression

in simple, precise terms so that estimates could be reliably compared.

The measures identified included the five “promising policy measures” selected by Lockheed and Verspoor (1991, p. 28): teaching time, text books and teaching materials, measures to increase pupils’ learning capacity (nutrition, health and initial education), teacher training and the curriculum. Also included were some measures that are prevalent in the region, even though there was evidence that they were ineffective. A preliminary version of these 40 strategies was reviewed with top officials from the countries participating in three planning courses organized by UNESCO in 1994 and 1996. By means of this process, the forty measures described in box 1 were eventually arrived at.

The public tend to believe (and pedagogical thinking tends to support them) that combinations of measures can have a cumulative effect, which is why a number of strategies combine two or more measures. For example, as well as measure 11 (decentralization giving greater authority to school principals) measure 12 is included (as above, but with greater inspection powers for the ministry), and measure 16 (provide two books to every pupil) is supplemented by 17 (as above, plus a week of teacher training).

III

The country, “Concordia”, where the strategies would be applied

In order to produce valid comparisons, a target country was devised: “Concordia”. This prototype country, which is described in box 2, was constructed on the basis of average values observed in Latin America, including demographic characteristics, cost levels, pupil-teacher ratio, school equipment and test scores. Consequently, all the responses (from the world experts and planners) are linked to a common educational context.

It was necessary to have this “artificial construct” without history or context because cost-effectiveness

will vary significantly depending on the number of students enrolled in each country’s education system, its degree of educational development and its gross domestic product per inhabitant. For example, relative equipment costs may be considerably higher in a country where the average unit cost of primary education is US\$ 100 or less, as compared with a regional average of US\$ 200. The same would be true in smaller countries where fixed costs are high and variable costs low (for example, sample-based assessments and distance learning).

Box 2
CONCORDIA

- Population: 20 million
- Rural population: 30%
- Indigenous population: 10%
- Primary education completion rate (six years): 60%
- Student-teacher ratio: 29:1
- Unit cost of primary education: US\$ 200
- Number of children in primary schooling (grades 1 to 6): 2 million
- Total cost of primary education system: US\$ 400 million
- Percentage of budget going on teachers' salaries: 90%
- Hours of schooling: four a day, 27 class periods of 45 minutes each per week
- 50% of children have (or use) basic textbooks
- There is no assessment system in place. However, a small sample of pupils were tested at the end of sixth grade. The test was based on the official mathematics and Spanish language curricula. The average test score was 50 out of 100. This score would indicate that a student had mastered what the official curriculum expected him or her to know.

IV

Characteristics of the panel of world experts

The authors selected experts who met six criteria: i) they had published articles in good professional reviews, ii) they had been cited repeatedly by education planners and professionals, iii) they had easy access to the results of recent research, iv) they had participated in projects in a variety of Latin American countries, v) they were leaders in the analysis of educational development initiatives and vi) they had experience of working with multilateral development bodies in the region. In addition, a balance was sought between the number of experts from North America and Latin America.

The names of the world experts on the panel and the institutions they work in obviate any need for further comment regarding the weight of their opinions: Martin Carnoy and Henry Levin (University of Stanford), Noel

McGinn and Fernando Reimers (University of Harvard), Claudio de Moura Castro (Inter-American Development Bank), Steve Heyneman, Himelda Martínez and Eduardo Vélez (World Bank), Jeffrey Puryear (Inter-American Dialogue) and Juan Carlos Tedesco (Geneva International Bureau of Education, UNESCO). The authors would like to take this opportunity to express their heartfelt gratitude to the panel that supported this study.

The response of the experts was enthusiastic, owing to their deep interest in the issues raised (only the two European representatives in the original sample could not respond to the survey). No systematic differences were noticed in the estimates submitted by the experts from the two regions referred to above.

