Cost-Effectiveness of Education Policies in Latin America:

A Survey of Expert Opinion

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The opinions expressed herein are those of the authors and do not necessarily reflect the official position of the Inter-American Development Bank. Readers who wish to utilize the methodology described in this paper should request permission from the authors via e-mail (larryw@iadb.org or eschief@ust.cl).

Foreword

The paper you are about to read provides a new approach to estimating the cost-effectiveness of educational interventions in primary education based on expert opinions.

Many educational investments continue to be made on the basis of untested or partially tested assumptions about the cost-effectiveness of particular interventions. In fact, current knowledge about cost-effectiveness in education is extraordinarily inadequate, especially considering the huge amounts of money that go into education. The authors devised a questionnaire and gave it to ten international experts, mainly located in universities and international agencies, all of whom were well acquainted with educational research and with practical attempts at educational reform in the region; as well as to about 30 Latin American planner/practitioners, most of them working in the planning office of their ministry of education. Each respondent was asked to estimate the impact of 40 possible primary school interventions on learning as well as the probability of successful implementation. Using their own estimates of the incremental unit costs of these interventions, the authors created an index ranking the cost-effectiveness of each of the 40 interventions.

This is the first time an index of this type has been created. While the results of this exercise provide no magic bullet for improving primary education, the exercise does help planners to clarify the assumptions underlying decisions made or to be made about priority educational investments. It also provides a new and potentially highly effective instrument for consensus building and for training of education decision makers throughout the world.

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Summary

This paper provides an alternative approach to measuring the cost-effectiveness of educational interventions. Rather than reviewing or undertaking empirical research, the authors measure the opinions of leading world educational researchers acquainted with Latin America. They also poll practicing education planners in the region and compare the opinions of the two groups.

This approach is very timely. While education is increasingly considered the key to economic success, and investments in education by national governments as well as international agencies are growing, most educational investments continue to be made on the basis of untested or partially tested assumptions about the cost-effectiveness of particular interventions. In fact, current knowledge about cost-effectiveness in education is extraordinarily inadequate, especially considering the huge amounts of money that go into education.

Given the importance of the subject and the difficulty in undertaking traditional cost-effectiveness research in education, intermediate and less time-consuming approaches to measuring cost-effectiveness should be sought, as means of helping researchers and practitioners to gain a better understanding of the issues related to this important subject. With this in mind the authors devised a questionnaire given to ten international experts, mainly located in universities and international agencies, and about 30 Latin American planner/practitioners, most of them working in the planning office of the ministry of education. Each respondent was asked to estimate the impact of 40 possible primary school interventions on learning (as defined by the score on a standardized test given at the end of sixth grade), as well as the percentage probability of successful implementation. The authors plugged in their own estimates of the incremental unit costs of these interventions, and then created an index ranking the cost-effectiveness of each of the 40 interventions.

The experts were reasonably consistent in their estimates. The main conclusions from this exercise are as follows:

- Educational decisions throughout Latin America are often made without due consideration of cost-effectiveness. Expensive interventions are often undertaken where less costly ones could have a major impact. Simple things with potential high impact are not being done.

- The following almost costless but effective interventions should be considered: assign best teachers to first grade; do not switch teachers during the school year; enforce the regulations on the official length of the school year; undertake mass media campaigns for parents to read to children; undertake sample testing of children and distribution of results.

- Latin American countries need to look twice at some very expensive interventions which have a small impact on learning. These especially include school feeding programs, computers, and raising overall teachers' salaries without complementary elements.

- Some interventions are of moderate to high cost but have a significant impact. The intervention with the highest potential increase in achievement is that of a "multiple package" of

targeted in-service training, materials, assessment, and feedback. Other interventions with the highest probable impact are those related to learning materials, extending the school day, pre-schooling, and raising rural school teachers' salaries.

- There appears to be a consensus in Latin America that decentralization is cost-effective even if it is not accompanied by strengthening the capacity of the ministry of education. This could well be a result of the current extraordinarily "ossified" central management or else it could be wishful thinking. In any event the expected impact of decentralization is low (but costs are low).

- Latin American practitioner/planners were more enthusiastic than the experts about the theoretical impact of interventions, but pessimistic about the potential for implementation, especially with regard to politically or financially difficult reforms. The practitioners did not seem to know how to estimate the costs of interventions. Therefore their advice to ministers could be misleading.

- Educational decision makers need to be more explicit about the justification for their decisions and about trade-offs, and need to undertake explicit consensus building for education reform.

Overall the exercise has created, for the first time, an index of cost-effectiveness of educational interventions in the region; identified inconsistencies, ambiguities, and contradictions in the opinions about cost-effectiveness; identified agendas for research which should eventually be the basis for objective decisions on education development; devised an effective teaching and consensus building tool; and identified training needs for practitioners in the region.

This exercise should be refined and improved by contacting larger numbers of experts and undertaking more sophisticated analyses, and should be tried out in other regions (e.g., Africa and Southeast Asia). It should be used worldwide to build a consensus among education decision makers and in training courses for upgrading the skills of educational planners.

Objectives and Approach

Education is increasingly considered the key to economic success and investments in education by national governments as well as international agencies are growing. In spite of this increased interest, most educational investments are made on the basis of untested or partially tested assumptions about the cost-effectiveness of particular interventions. In fact current knowledge about cost-effectiveness in education is extraordinarily inadequate, especially considering the amount of money that goes into education. The problem is that measuring the cost-effectiveness of educational interventions is a difficult, time-consuming and costly task requiring sophisticated research instruments. In the developing world only a small number of studies on cost-effectiveness of educational interventions have been completed; even these are often not taken into account when designing education reforms.

As of 1998, only a few successful education experiments in Latin America had been adequately evaluated and the results widely disseminated: radio mathematics in Nicaragua (Jamison et al, 1981); educational TV in El Salvador (Hornik, 1973); Northeast Education program in Brazil (Harbison and Hanushek, 1992); Escuela Nueva in Colombia (McEwan, 1995; Psacharopoulos et al, 1995; Rojas and Castillo, 1988); P-900 in Chile (Gutman, 1993); Escuelas Fe y Alegría (Swope et al, 1998); EDUCO in El Salvador (Ministerio de Educación, 1996); and accelerated primary schools in Brazil (Oliveira, 1998). However, in most cases interventions were carried out simultaneously and the effects of a single strategy were difficult to evaluate. In the past, educational experiments have not generally been evaluated in the region. Thus, while some of them could well have been highly successful, the lack of documentation means that they are not replicated. In some cases where research has been completed it has not been disseminated. Happily this situation is changing as more research is forthcoming, especially as a result of the increased number of national assessments of learning which provide clearly measurable targets of the impact of interventions.

The question of what is the most effective way for schools to use their limited resources is particularly critical for Latin America. The region is far behind its competitors in terms of quantity (school completion rates and the average level of education of the labor force) and quality (in terms of learning). In particular, recent international comparisons of students' achievements show the poor quality of education in the region (Elley, 1992; ETS, 1992; IEA, 1997). Given the importance of the subject and the difficulty in undertaking traditional cost-effectiveness research, an intermediate and less time-consuming approach should be sought. This approach could help researchers and practitioners to gain a better understanding of the issues.

