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INTERACTIVE RADIO HEALTH EDUCATION

PROJECT (PARI) IN BOLIVIA

TRIP REPORT

BY

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**AN INVESTIGATION INTO THE EFFECTIVENESS OF TEACHING
HEALTH CONCEPTS THROUGH RADIO IN QUECHUA OR IN SPANISH
TO THIRD GRADERS IN RURAL BOLIVIA**

PARI STAFF

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ABSTRACT

While strong endorsements of teaching young children in their native language abound in the literature, there is in Bolivia -- a tri-lingual country -- relatively little "hard" evidence to test or document the impact of language of instruction on student learning. There are several reasons for this lack of data. First, evaluation expertise and the consequent utilization of appropriate evaluation designs, methods, and assessment instruments, is still at the early stages of development in Bolivia. Secondly, there has been until recently little interest in the issue of bilingualism. Few questioned the advisability of teaching young students all content in Spanish and little advantage was seen in, even in limited ways, using Quechua as a language of instruction. This, plus the fact that the decision to utilize Quechua as a language of instruction is more of a political than an instructional one, have further limited research in the area of bilingualism in Bolivia.

The expansion of PARI (Program de Aprendizaje por Radio Interativa) from Mathematics into Health Education was justified by the need to combat the high mortality rate for children under six, especially as a result of diarrhea and pneumonia. The positive results achieved by PARI in Math education provided the necessary impetus to utilize interactive radio for health education. Due to the nature of the content taught -- health concepts which young children learn at home and talk about in their native language -- and the desire to teach in the most effective way, PARI started looking for strategies to increase its impact on the target population. The bilingual study was a result of these preoccupations. The driving force behind the study was a search for effectiveness, its main question of interest stated as, "Considering the urgency to improve and promote health habits in young children living in rural areas, what is the most cost effective way that yields the best results?" Radio, was already part of the answer. The next step was to look into language of instruction.

This report describes an investigation into the effectiveness of teaching health concepts via radio to third graders in public schools in rural Bolivia where Quechua is the native language. The main variable of interest was language of instruction -- Quechua or Spanish. The Quechua/Spanish Bilingual Study was conducted during the months of August and September 1994 in the Cochabamba region. In this section of the report the methodology and the findings of the study are summarized. A set of recommendations is also presented.

Out of the pool of possible schools, ten were randomly selected for participation. Third grade teachers at each school were given an overview of the study and two full days of training on implementation of program activities. At the end of training, they were randomly assigned to the experimental (Quechua) or Control (Spanish) group and instructed to speak only one of the two languages during the transmission of the health radio lessons. The experimental group received instruction and posttest in Quechua while the Control group received the same in Spanish.

A posttest only experimental design was selected. The 20-item, multiple choice test required students to mark, out of three alternatives, the picture that corresponded to the correct answer. This format was utilized to avoid penalizing students in the control group whose reading skills in Spanish were less than adequate. An additional reason for the selected format was that although students speak Quechua in their communities, homes and schools, they do not learn to read or write in Quechua. To ensure uniformity, a tape with test questions was utilized for both groups. Test questions were recorded in Spanish and in Quechua by PARI bilingual staff. Prior to administration, the instrument was field tested and revised as a result of the item analysis and of other statistical procedures conducted.

After three weeks of exposure to the radio lessons, 114 students in the experimental and 105 in the control group took the posttest and statistical procedures were utilized to treat the data. A highly significant value of t was obtained (10.90 significant beyond the .005 level) showing that the groups, as represented by their means were different at posttest time. Since schools, classrooms, and teachers had been randomly selected into experimental and control groups -- thus assuring equivalence at the beginning of the treatment -- and program implementation was closely monitored during the three weeks, the rejection of the null hypothesis was warranted and the difference in mean can be attributed to language of instruction.

SUMMARY OF RECOMMENDATIONS

A number of recommendations that ensue from the results of this study are summarized below. In **SECTION IV: CONCLUSIONS AND RECOMMENDATIONS** they are discussed in more depth.

RECOMMENDATION # 1: Expand the health radio program to rural areas where the need has been documented.

RECOMMENDATION # 2: For third graders in the rural areas around Cochabamba utilize Quechua as the language of instruction for the transmission of the health radio lessons.

RECOMMENDATION # 3: Clarify that teaching health concepts in Quechua to third graders whose first and home language is Quechua, does not signal or imply the abandonment of Spanish as a language of instruction in favor of Quechua. It means, in this specific case, to be more effective in the prevention of diseases and, therefore, reducing Bolivia's high infant and children mortality rate.