V

The indicator of pupils' academic performance

The dependent variable selected was the "score obtained by the pupil in a standardized test taken at the end of the sixth grade". It was assumed that this test would be similar to the language and mathematics tests given by UNESCO/OREALC in 13 countries in 1997, in which the

average pupil answered 50% of the questions correctly (table 1). The questions in these tests embodied a consensus opinion among the participant countries as to what would be expected of a common curriculum. In this case, the tests dealing with criteria anticipate a

100% correct response rate, since that is what the curriculum requires. Consequently, with the help of the appropriate action (strategy), it is feasible that a certain number of students may obtain higher results, as was shown by the case of Cuba.

This approach is not without its problems. Many children leave school before reaching the sixth grade or repeat a year, particularly in the poorer countries. If the variable selected had been the “percentage of children completing sixth grade”, the estimates arrived at by the experts would have changed, although not significantly. For example, school meals would have had a much greater impact on pupil retention than on learning, as they are assumed to be an incentive to attend school.

Using test scores as a dependent variable is more suitable for those education systems where large proportions of students complete primary education (Costa Rica or Argentina), but is much less so in the case of primary education systems that have a high drop-out rate (Honduras or Guatemala).

In any event, almost all the region’s education systems are progressing rapidly towards the goal of six years of schooling and, consequently, stressing the quality of education is important for almost all the countries. The overall score in a sixth grade test is a simple but clear measure of current efforts to improve the quality of education in Latin America.

VI

Assessing the impact of the strategies in the prototype country

The ten world experts were asked to provide the following two estimates for each measure applied in “Concordia”: firstly, the average percentage by which academic performance would improve among sixth grade pupils who have hitherto been obtaining a score of 50 out of a 100 in a standardized reading and mathematics test, by comparison with a control group that has not benefited from the measure (table 3, column A) and, secondly, the percentage probability of the measure being fully implemented, given the technical and political considerations involved (table 3, column B).

Subsequently, the authors carried out a third estimate: the likely increase in unit operating costs result-

ing from the measure, including capital spending, calculated on an annual basis (annex 1 and table 3, column D).

It was considered inappropriate to ask the experts for an estimate of the costs, as this is a technical matter that would take a long time to work through and that, furthermore, has a “right” answer (or an answer that the reader can amend on the basis of the situation in a specific country). The standard used for the cost estimates was a medium-sized, middle-income country in the region (see the characteristics of “Concordia”). A detailed explanation of the calculations is given in the annex.

VII

Calculating the cost-effectiveness index

Using the estimates described, a cost-effectiveness index was produced for each measure. This was calculated on the basis of the following:

- a = percentage of the school population benefiting from the measure;
- b = assuming that the measure is fully implemented,

- percentage increase expected in the test scores of the beneficiary population;
- c = percentage probability of the measure being fully implemented, and
- d = percentage increase in annual operating costs for the beneficiary population.