With this in mind, a select group of ten leading educational researchers and policy analysts acquainted with Latin America were provided with a list of 40 interventions in basic education, most of which have been used in education reform attempts carried out in the last decade in the region (Tables 1 and 2). They were also provided with the description of a "typical" Latin American country (Table 3). For each one they were asked to provide the following:

a) the estimated average percentage increment in student achievement on a standardized test

in mathematics and reading, given to sixth graders, with an initial score of 50 out of 100, compared to a control population which did not receive the intervention (Table 4, column A); and

b) the probability (in percentage) of adequate implementation of the intervention, based on both technical and political considerations (Table 4, column B).

The same set of questions were provided to 30 practicing educational planners who participated in an educational planning course held at UNESCO/Orealc in Santiago, Chile, in November 1997.

The authors then estimated the following:

c) the probable increment in annual operational unit cost from the intervention, including the annualized capital cost (Table 4, column D).

Using these estimates an index of estimated cost-effectiveness for each intervention was created. The index was calculated as follows:

a = % of school population benefiting from the intervention

b = if fully implemented, expected % increase in the test score of the target population

c = % probability of full implementation of the intervention

d = % increase in annual operational cost for the benefited population

I (index) = b*c/d for the target population; for the population as a whole, the costs and impact are reduced proportionally but the value of the index remains the same (e.g., I = b*c*a/d*a).

In principle, any intervention with a score above 1.0 can be considered to have a positive cost-effectiveness ratio. This approach is somewhat similar to the development of "DALYS" in the health sector (see Bobadilla and the World Bank World Development Report of 1993) in which cost-effectiveness estimates were derived from expert opinion on the extent that illnesses would affect the productivity of individuals.

The 40 interventions presented to the experts (see Table 2) were selected based on: the components of educational projects and programs, both successful and unsuccessful, implemented in Latin America in the last twenty years; educational policy recommendations and priorities proposed by international organizations and development banks (Lockheed and Verspoor, 1991; World Bank, 1994; Carnoy and Castro, 1997); main findings in regional diagnostic surveys carried out in the 1990s (OAS, 1998; Wolff et al, 1994); research reviews of previous studies on the cost-effectiveness of key strategies (Wolff et al, 1994; Lockheed and Verspoor, 1991; Verspoor, 1989); and the possibility to be expressed in a simple and accurate way so that the comparison of estimations could be reliable. The political and/or cost difficulty of implementing the interventions varies.

The interventions identified include the five "promising policy interventions" selected by Lockheed and Verspoor (1991, p. 28): instructional time; textbooks and learning materials; increasing the learning capacity of students (food, health, and initial education); teacher training; and curriculum. The strategies were also consistent with the California reform experience (Chrispeels, 1997). A number of interventions that are common in Latin America were also included despite the fact that there is at least some evidence that they are not effective. A first version was tried out with participants in three UNESCO planning courses held between 1994 and 1996. The experience was used to organize the strategies into twelve operational areas, as seen in Table 1.

Table 1: Education Interventions by Operational Area

Area	Intervention Number*
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 interventions	40

(*) Intervention numbers correspond to Table 2.

Table 2: Forty Possible Education Interventions in Latin America

1. Enforce a policy not to switch classroom teachers during school year.
2. Implement a policy to assign 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 minute recreational) and pay teachers additional proportional salary.
5. Extend length of school year by one week and pay teachers additional proportional salary.
6. Pay teachers in rural schools salary increment of 50 percent to have better trained teachers and raise the percentage of certified teachers.
7. Raise teachers' salaries by 10 percent in real terms, with no-strike agreement for two years.
8. Raise teachers' salaries by 20 percent in real terms, with no-strike agreement for three years.
9. Fire half the staff in the education bureaucracy (currently 5 percent of unit costs) and establish a new highly trained and motivated bureaucracy paid on average 2.1 times previous salary.
10. Establish 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 percent sample of 4th graders in math and reading and provide numerical results to all 4th grade classroom teachers.
14. Test the same sample, analyze results in terms of remedial strategies, and organize local follow-up seminars for 4th grade teachers (one week).
15. Universe testing of 4th graders (same as above).
16. Provide classrooms with one standard textbook per student in math 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 (1 week per year).
18. Produce and provide to each student a set of learning materials for individualized instruction in reading and math (400 pages per student, replaced every three years).

19. Provide small library (100 books) to each classroom (renew every 5 years).
20. School feeding programs: free snack (cup of milk and bread) for everyone.
21. School feeding programs: free snack provided for 1/2 of the children, the rest pay.
22. School feeding programs: free lunch for everyone.
23. School feeding programs: free lunch for 1/2 of the children, the rest pay.
24. Yearly checkup and referral by doctor. Not including medical interventions which come from the health system.
25. Vision test by school and referral. Not including treatment.
26. Adapt and broadcast high quality preschool TV programs such as Sesame Street (250 programs). For home viewing only.
27. Mass 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 developmentally oriented pre-schooling for at-risk children (50 percent), 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 to teachers (upgrading), 4 weeks per year (without follow-up materials for students).
32. Targeted in-service hand-on training focussing on developing classroom strategies for cooperative learning (group work) and students' active use of time (one week per year).
33. Targeted training focussing 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 program).
35. Establish a government grant program to improve the quality of pre-service training to meet the challenges of the 21st century. Government provides $50 additional for every teacher trainee to teacher training institutions revising their programs to emphasize active learning, high standards, commitment and responsibility.
36. Revise curriculum in math and reading using local experts and send a copy to each teacher (without teacher in-service 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 math, 1st and 2nd grade, as well as adaptation and translation of textbooks.
38. Prepare and implement interactive radio instruction program for mathematics and Spanish and broadcast by radio to all school children with accompanying teaching/learning materials.
39. Provide one hour per week of access to computers 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 percent 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.

Since there is increasing consensus that combinations of interventions may have a cumulative impact, a number of the forty combine two or more interventions. For example, in addition to strategy 11 "decentralization of authority to school principals," there is strategy 12 "same as 11 but improving capacity of the ministry for monitoring." Also, in addition to strategy 16, "provide two textbooks per student," there is strategy 17 "same as 16 plus one week training for teachers."

In order to produce reliable comparisons, a target country "Concordia" was defined. This country, which is described in Table 3, is based on averages for the region on population, costs, student-

teacher ratios, school inputs, and test scores. Thus, every participant provided answers linked to a common education context.

Table 3: Prototypical Country

CONCORDIA

- Population: 20 million
  Rural population: 30 percent
  Indigenous population: 10 percent
- Completion rate in primary education (six years): 60 percent
- Student teacher ratio: 29:1
- Unit cost of primary education: $200
- Number of children in grades 1-6: 2 million
- Total cost of primary education system: $400,000,000
- Percentage of budget going to teachers salaries: 90 percent
- Hours of schooling: 4 per day and 27 class periods of 45 minutes each per week
- Half of children have basic textbooks
- There is no assessment system in place. However a standardized test was given to a small sample at the end of sixth grade. The test was based on the official curriculum of both math and Spanish language. The average score on the test was 50 out of 100. A score of 100 would indicate that a student had mastered what the official curriculum expects him/her to know.

COMMENTS ON THE SAMPLE OF EXPERTS AND PLANNERS

The authors selected the ten world experts on the following basis: 1) had articles published in professional journals; 2) were widely quoted by other planners and practitioners; 3) had easy access to current research findings; 4) were involved in projects in several Latin American countries; 5) were leaders in the analysis of education development; and 6) had experience working with multilateral development agencies in the region. A balance was sought between experts from Latin America and North America. There was a high response rate from the experts due to their abiding interest in the issues. There were no systematic differences in estimates between experts from the two regions. The fact that there were only ten experts may have an impact on the reliability of answers since one expert with an unusual predisposition could have a significant impact on the overall average. The authors have subsequently identified more experts and recommend that, in any future replication, 20 to 25 experts be asked to respond to the questionnaire.