RECOMMENDATION # 4: Disseminate the findings of the study to guide decision makers, program developers, and educators in their efforts to better educate children in early grades. Dissemination strategies should include press releases, presenting at conferences, forming discussion groups, writing to scholarly publication, and other formal and informal means.

RECOMMENDATION # 5: Design training events to assist teachers in overcoming well established conventional patterns of teaching that reduce or limit the active participation of students in the learning process.

RECOMMENDATION # 6: Revise the radio lessons and the Guide to make it more appealing to young children and to ensure a higher level of participation in the radio lessons.

RECOMMENDATION # 7: Maintain and intensify the effort to raise the technical capability of the PER/PARI staff in the areas of research, testing, and evaluation with the aim of creating a solid core of individuals who can provide services to the educational community in the country.

RECOMMENDATION # 8: Establish partnerships between PARI/PER and local universities in order to expand the knowledge base regarding issues with which PARI/PER are concerned and, in this manner, make a contribution to educational practice in Bolivia.

SECTION I: BACKGROUND INFORMATION

In this section we briefly describe PARI (Interactive Radio Program), its goals and objectives, and its target population. Our intention is to provide a context for the Bilingual Study both in its relation to PARI and to the Bolivian reality.

A. DESCRIPTION OF PARI (Programa de Aprendizaje por Radio Interativo)

Bolivia is among the first countries to use interactive radio for school health education. This is not the first time that the methodology has been applied in the country. Since 1987, PARI (Programa de Aprendizaje por Radio Interativo) has sought to improve the learning of Mathematics in the public schools by offering teachers an alternative to the traditional teaching of Math. The pilot testing of the radio-based mathematics curriculum started in 20 public school second grade classrooms. By 1992, nearly 200,000 school children in grades two through five had learned their mathematics using Interactive Radio Instruction (IRI). In 1993, a Ministerial Resolution decreed "interactive radio mathematics" part of the official curriculum, thus paving the way for national implementation of the math radio curriculum as well as of radio programs in other areas of need, such as health education.

The rationale for expanding the program into the Health Education area took into consideration the success of the methodology for teaching Math and the knowledge base regarding radio interactive instruction developed as a result of the Math program. The expansion of PARI into the Health Education area was justified by the need to combat the high mortality rate for children under six, especially as a result of diarrhea and pneumonia. On the other hand, the positive results achieved by PARI in Math education provided the necessary encouragement to utilize interactive radio for health education.

A unique aspect of the Bolivian experience is that PARI went beyond the passive transmission of health concepts to the applied practice of healthy habits. By using interactive radio to target children in the formal school environment, rather than traditional media to reach parents in the non-formal environment, the Interactive Radio Program was able to develop an effective instructional methodology which integrates basic knowledge in health with practical activities that are within the means of the child.

The health lessons, which provide direct instruction to students in the schools, consist of twenty-five minute broadcasts where children respond to instruction by the "radio teacher" several times each minute. A complete lesson, however, from preparation to after lesson summary takes approximately forty-five minutes. Classroom teachers are encouraged to take an active role in guiding student interaction during the radio lesson, and by directing a five minute pre-broadcast period to motivate students and a fifteen minute post-broadcast session using suggestions provided in their teachers' guides.

Two factors have contributed to the success of the Radio Health Program: (a) the existence of baseline research to develop convincing messages and (b) the commitment to the child-to-child approach targeting older children as agents of change. The basic premise driving curriculum decisions is the belief that instruction should be limited to those actions that children can do for themselves or do for or teach younger siblings. The program aims at providing children with the means to reinforce practices, disseminate knowledge, and influence family health decisions.

Both qualitative and quantitative data gathered by the project indicate that the radio lessons have had a positive impact on children's attitudes and habits. There is evidence of more hand washing than before, more households are filtering water, and more children know how to recognize and respond to the problem of dehydration brought about by diarrhea. Most important, children are beginning to understand the concept of being healthy.

PARI has developed a comprehensive preventive-health curriculum for school children in grades three to five. In 1993, more than 1,000 third and fourth grade classrooms in Bolivia's principal cultural and geographical regions participated in the piloting of the new curriculum. The following content areas are included in the curriculum:

- o personal hygiene – body, dental, etc.
- o identification, prevention, and care of diseases -- transmittable diseases, immunizations, acute respiratory diseases, infections, cholera, diarrhea, etc.
- o nutrition – vitamins, foods that promote health, etc.