TABLE 3

Expert opinion on the cost-effectiveness of educational measures

Number and description of measure, in descending order of cost-effectiveness ^a	A Estimated increase in academic performance (%) ^b	B Likelihood of adequate implementation (%) ^c	C Likely impact (%) [A*B]	D Estimated increase in cost (%) ^d	E Cost- effectiveness [C/D]	F Unit cost of increasing academic performance by one point (dollars)
2. Assign best teachers to first grade	19.8	58.0	11.5	0.0	1531.2	0.003
3. Enforce regulations on official length of school year	10.6	49.5	5.2	0.0	699.6	0.006
1. Policy of not switching classroom teachers during school year	5.0	72.0	3.6	0.0	480.0	0.008
13. Carry out testing of 10% of fourth graders and distribute results to teachers	4.1	73.5	3.0	0.1	60.3	0.066
11. Decentralization	9.3	47.5	4.4	0.1	59.2	0.068
27. Media campaigns to encourage parents to provide early stimulation and read with their children	8.1	71.9	5.8	0.1	46.6	0.086
10. Use of MIS to identify low-performing schools	10.2	68.0	6.9	0.3	27.7	0.144
25. Eyesight testing by school and referral	3.2	66.0	2.1	0.1	21.1	0.189
35. Grant programme (US\$ 50/student) to improve pre-service teacher training	11.8	56.0	6.6	0.4	18.9	0.212
14. Carry out testing of 10% of fourth graders and provide remedial strategies (one week)	12.3	60.0	7.4	0.4	17.4	0.230
9. Reduce size of bureaucracy and pay higher salaries	8.9	36.0	3.2	0.3	12.9	0.311
36. Revise curriculum in mathematics and reading, and distribute	1.9	66.9	1.3	0.1	12.7	0.315
38. Interactive instruction by radio	10.7	57.5	6.2	0.5	11.4	0.350
37. Prepare and implement a bilingual curriculum	11.7	50.6	5.9	0.5	11.2	0.356
15. Universal testing of fourth graders	12.3	62.5	7.7	0.8	9.7	0.411
18. Provide learning materials for individualized instruction	16.5	72.5	12.0	1.5	8.0	0.500
26. Broadcast high-quality pre-school television programmes	8.2	72.4	5.9	0.8	7.9	0.505
12. Decentralization with good supervision	19.4	53.5	10.4	1.3	7.8	0.510
16. Provide standard textbooks for use in class	11.5	74.5	8.6	1.5	5.7	0.699
19. Provide classrooms with small libraries	8.5	76.5	6.5	1.4	4.7	0.846
17. Provide standard textbooks and train teachers in usage	18.4	66.0	12.1	3.8	3.2	1.235
5. Extend length of school year by a week	8.0	83.5	6.7	2.3	3.0	1.347
32. Train teachers in developing cooperative learning methods	12.2	52.0	6.3	2.3	2.8	1.419
33. Train teachers in using programmed learning materials	7.6	64.0	4.9	2.3	2.2	1.850

(continued on next page)

Table 3 (continued)

Number and description of measure, in descending order of cost-effectiveness ^a	A Estimated increase in academic performance (%) ^b	B Likelihood of adequate implementation (%) ^c	C Likely impact (%) [A*B]	D Estimated increase in cost (%) ^d	E Cost- effectiveness [C/D]	F Unit cost of increasing academic performance by one point (dollars)
34. Acquaint teachers with modern curriculum	7.0	64.0	4.5	2.3	2.0	2.009
40. Multiple interventions: learning packages, school-based management, training, testing	26.8	45.0	12.1	7.0	1.7	2.322
29. Development-oriented pre-schooling (50% unit cost of primary school)	13.0	54.5	7.1	4.2	1.7	2.354
28. Development-oriented pre-schooling (100% unit cost of primary school)	18.3	51.5	9.4	8.3	1.1	3.538
24. Yearly check-up and referral by doctor	4.1	61.5	2.5	2.4	1.1	3.807
30. Caretaking of pre-schoolers with no educational development	5.7	65.9	3.8	4.2	0.9	4.441
6. Pay teachers in rural schools salary increment of 50%	18.6	65.0	12.1	13.5	0.9	4.467
4. Extend daily schedule by one hour	17.0	67.0	11.4	15.0	0.8	5.268
7. Raise teachers' salaries by 10%	6.3	72.5	4.6	9.0	0.5	7.882
21. School feeding programmes (50% receive free snack)	5.1	63.0	3.2	6.8	0.5	8.403
8. Raise teachers' salaries by 20%	10.7	74.5	8.0	18.0	0.4	9.032
20. School feeding programmes (100% receive free snack)	5.6	74.5	4.2	13.5	0.3	12.943
31. In-service training for teachers without follow-up materials	4.1	63.5	2.6	10.0	0.3	15.364
23. School feeding programmes (50% receive free lunch)	6.9	59.0	4.1	18.0	0.2	17.686
39. Provide one-hour access to computers each week	4.4	51.5	2.3	14.9	0.2	26.337
22. School feeding programmes (100% receive free lunch)	8.1	67.5	5.5	36.0	0.2	26.337
Averages	10.3	62.8	6.5	5.1	76.9	4.1

^a See box 1 for detailed descriptions of the measures.

^b Estimated average percentage increase in student achievement in a standardized mathematics and reading test given to sixth graders, with an initial score of 50 out of 100, compared to a control population that did not benefit from the measure.