The sample of Latin American planner/practitioners included all the participants attending the Ninth Planning Course organized by UNESCO/ OREALC in Santiago, Chile, in November 1997. Most participants worked as planners or advisers to top education authorities. Their answers and opinions, therefore, are probably representative of the educational advice they provide to their national systems. At a latter stage it would be useful to have access to their educational and training background.

There were inconsistencies in the answers provided by the Latin American planner/practitioners, which were due in part to a lack of time and attention to devote to the questionnaire as well as, perhaps, inadequate knowledge and expertise. (Few inconsistencies were detected in the answers from world experts.) In addition, some of the respondents appear to have misunderstood the directions. This, as well as the lack of awareness of the literature, is cause for concern for policy-making and implementation in the region.

COMMENTS ON THE IMPACT VARIABLE, 40 INTERVENTIONS, AND PROTOTYPICAL COUNTRY

The "dependent variable," as noted above, was the score on a standard test given at the end of sixth grade. This test would be similar to the math/language tests given by UNESCO/ OREALC in 1992 to five countries, and again to 13 countries in 1997, in which students on average answered about 50 percent of the items correctly. The items were based on a consensus of the participating countries on the expectations of a common curriculum. Tests are generally standardized so that the deviation is normally about 10 points on each side (e.g., two-thirds of the students score between 40 and 60). However, in this case, criterion referenced tests expect children to score 100 percent which is what the curriculum demands. The standard deviation is, therefore, much larger and it is possible, with appropriate interventions, for a large number of school children to get high scores.

This approach has two problems. In the first place there is no consideration of the content of the test or of the content standards it was supposed to have. The focus is on the impact of "opportunity-to-learn standards" on the academic achievement levels, assuming that the curriculum content is relevant. In short, for the sake of simplicity, the test is assumed to be relevant and its content is not taken into account as a separate input.

The second problem is that many children drop out before sixth grade or repeat the year, especially in the poorer countries. If the measure used had been the percentage of students completing the sixth grade, then there would have been some, but not many changes. For instance, school feeding would have had a much more significant impact on school retention than on learning, since it is assumed that school feeding encourages school attendance. Using test scores as the dependent variable works best for a school system which has many children completing six years of education (e.g., Argentina, Chile, Costa Rica, Uruguay, Venezuela). It is less relevant for those systems with high dropout rates before sixth grade (e.g., Bolivia, Guatemala, Haiti). But, in fact, nearly all Latin American education systems are moving quickly toward six full years of education, and therefore the focus on quality is important in every country. The overall score on a sixth grade test is a simple but clear measure of current attempts to improve the quality of schooling in the region.

The target country, Concordia, is defined on the basis of the regional averages of population, educational coverage, primary enrollments, unit primary cost, student-teacher ratio, rural sector and ethnic minorities. The fact that there is a common "country" for all participants helps to make a meaningful comparison of answers, but it is an artificial construct with no history or context. Cost-effectiveness will vary significantly with the size of the country, its current stage of educational development, and its GNP per capita. For example, relative costs of inputs can be significantly higher in a country where average unit

costs are $100 or less, compared to the regional average of $200. There would also be some savings in larger countries where fixed costs are high and variable costs low (e.g., sample-based assessments and distance education).

Results of the Cost-Effectiveness Survey

Table 4 summarizes the estimates of the ten international experts who responded to the questions on impact and probability of good implementation of interventions. The authors' estimate of costs for each of the interventions was added to those responses, followed by the estimates of cost-effectiveness. The table presents the forty interventions in order of highest to lowest estimated cost-effectiveness.

IMPACT ON LEARNING

On average the experts estimated that the various interventions could have an impact of 10 percent. The intervention with the greatest impact (27 percent), was a "package of interventions" (item #40).[1] Three other interventions had increments in learning equal to or higher than 19 percent. They were: #2, assigning the best teachers to first grade (20 percent);[2] #6, paying rural teachers 50 percent more (19 percent); and #12, decentralizing and also improving the ministry of education's capacity for oversight (19 percent).[3] Providing learning materials (#17 and #18) and preschooling (#28) also score high (18 percent). The experts identified a number of commonly used interventions which have little or no impact. For example, changing the curriculum without really training teachers had the least impact (#36, with 2 percent). Five interventions with impacts of 4 percent or less on achievement were: medical and eye examinations (#24 and #25, with 4 percent and 3 percent, respectively); tests to a 10 percent sample of fourth graders, without using the results for remedial strategies (#13, with 4 percent); traditional teacher training for four weeks (#31, with 4 percent), and access to computers (#39, with 4 percent).

IMPLEMENTATION

On average, the experts felt that the probability of adequate implementation was 63 percent. The intervention with the lowest probability of adequate implementation (36 percent) was #9 (the ministry of education reduces its staffing by 50 percent), obviously an estimate of political feasibility. Another intervention with a low probability of implementation was the package of interventions (#40, with 45 percent). This is somewhat surprising since similar packages are already being implemented in Argentina, Bolivia, Brazil, Chile, and Colombia. Decentralization is also not expected to be well implemented (#11, with 48 percent), but an ambiguity is generated by the higher probability assigned to the following intervention—decentralization with improvement in the capacity of ministry of education (#12, with 54 percent). Ensuring that the length of the school year is maintained (#3, with 50 percent) and preparing a bilingual education program (#37, with 51 percent), were also considered difficult to implement.

The interventions with the best chance of being well implemented were simple ones, often depending on procurement of a few items, such as: providing a library to the classrooms (#19, with 77 percent), or extending the school year one week and paying teachers proportionally (#5, with 84 percent). Four other interventions that

[1] This intervention is currently being implemented in several Latin American countries.

[2] The assumption is more than likely that children will learn to read and this could be built on. This, incidentally, is a policy which has not been implemented in Latin America

[3] Predictably, the international experts were less enthusiastic about decentralization without oversight (#11, with 9 percent).