Although it is too early to assess the long-term impact of PARI on behavior change, a comprehensive research program is currently being undertaken through 1996 to track the course of the messages from radio to student to household. In the meantime, tests measuring student comprehension of Radio Health messages have produced significant results in several areas including the proper preparation of homemade oral rehydration solution and the assistance that older children can give to younger children with diarrhea (Fryer, M. Health Education Through Interactive Radio: A Child-To-Child Project in Bolivia, Health Education Quarterly, Vol. 18, No. 1, Spring 1991. John Wiley & Sons: New York, 1991.)

B. GOALS AND OBJECTIVES OF PARI

The goal of the PARI Program is to increase awareness of health issues with the consequence of lowering the rate of infant and children mortality. PARI was designed to assist children in meeting the following objectives:

1. Acquire personal hygiene habits that promote health.
2. Identify diseases such as diarrhea, cholera, and pneumonia and their causes, become aware of the danger they represent, and recognize the actions to be taken in the care of victims.
3. Acquire good nutritional habits.
4. Become change agents in their homes by applying the knowledge acquired in the care of siblings.

C. TARGET POPULATION

In 1992 PARI Health Education Program was implemented in five cities in Bolivia. The target audience were third graders aged between 8 and 10 in public schools who receive a twenty-five minute radio lesson a week. In 1993, implementation was extended to fourth graders in the same cities and to fifth graders in 1994.

The expansion of PARI Health Education Program to rural areas stems from its success in urban and suburban areas. The pilot study described in this report is the

first attempt to collect data on two major issues on which the success of the program in rural areas will hinge: (a) language of instruction and (b) implementation procedures. The first issue is whether in rural areas, where Quechua is the students' first language and the language utilized by the community, the Health Program should be transmitted in Quechua or in Spanish. The second, whether changes in the program are needed to facilitate its implementation in rural communities.

D. ISSUES IN BILINGUAL EDUCATION

The valley of Cochabamba, where the Bilingual Study was conducted, is a rural area with a Quechua speaking population. The rural schools in the area are, in reality, bilingual environments where Spanish is the language of formal instruction and Quechua the language of communication. The schools are located in Quechua speaking communities and even though Spanish is the official language of instruction, one must take care not to underestimate the role played by Quechua in the schools and in the instructional processes.

Outside of the school, Quechua is the language spoken at home and in the community. At the time of enrollment, children are monolingual speakers of Quechua. As they start school, reading and writing and content learning in Spanish are introduced. Quechua is utilized as an ancillary language to facilitate instruction. When teachers explain concepts that students fail to grasp, Quechua is used to give explanations, to clarify meaning, and to increase understanding; Spanish vocabulary items that are unfamiliar to students are translated into Quechua; and, in the classrooms, as well as in the common areas of the school, students speak to each other and to their teachers in Quechua. Before starting class activities for example, teachers talk informally to their students in Quechua, students sing songs in Quechua. Quechua is also used in school meetings. When students are asked to recite or sing in Spanish, they do so from memory and with a high degree of effort.

The knowledge that students have regarding the content the Health Education program varies. At home they may have learned from their parents to drink clean water or may have observed parents treat diseases such as diarrhea and stomach aches with medicinal plants and teas. They themselves, when sick, have been treated in this manner. They may have learned personal hygiene habits from their parents and transmitted the knowledge to younger siblings. In rural areas, the notions of health care are learned in the family only, and not as a result of television (practically non-existent in these areas) or of radio campaigns (we know for a fact that children's levels of radio listening is low).

Therefore, one must weigh and consider the following facts: (a) the health notions that these children already possess without the benefit of the PARI Health Education Program, have been learned at home in Quechua; (b) in the early grades their level of proficiency in Spanish is too limited for effective communication; (c) one of the objectives of PARI is to enable and encourage children to become change agents -- influencing the behavior of younger siblings, their families, and their communities; and, (d) children will only live up to this objective, if what they learned through PARI is transmitted to others in Quechua. The relevant question then is, "When dealing with rural children in early grades in Quechua speaking areas, what language would cause PARI Health Education Program to achieve its objectives more effectively?" The Bilingual Study is our first attempt to answer this question.

SECTION II: DESCRIPTION OF THE STUDY

In section II we describe the pilot study which is the object of this report. The rationale for the study was the need to document if and how language of instruction (Spanish or Quechua) impacts third graders in rural areas who are learning health concepts transmitted by interactive radio.

Research in Bilingual Education has made it clear that learning is more effective when conducted in students' first language. This study was designed to answer the following question: Is the difference in the learning of health concepts transmitted by radio in Spanish or in Quechua statistically and educationally significant for rural third grade students whose first language is Quechua ?