^c Percentage probability of the measure being implemented adequately given the technical and political considerations involved.

^d Likely increase in annual unit operating costs as a result of the measure, including projected annualized capital cost.

For the beneficiary population I (Index) = $b*c/d$; for the population as a whole both the costs and the effects fall proportionately, although the index value remains unchanged (for example, $I = b*c*a/d*a$).

Table 3 gives the efficiency index values of the 40 measures considered, in descending order. However,

there are many possible ways of summarizing the information from this table and drawing conclusions, including the percentage increase expected in test scores, the rise in scores in relation to the feasibility of implementing the measure, and cost-effectiveness.

VIII

Cost per unit of impact

It is sometimes useful to compare the different measures by the cost of raising academic performance by 1% with each of them. This “cost per unit of impact (K)” is equal to the total annual cost divided by the likely impact. In this case: $K = d \cdot 200 / (50 \cdot b \cdot c)$. In the formula, 200 is the average unit cost in dollars (box 2) and 50 is the average number of correct answers in the test.

The results are given in column F of table 3. They are proportional to the cost-effectiveness index and take account of the different weightings arrived at by considering the two constants (200 and 50).

Because of this characteristic, analysis of the results is carried out only for the cost-effectiveness index.

IX

Analysis of the main results

The six measures that in the judgement of the experts would have the greatest impact on learning if implemented successfully have been identified (table 4).

As was expected, the first place is taken by an approach based on “systems” that bring together a great variety of measures. By a wide margin, this is deemed to be the strategy that can be expected to produce the greatest effects, if implemented properly. It is interesting to note, however, that the next five strategies are single-measure ones and have an effect that is very similar in scale. These include assigning the best teachers to the first grade, introducing a decentralized system while strengthening the central authority, giving rural teachers a substantial pay rise, providing standardized text books and training in their use and offering development-oriented pre-school programmes.

However, the experts expressed their concern about the difficulty of putting these approaches into practice, particularly the system-based one (column B of table 3). When the expected effect on learning and the likelihood of proper implementation are taken into account simultaneously (the two estimates are multiplied) the likely impact changes considerably (column C of table 3). Table 5 shows the six strategies that then have the greatest impact.

The six best measures now include extending the school day by one hour and providing personalized learning packages. It can be seen that, once the

difficulties of application are considered, the system-based approach is no more efficient than providing a number of inputs separately. Furthermore, pre-school programmes and decentralization, being difficult to put into practice, drop out of the list of the six best measures.

The effectiveness of strategies, however, has to be compared on the basis of a similar increase in cost. When the likely (net) increase in performance is divided by the increase in cost (column E of table 3), then the most desirable strategies can finally be identified. Table 6 shows the six measures that obtained the highest overall index value for cost-effectiveness.

The measures calculated as having the highest cost-effectiveness index value are not the ones expected to have the greatest impact, a number of them being associated with some type of impact that is virtually cost-free. The only measure that is kept is number 2 (assigning the best teachers to the first grade) as, despite its very low cost, the experts consider that it would have a large impact.

Another measure that meets this condition is enforcement of the regulations on the length of the official school year, although this could entail political complications, especially in countries where teacher strikes are common. Preventing teachers from switching class during the school year does not involve major costs either, but could cause administrative problems. A teacher withdrawing during the school year would have to be replaced by

TABLE 4

The six measures with the greatest impact on the target population if implemented successfully
(Percentages)

Measure	Expected increase in test scores
40. Multiple interventions: learning packages, school-based management, training, testing	26.8
2. Assign best teachers to first grade	19.8
12. Decentralization with good oversight	19.4
6. Pay teachers in rural schools salary increment of 50%	18.6
17. Provide standard textbooks and train teachers in usage	18.4
28. Development-oriented pre-schooling (100% unit cost of primary school)	18.3

TABLE 5

The six measures with the greatest impact on the target population, taking into account the feasibility of implementation
(Percentages)

Measure	Expected increase in test scores
17. Provide standard textbooks and train teachers in usage	12.1
40. Multiple interventions: learning packages, school-based management, training, testing	12.1
6. Pay teachers in rural schools salary increment of 50%	12.1
18. Provide learning materials for individualized instruction	12.0
2. Assign best teachers to first grade	11.5
4. Extend daily schedule by one hour	11.4

a temporary stand-in, as an alternative to transferring a teacher from another school.