Table 4: Expert Opinion on Cost-Effectiveness of Educational Interventions

Intervention Number and Description in Order of Descending Cost-Effectiveness (For More Complete Descriptions, see Table 2)	A. Estimated Increase in Achievement (%)	B. Probability Of Adequate Implementation (%)	C. Probable Impact (%) [A*B]	D. Estimated Increase in Cost (%)	E. Cost-Effectiveness [C/D]
2. Assign best teachers to first grade	19.8	58.0	11.5	0.0	1531.2
3. Enforce regulations on official length of school year	10.6	49.5	5.2	0.0	699.6
1. Policy not to switch classroom teachers during school year	5.0	72.0	3.6	0.0	480.0
13. Test 10 percent of 4th graders and distribute results to teachers	4.1	73.5	3.0	0.1	60.3
11. Decentralization	9.3	47.5	4.4	0.1	59.2
27. Media campaigns for parents to read to children	8.1	71.9	5.8	0.1	46.6
10. MIS for identifying low performing schools	10.2	68.0	6.9	0.3	27.7
25. Vision test by school and referral	3.2	66.0	2.1	0.1	21.1
35. Grant program ($50/student) to improve pre-service teacher training	11.8	56.0	6.6	0.4	18.9
14. Test 10 percent of 4th graders and provide remedial strategies (one week)	12.3	60.0	7.4	0.4	17.4
9. Reduce size of bureaucracy and pay higher salaries	8.9	36.0	3.2	0.3	12.9
36. Revise curriculum in math and reading, and distribute	1.9	66.9	1.3	0.1	12.7
38. Interactive instruction by radio	10.7	57.5	6.2	0.5	11.4
37. Prepare and implement bilingual education	11.7	50.6	5.9	0.5	11.2
15. Universal testing of 4th graders	12.3	62.5	7.7	0.8	9.7
18. Provide learning materials for individualized instruction	16.5	72.5	12.0	1.5	8.0
26. Broadcast high quality preschool TV programs	8.2	72.4	5.9	0.8	7.9
12. Decentralization with supervision	19.4	53.5	10.4	1.3	7.8
16. Provide classrooms with standard textbooks	11.5	74.5	8.6	1.5	5.7
19. Provide small libraries to classrooms	8.5	76.5	6.5	1.4	4.7
17. Provide standard textbooks and train teachers in usage	18.4	66.0	12.1	3.8	3.2
5. Extend length of school year	8.0	83.5	6.7	2.3	3.0
32. Train teachers on developing cooperative learning	12.2	52.0	6.3	2.3	2.8
33. Train teachers on using programmed learning materials	7.6	64.0	4.9	2.3	2.2
34. Acquaint teachers with modern curriculum	7.0	64.0	4.5	2.3	2.0
40. Multiple interventions: learning packages; school-based management; training; testing	26.8	45.0	12.1	7.0	1.7
29. Developmentally oriented pre-schooling (50 percent unit cost of primary school)	13.0	54.5	7.1	4.2	1.7
28. Developmentally oriented pre-schooling (100 percent unit cost of primary school)	18.3	51.5	9.4	8.3	1.1
24. Yearly checkup and referral by doctor	4.1	61.5	2.5	2.4	1.1
30. Caretaking of preschoolers with no educational development	5.7	65.9	3.8	4.2	0.9
6. Pay teachers in rural schools salary increment of 50 percent	18.6	65.0	12.1	13.5	0.9
4. Extend daily schedule by one hour	17.0	67.0	11.4	15.0	0.8
7. Raise teachers salaries by 10 percent	6.3	72.5	4.6	9.0	0.5
21. School feeding programs (50 percent receive free snack)	5.1	63.0	3.2	6.8	0.5
8. Raise teachers salaries by 20 percent	10.7	74.5	8.0	18.0	0.4
20. School feeding programs (100 percent receive free snack)	5.6	74.5	4.2	13.5	0.3
31. In-service training to teachers without follow-up materials	4.1	63.5	2.6	10.0	0.3
23. School feeding programs (50 percent receive free lunch)	6.9	59.0	4.1	18.0	0.2
39. Provide one-hour access to computers	4.4	51.5	2.3	14.9	0.2
22. School feeding programs (100 percent receive free lunch)	8.1	67.5	5.5	36.0	0.2
AVERAGES	**10.3**	**62.8**	**6.5**	**5.1**	**76.9**

(A) Estimated average percentage increment in student achievement on a standardized test in mathematics and reading, given to sixth graders, with an initial score of 50 out of 100, compared to a control population which did not receive the intervention.
(B) Probability (in percentage) of adequate implementation of the intervention, based on both technical and political considerations.
(D) Probable increment in annual operational unit cost from the intervention including the annualized capital cost.

are easy to implement are: increasing the salary of teachers by 10 percent (#7, with 73 percent) and 20 percent (#8, with 75 percent);[4] giving tests to a sample of 10 percent of fourth graders, without using the results in follow-up programs (#13, with 74 percent), and free snacks for all students (#20, with 75 percent).

COSTS

The authors did their own estimates of costs and applied them to the experts' estimates of the impact on learning and on probability of implementation. It was inappropriate to ask the experts to estimate costs since this is a technical question which had a "right" answer. The cost estimates are based on costs in a typical middle-income, medium-size country in the region? Colombia probably fits this criterion best. Table 5 provides the reasoning behind the cost estimates, while the estimates themselves appear in Table 4.

The highest cost intervention is providing a lunch to all school children (#22, with a 36 percent unit cost increase). Other high-cost interventions (above 10 percent) include adding an hour to the school day and paying teachers proportionally (#4 at 15 percent), paying rural teachers 50 percent more (#6 at 14 percent), increasing salaries by 20 percent (#8 at 18 percent), providing all students with a free snack and providing a free lunch to half the students (#23 and 20 at 18 percent and 14 percent, respectively), and access to computers (15 percent). The lowest costs refer to administrative decisions whose costs are nil or insignificant, such as enforcing regulations (#1 and 3, with 0.01 percent) and putting good teachers in first grade (#2, with 0.01 percent). Decentralization by itself is a very low cost intervention (#11, with 0.1 percent); but combining decentralization with better central government oversight is significantly more costly (#12, with 1 percent). One year of pre-schooling, which at first glance would be expensive, should be prorated over six years (#28, with 8 percent, or #29, at 4 percent). The "package" of interventions is not excessively expensive (#40, with 7 percent). In theory several interventions could be combined to make new packages. For example, #40, #8 and #28 (a package of interventions plus raising teacher salaries and pre-schooling) could be combined into a new package which would increase costs by 33 percent.

PROBABLE IMPACT

When the expected impact on achievement (10 percent) is combined with the 63 percent probability of implementation, then the average probable impact is 6 percent. In fact, no intervention scored more than a 13 percent probable impact. The four interventions with the greatest probable impact were: providing teaching/learning materials to teachers and training the teachers to use them (#17 at 12 percent); self-learning materials alone (#18 at 12 percent); the package of interventions (#40, also at 12 percent, much reduced because of low probability of implementation); paying rural teachers more (#6, at 11 percent) and assigning the best teachers to first grade (#2 at 11 percent).

The interventions with the lowest potential impact (2 percent or less) are those which have the least effect on learning, and have a probability of being implemented of between 50 percent and 70 percent. These include: revising the curriculum (#36, with 1 percent); medical and vision tests (#24 and 25, with 3 and 2 percent, respectively); computers (#39, with 2 percent); and reducing the ministry of education's bureaucracy (#9, with 3 percent). The following interventions have a probable impact of 3 percent: giving tests without utilizing the results (#13); and providing conventional training to teachers for four weeks (#31). The four school feeding interventions

[4] Significantly different from the Latin American planners who were much more skeptical with regard to political feasibility.

Table 5: Estimated Unit Cost Increases For Each Intervention[5]

INTERVENTION	% INCREASE IN UNIT COST	EXPLANATION FOR COST CALCULATION
1.	0.01	Nominal cost of $30,000.
2.	0.01	Nominal cost of $30,000 for information and control.
3.	0.01	Nominal cost of $30,000 for providing information and insuring enforcement.
4.	15.0	A 16.7% increase in hours, equivalent to a 16.7% increase in salaries (90% of total cost). 16.7% times 90% is 15%, or $30 per student.
5.	2.3	One extra week of work is based on above and in results in $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 $200) or $90 per student in the target group. For the system, cost is $27 per student (total cost is $90x 600,000 divided by $400 million).
7.	9.0	Increase would be $18 per student.
8.	18.0	Increase would be $36 per student.
9.	0.3	Bureaucrats are 5% of the total budget, or $20 million, which is $10 per student. Cost is cut by 1/2 to $10 million by reducing number of bureaucrats by one-half and increased by $10.5 million for better salaries. Increase result is $500,000. Can also be calculated directly on unit cost basis. Current cost is $10. If bureaucracy halved, unit cost is $5; if cost is increased 2.1 times, new unit cost is $10.5. Total unit cost increase is $.50.
10.	0.3	MIS estimated at $1,000,000 or $0.50 per student.
11.	0.1	Since there is no improvement in MOE capacity for oversight and assessment, the cost is estimated at only US$300,000 or $0.15 for booklet for principals and PTAs plus diffusion and an information system.