The cost of administering tests to samples of pupils is considerably lower than the cost of doing so by means of cluster sampling. For this latter method to be practical, the results would have to be presented to the user in an amicable fashion and include suggestions for improvement.

In the experts' opinion, centralized educational administration in the region is so "ossified" that decentralization, even without a stronger supervisory authority, ought to have a positive effect, being virtually

TABLE 6

Measures expected to have the highest cost-effectiveness index value

Measure	Cost-effectiveness index value
2. Assign best teachers to first grade	1 531.2
3. Enforce regulations on official length of school year	699.6
1. Policy of not switching classroom teachers during school year	480.0
13. Carry out testing of 10% of fourth graders and distribute results to teachers	60.3
11. Decentralization (without improving oversight)	59.2
27. Media campaigns to encourage parents to provide early stimulation and read with their children	46.6

TABLE 7

Measures expected to have the lowest cost-effectiveness index value
(Percentages)

Measure	Cost-effectiveness index value
22. School feeding programmes (100% receive free lunch)	0.2
39. Provide one-hour access to computers each week	0.2
23. School feeding programmes (50% receive free lunch)	0.2
20. School feeding programmes (100% receive free snack)	0.3
31. In-service training for teachers without follow-up materials	0.3
8. Raise teachers' salaries by 20%	0.4

cost-free. Lastly, media campaigns apparently cost relatively little, but can have a considerable impact.

Table 7 shows the measures that have the lowest cost-effectiveness value. Obviously, school meal programmes are expensive and their effect on learning might be only marginal, but they could have a substantial influence on other parameters, such as attendance, health and income distribution. Again, modest pay rises that are not accompanied by greater responsibilities are not an efficient approach (in terms of cost). Lastly, computers are apparently not at present an efficient option for primary education either.

X

Comparison of these results with the estimates of Latin American planners

When the estimates of the panel of experts are compared with those of the planners and advisers in Latin American ministries of education who attended the planning courses run by UNESCO in 1994 and 1996, it is found that the latter are more optimistic than the experts about the impact the measures could have (on average, 19% as against 10%). It is possible that the planners are not sufficiently familiar with the literature dealing with the effectiveness of measures, which tends to be very conservative (Schiefelbein, Wolff and Schiefelbein, 1998). Again, when it came to opinions about the likelihood of successful implementation, exactly the opposite occurred (48% as against 63%). In particular, the planners inclined less towards action requiring higher financing, and their figure for the increase in unit cost produced by each measure was 14% on average, almost three times the percentage arrived at by the authors (5%).

As regards cost-effectiveness calculations, the values obtained by the planners and the experts are of the same order (when compared using the cost estimates in the annex), although there are some differences. The planners attribute appreciably greater cost-effectiveness than do the experts (more than double) to decentralization (No. 11), prevention of class switching by teachers (No. 1), improvements in pre-service teacher training (No. 35), curricular changes (no. 36), pre-school programmes (Nos. 29 and 30), traditional in-service training initiatives (No. 31) and computer use (No. 39). The experts, meanwhile, attribute greater cost-effectiveness only to those measures that involve slimming down bureaucracy (No. 9), television programmes for pre-school children and media campaigns (Nos. 26 and 27), lengthening the school day and year (No. 4 and no. 5), a salary increment for rural teachers (No. 6) and higher pay for teachers (Nos. 7 and 8).

XI

Conclusions of the cost-effectiveness estimates for the 40 strategies

The cost-effectiveness index is a tool designed to “make thinking explicit”, and the coefficients analysed have the limitations (and strengths) of the experts who submitted their estimates. Its main value lies in the help it offers in formulating important questions about the components included in the projects under consideration. It comes at a very good time for Latin America, given the growing consensus regarding the fundamental role played by education in economic and social success, the interest of the region’s presidents as expressed in an agreement signed at the Heads of State Summit in 1998, the large increase in educational investment made by governments and international organizations in the 1990s and the low impact levels revealed by the reports of OECD (2000) and UNESCO (2000).

The need to decide on strategies in the sphere of education concerns not just those working in this field but also political and business leaders. Perhaps the simple instrument devised may help those who have to take decisions to distinguish between strategies that “might possibly be expected to work” and those that “are unlikely to do so” and aid in building a stronger social consensus over the need to invest efficiently in the education sector.

The exercise carried out is also an excellent training method for policy makers and planners, as it forces them to make their thinking explicit. The best way of going about this is to set up small groups that work with around five measures. The idea is to work as a team and submit the conclusions to a plenary session. This

reduces inconsistencies, ambiguities and contradictions over the cost-effectiveness of the project or strategy.

Generally speaking, many of the programmes and projects implemented in Latin America do not accord with the recommendations derived from this exercise. In particular, simple, low-cost approaches such as teacher assignment and continuity and media campaigns are not usually included in projects. Unfortunately, when empirical information is obtained, very few measures can show substantial improvements in the level of learning.

The above is particularly true of measures that are currently in vogue, such as decentralization, testing and computer use. Mistakes are costly, and at a time when

education is being proclaimed as a key factor in economic and social development, and a great deal of investment is being put into it in the region and around the world, it is indispensable for the impact of the different measures to be re-examined.

The fact that no more than 10 experts participated, even though these were unquestionably of the highest level, may reduce the reliability of the results: if just one of them expressed an exceptional view, the effect on the overall average would be significant. The authors have identified other experts and recommend that, at a later date, new surveys be conducted with the participation of 20 to 25 experts. Similar exercises can be carried out for intermediate and higher education.

XII

Recommendations deriving from examination of the results

The exercise suggests four recommendations for policies associated with educational measures:

- i) Implement those measures that have a “large impact on performance”, particularly those involving multiple initiatives, teaching materials and differential support for rural education, where the cost is moderate. These measures should be implemented because of the considerable effect they can be expected to have, in spite of the cost. Caution is needed, however, in regard to potential problems with developing and applying them.
- ii) Implement measures that cost very little and have a positive impact. These are the ones that are generally overlooked (for example, regulating the length of the school year or assigning good teachers to the first grade).
- iii) Avoid measures that entail a high cost and that do not in themselves (in the absence of supplementary activities or objectives) produce a major impact, i.e. do not constitute a good investment. This applies particularly to pay rises, computer use and school feeding programmes.
- iv) Compare the projects put forward for improving the country’s education with the estimates of the panel of experts and account for the differences. At the least,

having available a range of strategies on which the experts have given their views makes it possible to arrive at a detailed explanation of these differences.

When questions are formulated in future, it would be advisable for the expected costs and effects to be made explicit, with a view to giving greater transparency to the thinking of those proposing the strategies in relation to more debatable aspects which may or may not work in certain circumstances. Exercises of this type can give education policy planners timely warning of the relative value of the strategies they have adopted, enabling them to reassess their assumptions. Calculating the cost of measures is very useful in itself, as this is something that is not generally done in a systematic way. Thus, these estimates can be used for evaluation purposes, or at least to provide a reference figure, with a view to calculating how much the components of these projects would cost in different countries.

Latin America now has a great opportunity to carry out applied research, as all the countries in the region are conducting assessments on a national scale, whether by means of pupil samples or clusters, and will now be in a position to use this research as an instrument to help them identify which strategies produce the best learning outcomes.