[5] Total cost of primary system is US$400 million and unit cost is US$200.

12. to age- and	1.3	To improve flow of information and capacity for regulation and oversight, cost is about $3 million strengthen testing, statistics and financial man- ment. Testing is $5 per student, 330,000 students in 4th grade, plus about $1,000,000 for a MIS, miscellaneous costs of $300,000. Total unit cost is $2.65.
INTERVENTION	**% INCREASE IN UNIT COST**	**EXPLANATION FOR COST CALCULATION**
13. 4th 1.67% for sults $0.10.	0.1	Approximately $5 per student for adequate testing. However, only 10% of fourth graders are tested. graders are 1/6 of the total,therefore, we test of all students. For these students, the cost is $5; the system the cost is $0.08. Distributing the re- to 4th grade teachers adds $0.02 resulting in
14. $4.50	0.4	The cost of the follow up seminar is the same as one week of teacher's time which comes to $4.50, provided to all fourth grade teachers. Unit cost is /6 or $0.75 plus the $0.10 for testing which gives $0.85 for the system.
15. all $5.00 $1.58.	0.8	Includes one week of training. Universal testing of fourth graders is conducted, for cost of 1/6 of or $0.83, plus $0.75 of training. Total cost is
16. total	1.5	Should state that two textbooks are provided (Spanish and math). Assumes $1.50 for each book for of $3 per student.
17. one If at	3.8	Teacher salary is assumed to be 90% of $200 unit cost, which is $180 per student. Divided by 40, week of teachers time comes to $4.50 per student. we add this to the $3 per student above, we arrive $7.50.

18. leading	1.5	Cost of printing is $8.75 (four textbooks) and cost of preparation is 500,000 which is $.25 per student. Overall cost is $9. Books last for three years to $3 cost.
19. dents	1.4	Assume each book costs $2 (in bulk), so library costs $400. Cost over five years is $80. With 29 students per classroom unit cost is $2.75.
20.	13.5	Estimate milk at $0.10 and bread at $0.05. Total is $0.15x180 days or $27 per student.
21.	6.8	Same as above but given to half the students; hence, unit cost is $13.50.
22.	36.0	Lunch is estimated at $.40 per day; therefore, cost is $0.40x180 or $72 per student.
23.	18.0	Half of above or $36.
24. doctor about unit	2.4	Detection only. Does not include medical interventions which come from the health system. One doctor can check 28 students a day or, over 180 days, about 5,000 per year. Doctor's salary is $24,000 so the unit cost is $4.80.
INTERVENTION	**% INCREASE IN UNIT COST**	**EXPLANATION FOR COST CALCULATION**
25. some dent.	0.1	Detection only, but nearsighted students can sit up front. Can be done by teacher if materials and some extra money are provided. Cost is $0.20 per student.
26. lion, Street	0.8	250 television programs are provided for home viewing only. Estimate absolute cost at $3 million, assuming high quality and purchase of Sesame Street programs.
27. pur-	0.1	Estimate overall at $500,000 for preparation and purchase of TV time, which is $0.25 per student.
28. and	8.3	Cost is $200 for 50% of students pro-rated over 6 years which comes to $33.33 for the target group and $16.67 per student for the system as a whole.

29.	4.2	Half the cost. Results in $16.67 for the target group and $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 4 times $4.50 which comes to $18. Add cost of course preparation, material, and travel resulting in approximately $20.
32.	2.3	Training for one week is estimated at $4.50 as above.
33.	2.3	Same as above.
34.	2.3	Same as above.
35.	0.4	Grant program is estimated at $200 per graduate (5x4) who teach for 10 years so the cost is $20 per year per teacher. Since there are 29 students per teacher, the annual cost is 20/29 or $0.70. (Another teachers approach would be that each year 7,000 new are trained to replace 10% of teaching force of 70,000. 7,000 new teachers times $200 results in $1,400,000 or a $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 $400,000 mainly for local riculum experts and a very low cost of distributing curguide. ($1 each guide, 70,000 copies
37.	0.5	Bilingual curriculum has a low fixed cost of about $100,000 to contract master bilingual teachers. This is $0.05 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 $4.50 for one week of training plus three books at $2 each costing $6; total is about $10.55 for indigenous students. Cost to the
INTERVENTION	**% INCREASE IN UNIT COST**	**EXPLANATION FOR COST CALCULATION**

		entire system is 10% or $1.05.
38.	0.5	$500,000 for preparation which is $0.25 per student, without using foreign technical assistance (case of Venezuela). Cost of radio ($29 per set per class) is about $1 per student but it lasts three years so it is $0.33. Materials are about $.50. Total unit cost is $1.08.
39.	14.9	$2,000 for the computer plus $100 for other physical modifications. Computer lasts four years; therefore, computer cost is $525 a year. Computer serves 30 students at one hour per week (30 hours per week) or $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 results in 1/27 of 90% of unit cost, or $6.67. Maintenance for computer is $200 per year or another $6.67 per student. Total is$29.84 per student. Cost could be reduced significantly if outdated computers are purchased for $1000, which would also reduce security and maintenance costs by 1/2. Also could hire a technician rather than a teacher at 2/3 cost. Total cost could be reduced to $8.25 plus $5 and $3.33 or $16.58; this, however, may not be feasible.
40.	7.0	Cost is based on above calculations as follows: text books $3; self-help learning materials $3; one week training $4.50; local school management $2.65; evaluation system $0.85. Total cost is $14.

#20 to #23) average 4 percent with a maximum impact of 8 percent.

COST-EFFECTIVENESS

The index of cost-effectiveness, the final column in Table 4, is very important. Interventions with the highest cost-effectiveness would be expected to be those which cost very little but have at least some impact on learning. These especially include inexpensive policies such as assigning the best teachers to first grade (#2, with 1,531.2);[6] enforcing regulations on the number of days and hours in the school year (#3, with 699.6); and not switching teachers during the school year (#1, with 480).

Some interventions have a low cost but a significant estimated impact, and therefore have a high cost-effectiveness ratio. These include decentralization (#11, with 59.2); sample testing of fourth graders (#13, with 60.3); mass media campaigns to encourage parents to stimulate their children (#27, with 46.6); and strengthening pre-service teacher training (#35, with 18.9), as well as interactive radio instruction (#38, with 11.4), bilingual education (#37, with 11.2), and revising the curriculum (#36, with 12.7).

Finally some interventions with significant costs as well as impact also have reasonable cost-effectiveness ratios. These include providing reading materials (#16 and 17, 5.7 and 3.2), learning materials (# 18, with 8.0), a small classroom library (# 19, with 4.7), and high quality preschool television programs (#26, with 7.9).

The items with the lowest cost-effectiveness are those which are very costly and have little, or only a modest, impact on learning. These especially include school feeding (#20 through 23, with a 0.29 average) and provision of computers (#39, with 0.15).[7] Other interventions may not be costly but basically have almost no impact on learning, such as general training of teachers (#31, with 0.26). Paying teachers more money (#6-8) is costly but the experts believe that it is not by itself a cost-effective intervention (0.44, 0.51, and 0.90).