ANNEX 1

Estimated unit cost increase of each educational measure^a

Measure	Increase in unit cost (%)	Explanation of cost calculation
1	0.01	Nominal cost of US\$ 30,000.
2	0.01	Nominal cost of US\$ 30,000 for information and oversight.
3	0.01	Nominal cost of US\$ 30,000 for providing information and ensuring enforcement.
4	15.0	A 16.7% increase in hours, giving a 16.7% increase in salaries (90% of total cost). 16.7% times 90% is 15%, or US\$ 30 per student.
5	2.3	One extra week of work, as above, giving US\$ 4.50.
6	13.5	30% of students are in rural areas. For this group, teacher salary increase is 50% of 90% of unit cost (0.45 times US\$ 200) or US\$ 90 per student in the target group. For the system as a whole, cost is US\$ 27 per student (total cost is US\$ 90 times 600,000 against a total of US\$ 400 million).
7	9.0	Increase would be US\$ 18 per student.
8	18.0	Increase would be US\$ 36 per student.
9	0.3	Bureaucrats are 5% of the total budget, or US\$ 20 million, which is US\$ 10 per student. Cost is cut by half to US\$ 10 million by reducing number of bureaucrats by half and increased by US\$ 10.5 million by better salaries. Resultant increase is US\$ 500,000. Can also be calculated directly on unit cost basis. Current cost is US\$ 10. If bureaucracy halved, unit cost is US\$ 5; if cost is increased 2.1 times, new unit cost is US\$ 10.5. Total unit cost increase is US\$ 0.50.
10	0.3	Cost of MIS estimated at US\$ 1,000,000 or US\$ 0.50 per student.
11	0.1	Since there is no improvement in ministry of education capacity for oversight and assessment, the cost is estimated at only US\$ 300,000 or US\$ 0.15 for booklets for principals and PTAs plus dissemination and an information system.
12	1.3	To improve flow of information and capacity for regulation and oversight, cost is about US\$ 3 million to strengthen testing, statistics and financial management. Testing is US\$ 5 per student for 330,000 students in fourth grade, plus about US\$ 1,000,000 for MIS and miscellaneous costs of US\$ 300,000. Total unit cost is US\$ 2.65.
13	0.1	Approximately US\$ 5 per student for adequate testing. However, only 10% of fourth graders are tested. Fourth graders are 1/6 of the total, therefore 1.67% of all students are tested. For these students, the cost is US\$ 5; for the system as a whole the cost is US\$ 0.08. Distributing the results to fourth grade teachers adds US\$ 0.02 to give a total of US\$ 0.10.
14	0.4	The cost of the follow-up seminar, provided to all fourth grade teachers, is the same as one week of teacher's time, giving US\$ 4.50. Unit cost is US\$ 4.50/6 or US\$ 0.75 plus the US\$ 0.10 for testing which gives US\$ 0.85 for the system as a whole.
15	0.8	Includes one week of training. Universal testing of all fourth graders is conducted, for cost of 1/6 of US\$ 5.00 or US\$ 0.83, plus US\$ 0.75 of training. Total cost is US\$ 1.58.
16	1.5	Should state that two textbooks are provided (Spanish and mathematics). Assumes US\$ 1.50 for each book for total of US\$ 3 per student.
17	3.8	Teacher salary is assumed to be 90% of US\$ 200 unit cost, which is US\$ 180 per student. Divided by 40, one week of teacher's time comes to US\$ 4.50 per student. If we add this to the US\$ 3 per student above, we arrive at US\$ 7.50.
18	1.5	Cost of printing is US\$ 8.75 (four textbooks) and cost of preparation is US\$ 500,000 which is US\$ 0.25 per student. Overall cost is US\$ 9. Books last for three years, yielding US\$ 3 cost.
19	1.4	Assume each book costs US\$ 2 (in bulk), so library costs US\$ 400. Cost over five years is US\$ 80. With 29 students per classroom unit cost is US\$ 2.75.
20	13.5	Estimate milk at US\$ 0.10 and bread at US\$ 0.05. Total is US\$ 0.15 times 180 days or US\$ 27 per student.
21	6.8	Same as above but given to half the students; hence, unit cost is US\$ 13.50.
22	36.0	Lunch is estimated at US\$ 0.40 per day; therefore, cost is US\$ 0.40 times 180 or US\$ 72 per student.
23	18.0	Half of above or US\$ 36.
24	2.4	Detection only. Does not include medical treatment provided by the health system. One doctor can check 28 students a day or, over 180 days, about 5,000 per year. Doctor's salary is US\$ 24,000 so the unit cost is US\$ 4.80.
25	0.1	Detection only, but near-sighted students can sit at the front. Can be done by teacher if materials and some extra money are provided. Cost is US\$ 0.20 per student.
26	0.8	250 television programmes provided for home viewing only. Estimate absolute cost at US\$ 3 million, assuming high-quality programmes such as Sesame Street purchased.
27	0.1	Estimate overall cost at US\$ 500,000 for preparation and purchase of television time, which is US\$ 0.25 per student.

(continued on next page)

ANNEX 1 (continued)

Measure	Increase in unit cost (%)	Explanation of cost calculation
28	8.3	Cost is US\$ 200 for 50% of students pro-rated over 6 years which comes to US\$ 33.33 for the target group and US\$ 16.67 per student for the system as a whole.
29	4.2	Half the cost. Results in US\$ 16.67 for the target group and US\$ 8.34 per student for the system.
30	4.2	Provided to 50% of students. Cost is same as above.
31	10.0	Four full weeks of teacher upgrading is estimated at four times US\$ 4.50 which comes to US\$ 18. Adding cost of course preparation, material and travel gives approximately US\$ 20.
32	2.3	Training for one week is estimated at US\$ 4.50 as above.
33	2.3	Same as above.
34	2.3	Same as above.
35	0.4	Grant programme is estimated at US\$ 200 per graduate teacher (US\$ 50 x 4) who will teach for 10 years, so the cost is US\$ 20 per year per teacher. Since there are 29 students per teacher, the annual cost is 20/29 or US\$ 0.70. (Another way of looking at this is that each year 7,000 new teachers are trained to replace 10% of teaching force of 70,000. 7,000 new teachers times US\$ 200 gives US\$ 1,400,000 or a US\$ 0.70 unit cost).
36	0.1	Not based on detailed research but rather on contracting local experts and distributing curriculum guide. Cost estimated at US\$ 400,000, mainly for local experts and a very small amount for distributing curriculum guide (US\$ 1 per guide, 70,000 copies).
37	0.5	Bilingual curriculum has a low fixed cost of about US\$ 100,000 to contract bilingual teachers. This is US\$ 0.50 per student reached (10% of students). Books have to be provided and teachers trained for at least one week per year. Therefore, the variable cost for 10% of the population is US\$ 4.50 for one week of training plus three books at US\$ 2 each totalling US\$ 6; total is about US\$ 10.55 for indigenous students. Cost to the entire system is 10% or US\$ 1.05.
38	0.5	US\$ 500,000 for preparation which is US\$ 0.25 per student, without using foreign technical assistance (case of Venezuela). Cost of radio (US\$ 29 per set per class) is about US\$ 1 per student but it lasts three years so it is US\$ 0.33. Materials are about US\$ 0.50. Total unit cost is US\$ 1.08.
39	14.9	US\$ 2,000 for the computer plus US\$ 100 for other physical modifications. Computer lasts four years; therefore, computer cost is US\$ 525 a year. Computer serves 30 students at one hour per week (30 hours per week) or US\$ 16.50 per student. Add a full-time teacher working 27 hours per week (once in the week a class works with two teachers for one period). Teacher cost comes to 1/27 of 90% of unit cost, or US\$ 6.67. Maintenance for computer is US\$ 200 per year or another US\$ 6.67 per student. Total is US\$ 29.84 per student. Cost could be reduced significantly if outdated computers were purchased for US\$ 1,000, which would also reduce security and maintenance costs by half. Another option is to hire a technician rather than a teacher at 2/3 cost. Total cost could be reduced to US\$ 8.25 plus US\$ 5 plus US\$ 3.33 or US\$ 16.58; this, however, may not be feasible.
40	7.0	Cost is based on above calculations as follows: textbooks US\$ 3; self-help learning materials US\$ 3; one week's training US\$ 4.50; local school management US\$ 2.65; evaluation system US\$ 0.85. Total cost is US\$ 14.

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