Summary

Overall, the experts' estimates confirm the following common sense conclusions about financing educational interventions:

- Undertake interventions which do not cost much but have an impact (e.g., enforcing school year regulations, putting good teachers in first grade).

- Some interventions are of moderate to high cost but have a significant impact, especially those related to teaching materials and to hands-on teacher training. These interventions should be implemented.

- Some interventions which are expensive and, at least by themselves, without ancillary activities, are not good investments. This is especially the case of increased salaries, traditional teacher training, computers and school feeding programs.

The ratings raise some questions. For example "decentralization" as well as "sample testing" have higher cost-effectiveness ratios than the same interventions with complementary activities such as "decentralization while also strengthening the ministry of education" (# 12 at 7.9) and testing while also providing feedback on tests (#14 at 9.7). This goes against the authors' beliefs that decentralization without other elements will have *no* impact on learning. One interpretation of these results is that many respondents believe that centralized management is so "ossified" that any form of decentralization will have a positive impact, and that testing by itself will have at least some impact. The most comprehensive package of interventions (#40), which is similar to projects being implemented in several countries, has a relatively low cost-effectiveness ratio (1.72).

[6] Interestingly this intervention has never been used on a large-scale basis in the region.

[7] The cost of computers is going down rapidly and the cost-effectiveness could well change over the next decade.

Also, changing the curriculum and sending a copy to the teachers (#36, with 12.7) is "cost-effective." The authors believe that this would have almost *no* impact on learning and therefore a very low cost-effectiveness. On the other hand, since the cost is very low, any positive impact would result in high cost-effectiveness.

COMPARING LATIN AMERICAN EDUCATION PLANNERS AND INTERNATIONAL EXPERTS

Table 6 provides the estimates made by the Latin American planner/practitioners and Table 7 compares their results with those of the experts. Overall the planners were much more enthusiastic than the world experts on whether a particular intervention would have an impact (19 percent vs. 10 percent). Perhaps they are not conversant with the literature on the effectiveness of interventions, which tends to be very conservative. Alternatively, being on the front line, they may have felt obliged to be more positive than merited by the literature.[8] The planners were more than twice as optimistic as the experts about the impact on learning of: establishing an MIS (#10), eyesight examination (#25), avoiding changing teachers (#1), assigning best teachers to first grade (#2), decentralization (#11), testing without feedback (#13), free lunches (#21 and 22), pre-schooling (#29 and 30), traditional in-service training (#31), programmed learning materials (#33), training for curriculum (#34), improving pre-service training (#35), curriculum reform (#36), and computer access (#39). In no case were the experts more positive than the planners.

The planners were much less enthusiastic than the experts about the probability of successful implementation (48 percent vs. 63 percent). In particular, they were less positive about interventions which require more funding. The differences were greatest (25 percent) on the following interventions: extending the length of the school year by one week (#5), increasing teachers' salaries by 10 percent and 20 percent (#7 and 8), avoiding changing teachers during the year (#1), increasing schooling by one hour (#4), and paying a higher salary to rural teachers (#6). The experts were less enthusiastic about implementation only in the cases of decentralization (#11 and 12), pre-schooling (#28 and 29), and the package of interventions (#40). The combined effect of both estimates generated a fairly wide discrepancy in the estimates of impact, 9 percent for the planners and 6 percent for the experts.

When asked to estimate unit costs, the Latin American planners estimated that each intervention would increase unit costs by an average of 14 percent, compared to the authors' estimate of 5 percent. A detailed analysis of the planners' estimates suggests that either they did not understand the questions or had insufficient time to answer them. Therefore, their cost estimates are not reported here. However, these mistakes could affect their advice to ministers of education and deserve further analysis.

The planners' estimates of cost-effectiveness are in roughly the same order as the experts, but with some significant differences. The planners attribute significantly higher cost-effectiveness than the experts (more than twice as much) to decentralization (#11), avoiding the changing of teachers (#1), improved pre-service training (#35), revising the curriculum (#36), pre-schooling (#29 and 30), traditional in-service teacher training (# 31), and computers (#39).

For their part, the experts attributed a higher cost-effectiveness than the planners only to the interventions which involve reducing the bureaucracy (# 9), preschool television programs and mass media campaigns (#26 and 27), extending the school year and the school day (#5 and #4), increasing salaries for rural teachers (#6), and increasing salaries of teachers (#7 and 8).

[8] Similarly staff of the international agencies are invariably positive about proposed new education initiatives and reforms.

Table 6: Opinions of Latin American Planners on the Cost-Effectiveness of Educational Interventions

Intervention Number and Description In Order of Descending Cost-Efffectiveness (For More Complete Descriptions, See Table 2)	A. Estimated Increase in Achievement (percent)	B. Probability of Adequate Implementa-tion (percent)	C. Probable Impact [A*B] (per-cent)	D. Esti-mated Increase in Cost (percent)	E. Cost-Effectiveness [C/D]
2. Assign best teachers to first grade	38.2	44.8	17.1	0.0	2281.9
1. Policy not to switch classroom teachers during school year	25.6	42.3	10.8	0.0	1442.5
3. Enforce regulations on official length of school year	18.0	42.2	7.6	0.0	1012.9
11. Decentralization	26.4	53.6	14.2	0.1	188.9
27. Media campaigns for parents to read to children	12.4	45.7	5.7	0.1	45.3
13. Test 10 percent of 4th graders and distribute results to teachers	9.3	53.5	5.0	0.1	100.0
35. Grant program ($50/student) to improve pre-service teacher training	28.1	53.6	15.1	0.4	43.1
25. Vision test by school and referral	7.3	51.1	3.7	0.1	37.1
36. Revise curriculum in math and reading, and distribute	6.3	58.0	3.6	0.1	36.3
10. MIS for identifying low performing schools	20.8	50.3	10.4	0.3	41.8
14. Test 10 percent of 4th graders and provide remedial strategies (one week)	19.0	56.8	10.8	0.4	25.4
12. Decentralization with supervision	33.8	56.6	19.1	1.3	14.4
15. Universal testing of 4th graders	23.9	51.6	12.3	0.8	15.6
37. Prepare and implement bilingual education	21.9	51.3	11.2	0.5	21.4
9. Reduce size of bureaucracy	10.5	27.1	2.9	0.3	11.4
19. Provide small libraries to classrooms	15.9	49.6	7.9	1.4	5.8
38. Interactive instruction by radio	15.9	43.4	6.9	0.5	12.8
18. Provide learning materials for individualized instruction	24.2	53.5	13.0	1.5	8.6
32. Train teachers on developing cooperative learning	19.9	58.9	11.7	2.3	5.2
16. Provide classrooms with standard textbooks	17.6	52.8	9.3	1.5	6.2
34. Acquaint teachers with modern curriculum	13.9	59.1	8.2	2.3	3.7
29. Developmentally oriented pre-schooling (50 percent unit cost of primary school)	29.7	54.4	16.1	4.2	3.9
33. Train teachers on using programmed learning materials	13.4	57.4	7.7	2.3	3.4
26. Broadcast high quality pre-school TV programs	8.6	42.7	3.7	0.8	4.9
17. Provide standard textbooks and train teachers in usage	25.2	57.6	14.5	3.8	3.9
40. Multiple interventions: learning packages; school-based management; training; testing	38.5	50.6	19.5	7.0	2.8
5. Extend length of school year	12.1	40.2	4.8	2.3	2.2
28. Developmentally oriented pre-schooling (100 percent unit cost of primary school)	32.2	53.4	17.2	8.3	2.1
24. Yearly checkup and referral by doctor	8.6	48.3	4.2	2.4	1.7
30. Caretaking of pre-schoolers with no educational development	14.1	53.5	7.6	4.2	1.8
21. School feeding programs (50 percent receive free snack)	14.0	45.9	6.4	6.8	1.0
31. In-service training to teachers without follow-up materials	13.2	59.8	7.9	10.0	0.8
4. Extend daily schedule by one hour	26.8	40.6	10.9	15.0	0.7
6. Pay teachers in rural schools salary increment of 50 per-cent	22.1	38.5	8.5	13.5	0.6
20. School feeding programs (100 percent receive free snack)	13.5	56.5	7.6	13.5	0.6
7. Raise teachers salaries by 10 percent	11.8	30.6	3.6	9.0	0.4
39. Provide one-hour access to computers	14.9	40.1	6.0	14.9	0.4
23. School feeding programs (50 percent receive free lunch)	13.7	42.4	5.8	18.0	0.3
8. Raise teachers salaries by 20 percent	13.7	27.8	3.8	18.0	0.2
22. School feeding programs (100 percent receive free lunch)	16.6	42.8	7.1	36.0	0.2
AVERAGES	**18.8**	**48.5**	**9.2**	**5.1**	**134.8**

(A) Estimated average percentage increment in student achievement on a standardized test in mathematics and reading, given to sixth graders, with an initial score of 50 out of 100, compared to a control population which did not receive the intervention.
(B) Probability (in percentage) of adequate implementation of the intervention, based on both technical and political considerations.
(D) Probable increment in annual operational unit cost from the intervention including the annualized capital cost.

Table 7: Index of Estimated Cost-Effectiveness - Experts Versus Planners

Intervention Number and Descriptions In Order of Descending Cost-Effectiveness	Cost-Effectiveness		
	A. Experts' Estimates	B. LAC Planners' Estimates	C. Difference (A-B)
2. Assign best teachers to first grade	1531.2	2281.9	-750.7
3. Enforce regulations on official length of school year	699.6	1012.9	-313.3
1. Policy not to switch classroom teachers during school year	480.0	1442.5	-962.5
13. Test 10 percent of 4th graders and distribute results to teachers	60.3	100.0	-39.7
11. Decentralization	59.2	188.9	-129.7
27. Media campaigns for parents to read to children	46.6	45.3	1.3
10. MIS for identifying low performing schools	27.7	41.8	-14.0
25. Vision test by school and referral	21.1	37.1	-16.0
35. Grant program ($50/student) to improve pre-service training of teachers	18.9	43.1	-24.2
14. Test 10 percent of 4th graders and provide remedial strategies (one week)	17.4	25.4	-8.1
9. Reduce size of bureaucracy	12.9	11.4	1.5
36. Revise curriculum in math and reading, and distribute	12.7	36.3	-23.6
38. Interactive instruction by radio	11.4	12.8	-1.4
37. Prepare and implement bilingual education	11.2	21.4	-10.2
15. Universal testing of 4th graders	9.7	15.6	-5.9
18. Provide learning materials for individualized instruction	8.0	8.6	-0.6
26. Broadcast high quality pre-school TV programs	7.9	4.9	3.0
12. Decentralization with supervision	7.8	14.4	-6.6
16. Provide classrooms with standard textbooks	5.7	6.2	-0.5
19. Provide small libraries to classrooms	4.7	5.8	-1.0
17. Provide standard textbooks and train teachers in usage	3.2	3.9	-0.6
5. Extend length of school year	3.0	2.2	0.8
32. Train teachers on developing cooperative learning	2.8	5.2	-2.4
33. Train teachers on using programmed learning materials	2.2	3.4	-1.3
34. Acquaint teachers with modern curriculum	2.0	3.7	-1.7
40. Multiple Interventions: learning packages; school-based management; training; testing	1.7	2.8	-1.1
29. Developmentally oriented pre-Schooling (50 percent unit cost of primary school)	1.7	3.9	-2.2
28. Developmentally oriented pre-schooling (100 percent unit cost of primary school)	1.1	2.1	-0.9
24. Yearly checkup and referral by doctor	1.1	1.7	-0.7
30. Caretaking of pre-schoolers with no educational development	0.9	1.8	-0.9
6. Pay teachers in rural schools salary increment of 50 percent	0.9	0.6	0.3
4. Extend daily schedule by one hour	0.8	0.7	0.0
7. Raise teachers salaries by 10 percent	0.5	0.4	0.1
21. School feeding programs (50 percent receive free snack)	0.5	1.0	-0.5
8. Raise teachers salaries by 20 percent	0.4	0.2	0.2
20. School feeding programs (100 percent receive free snack)	0.3	0.6	-0.3
31. In-service training to teachers without follow-up materials	0.3	0.8	-0.5
23. School feeding programs (50 percent receive free lunch)	0.2	0.3	-0.1
39. Provide one-hour access to computers	0.2	0.4	-0.2
22. School feeding programs (100 percent receive free lunch)	0.2	0.2	0.0

Lessons Learned and Next Steps

ESTIMATES OF IMPACT, IMPLEMENTATION, AND COSTS

There is a reasonable consensus among the international experts about the relative merits of particular interventions, although there is less agreement on the size of the impact. There is less consensus among the Latin American planners and their estimates of impact and implementation are quite different from those of the experts. The higher estimates of impact made by the planners probably result from a lack of awareness of the international literature, while the more pessimistic estimates of implementation result from a greater awareness of the difficulty of reform.

Implementation problems are difficult to estimate beforehand, and are linked to most failed attempts at reform (McAdams, 1997; Verspoor, 1989). The likely contribution of policy instruments (mandates, incentives, training, funding, assessing, local decisions) depends on goals and context (Neustadt, 1970). Any change (even a small one) involves breaking traditions and affecting many social relationships which support a return to the old patterns. The analysis of major school reforms shows that "... even moderately complex changes take from three to five years, while major restructuring efforts can take five to ten years" (Fullan, 1991). Finally, all successful reforms include coherence and institutional capacity building (Chrispeels, 1997; Lockheed and Verspoor, 1991; Rondinelli et al, 1990).

Given these general issues, it is difficult to estimate the probability of adequate implementation in Latin America. In addition, the schools operate under complex political conditions, including centralized systems and powerful teacher unions, and often the physical process of, say, delivering textbooks to rural schools, is problematical. A more sophisticated approach could separate the technical problems of implementation from the political ones.

In spite of the fact that the Latin American planners had several weeks to answer the questionnaire, they did not do a good job of estimating costs.[9] This was due to a combination of reasons, including misunderstanding the questions, mathematical mistakes, lack of awareness of the costs of interventions, and, in some cases, assuming a definition of costs that differs from the authors. With regard to the latter, for example, the planners seemed to feel that assigning the best teachers to first grade would be costly. Perhaps they thought that a salary increment would be required. They also thought that enforcing regulations on the official length of the school year would cost money, perhaps because they would have to pay teachers more to remain on the job longer. Their estimated costs for pre-schooling were much too high because they did not do the arithmetic correctly. Their estimates for the "package of interventions" were also far in excess of what the actual costs of the program in Chile are.

In future replications, the cost question should be included only in the context of a course or seminar where there is a teaching objective, and small groups should work together on the cost estimates. Otherwise, the responses to this part of the questionnaire will be inadequate.

The authors' cost index was developed on the basis of their experience in Latin America. Table 5 provides the basis of the calculations. Feedback

[9] The authors took an entire day to come up with cost estimates.

from readers on the adequacy of these estimates would be useful and is encouraged.

CONCLUSIONS

As noted earlier, the common sense conclusions of the exercise were: undertake interventions which do not cost much but have an impact (e.g., enforcing school year regulations, putting good teachers in first grade); some interventions are of moderate cost and have a significant impact, especially those related to teaching materials, and should be undertaken; do not undertake large-scale expensive interventions which up to now have demonstrated low cost-effectiveness (increased salaries, conventional teacher training, etc.); and implement packages of interventions rather than isolated ones. Yet, in Latin America many projects and programs do not follow these prescriptions. There is a tendency to invest heavily in unproved approaches or to have excessive expectations of the potential impact on learning of some reforms. In particular, Latin American planners are excessively enthusiastic about the theoretical impact of interventions.[10]

By making the estimated costs and impacts explicit, the preassumptions made by key decision makers about what works and what doesn't work become clear. The exercise alerts policymakers to the strategies they are actually selecting, and permits them to revise what their presuppositions are. Estimating the costs of interventions, in itself, is of great value since it is rarely done systematically. These estimates can be used to assess, or at least to provide a benchmark, for estimates of the cost of project components made in various countries.

The exercise is an excellent teaching device for training policymakers and educational planners because it forces them to clarify their own thinking. To work best, small groups could be assigned about five of the interventions. They would work together and then come up with conclusions which would be presented to a plenary session. The authors began this approach with a group of IDB staff, and some universities may want to experiment with masters' degree students in international education.

But this approach is still a poor substitute for real cost-effectiveness research. To put it simply, planners and experts work under a large set of partially tested assumptions. The assumptions that are actually supported by empirical evidence are unfortunately few. This is especially the case for currently favored interventions, such as decentralization, testing and computers. At the same time, education is now hailed as the key element for economic and social development and major investments are being made in the region and throughout the world.

In short, the results of this approach are as follows:

- an index (admittedly crude) of cost-effectiveness of interventions has been established;
- the opinions of international experts have been compared with practicing educational planners in Latin America;
- inconsistencies, ambiguities, and contradictions in the opinions about cost-effectiveness have been identified;
- agendas for the traditional time-consuming cost-effectiveness research which should eventually be the basis for objective decisions on education development have been identified; and
- most importantly, an effective teaching and consensus-building tool has been devised.

The index is a timely tool for the region, given the increasing consensus on the key role of education in economic and social success, the agreement of the 1998 Summit of Heads of State

[10] But pessimistic about the potential for implementation, especially with regard to financing and implementing politically difficult reforms.

and the growing investments in education by national governments and international agencies

NEXT STEPS

The authors believe that there is now a great opportunity in Latin America to undertake applied research, since nearly all countries in the region have initiated national assessments administered to samples or the universe of students. In principle, it would be easy to apply these national assessments to measure the impact of interventions. The authors recommend that national assessment programs in Latin America be linked to a very strong applied research agenda. This is already happening in a number of countries.

There are also many new steps which could be taken with regard to this exercise. As an example, the questionnaire could be applied to other regions in the world. The results could well be significantly different. To give an example, experts would likely assume that decentralization in the United States, Africa, and Europe would result in declines in test scores rather than any increases as identified in Latin America. In Africa, low unit costs and low level of general education of teachers would play a major role in identifying cost-effective interventions. Also in Africa, the dropout rate is high and therefore testing will only capture one element of the learning process. In the United States, much of the research has suggested that increased inputs into the system have little or no impact, and the current debate is on raising standards and establishing a variety of centralized testing measures. The exercise could also be undertaken for general secondary schools, which have as one of their main objectives to increase proficiency in mathematics and language. This would be particularly important since the different interventions in the developing world have not yet been well documented at this level. There is an increasing concern about the teaching of attitudes and values in schools, but little understanding of what works. It is therefore increasingly important to identify and rank strategies which affect elements such as civic understanding, cooperation, and democratization.

Finally, the exercise can be repeated. Over time, new interventions will be identified, political constraints may be reduced (as is happening with cost-recovery in higher education), and costs may be reduced (for example, with computers), therefore allowing some interventions to become increasingly cost-effective. In fact, the authors prepared an initial list of interventions in 1991, many of which, upon review in 1997, were found to be of less interest. New interventions are now in vogue, especially those related to systems approaches, decentralization and testing.

Finally, not only education practitioners, but also national political and business leaders, need to define their priorities in education. Perhaps, with this simple tool to explicitly define assumptions, national decision makers can begin to understand what works and what does not work in education, and help create a stronger social consensus on education investments.

In short, this exercise should be refined and improved by contacting a larger number of experts and undertaking more sophisticated analyses. The approach could be undertaken in other regions, with varying results. It should be used in training courses for upgrading the skills of educational planners worldwide and for seeking consensus on approaches to education reform.

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Annex

Letter to World Experts

Dear Colleague xxxxxxxx:

As you are aware, accurately measuring the cost effectiveness of educational interventions is difficult, time-consuming, and costly. In the developing world only a few studies have satisfactorily answered this question.

Given the importance of the subject and the difficulty in undertaking traditional cost-effectiveness research, we believe that intermediate and less time consuming approaches to measuring cost effectiveness should be sought. These approaches could help researchers and practitioners to gain a better understanding of the issues related to this important subject.

With this in mind, we propose to measure the opinions of practicing education planners about the cost effectiveness of various education interventions. Specifically we will ask a group of about 15 international experts, of which you are considered one, to estimate the cost and effectiveness of 40 possible interventions in a "typical" Latin American country. We will also ask the same questions of a group of about 30 Latin American planners participating in the UNESCO/Orealc course on education planning given every November in Santiago. We will create an index of expected cost effectiveness of the interventions and compare differences among the respondents. By measuring opinions about cost effectiveness, we hope to achieve the following: (a) an index of expert opinion about cost effectiveness; (b) a measure of the extent to which practicing education planners in the front lines think about and understand cost effectiveness issues; (c) clarification of the issues in thinking about cost effectiveness; and (d) a further agenda for educational research. This exercise can also serve as a powerful teaching tool.

We would like to enlist your support in this endeavor by asking you to fill out the attached questionnaire which requires you to estimate the unit cost, expected impact on learning, and probability of implementation of 40 interventions. We estimate the task will take 2-3 hours to complete. After we receive the questionnaires we will provide you with some feedback as to how your answers compare with those of other experts. Please rest assured that none of your specific answers will be individually reported in any publication. Also please understand that we will not give excessive credence to the whole exercise, which is not a substitute for the necessary research on cost-effectiveness and which, obviously, pays inadequate attention to macro-issues and to the political economy of reform.

We would appreciate your completing the questionnaire and forms and sending it to us by December 1, 1997. We have provided all the necessary information on a fictitious Latin American country necessary for the exercise. We recognize that you will have to make an educated guess for many of these questions, but the fact is that this is the current lamentable state of the art. Don't feel bashful about guessing, and please let us know what you think of the exercise.

We would like to thank the Inter-American Development Bank for helping to finance this study.

We look forward to hearing from you.

Sincerely,

Laurence Wolff and Ernesto Schiefelbein