A. CHARACTERISTICS OF THE STUDY

To select the area to implement the study various aspects were considered: the regions in Bolivia where both languages are used, the access to rural schools in those areas, and the human and material resources available. Initially two areas were considered – Oruro and Cochabamba. The final decision to conduct the study in Cochabamba was due to the fact that PARI has a regional office in Cochabamba and to its proximity to a number of rural schools in the area.

Teachers and students who participated in the study are all bilingual. However, for the participating students, Quechua is still the dominant language since their Spanish proficiency is still very limited. All-Spanish instruction begins as children enter school and continues throughout students' school life and Quechua remains as the home and community language. In reality, teachers and students continue to utilize Quechua for out of class communication and as a means to get meaning across whenever concepts in Spanish are not grasped promptly.

B. DESIGN OF THE STUDY

The study was designed by the staff of the PARI regional office in Cochabamba in consultation with the PARI staff in La Paz, and, at a later date, with guidance from the EDC evaluation consultant. A pretest/posttest experimental design was initially selected and later modified. The design of the study included the following components:

1. Student Achievement. Out of the pool of possible schools, ten schools were randomly selected for participation in the study. The ten third grade classes were then randomly assigned to an Experimental or Control group. The Experimental group received pretest, instruction, and posttest in Quechua while the Control group received the same in Spanish. Teachers -- all bilingual -- were told to utilize Quechua or Spanish only for the duration of the study.

A ten item pretest/posttest in Quechua and in Spanish had been developed, field tested, and revised by PARI staff. A formal analysis of field test data, however, was not conducted. After pretest administration, the analyses conducted showed the data collected to be unreliable (described in C. Outcome Measures). As a result, the pretest was abandoned and the design modified to a posttest only control group experimental design. The modification of the design did not affect the results of the study, since the

main question of interest was whether the difference between the means of the Experimental and of the Control group were statistically significant at the end of the ten lesson block.

In addition to the posttest, a Student Interview Protocol was developed and interviews were conducted in Quechua and in Spanish with groups of students in the Experimental and Control groups. Results of the analysis of the data collected by the outcome measure and the Student Interview Protocol are presented in SECTION III: RESULTS OF THE STUDY.

2. Staff Development Sessions. The ten participating teachers received two full days of training. The following areas were addressed during training: (a) interactive radio methodology; (b) health education content; (c) utilization of materials – study guides, recorders, etc.; and, (d) overview of the study.

The staff development sessions focused on the content to be taught, the methodology to be employed, and the need to adopt standard program implementation procedures. It was emphasized that the study would not be valid unless teachers followed recommended procedures faithfully.

Two implementation measures were developed. The first, collected data on program implementation. The second, a teacher interview protocol was utilized during each site visit. Interview questions focused on language issues that were relevant to the study. Analysis of the data collected by the implementation measures are presented in SECTION III. Figure 1 graphically depicts the design of the study.

INSERT TABLE 1 HERE

C. OUTCOME MEASURES

In order to provide an answer to the main question that the study was designed to address, a ten-item test was developed by project staff with the guidance of the PARI project evaluator. The content specialists identified the particular focus of the test and the project evaluator adapted items from a previously used test to measure the selected skills or behaviors that program participants were expected to have acquired by the end of the ten lesson block. The instrument was field tested with a group of 19 students at a school in Cochabamba. The purpose of the field test was to check the clarity of instructions and the appropriateness of the layout.

The results of the field test led to two main revisions: (a) instructions were found to be cumbersome and too elaborate and (b) the format proved to be confusing leading examinees to mark both spaces under YES or NO, thus selecting two alternatives. Following the field testing, instructions were streamlined and clarified and the test format was altered. Instead of asking students to "Put a check in the box under YES or NO; that corresponds to the answer you find to be correct", directions instructed students to "Listen to each question and write "YES" or "NO" in the space provided".

The EDC evaluation consultant started to work on September 19 while still in the United States, to refine the evaluation design, develop instruments for data collection, lead the data analysis effort, and guide the writing of the report. At that time, the test had already been developed and field tested and it was assumed that the instrument was technically sound. Nevertheless, and for the simple reason that longer tests tend to be more reliable than shorter tests, the EDC consultant recommended that the number of items be increased from ten to fifteen. This was done and pretests were administered on August 29 and 30 prior to the consultant's arrival.

Unfortunately, and due solely to lack of technical expertise and not of good intentions, the analysis of the field test data did not go any further. Neither the distribution of scores nor frequencies were plotted. P-values (to determine the levels of difficulty of individual items) and Discrimination indices (to determine how items discriminated between high and low scorers) were not calculated. Had this been done, the need to submit the test to major revisions would have become evident. TABLE 1 displays the results of the field test data analysis conducted after the fact by the EDC evaluation consultant.

TABLE 1
Analysis of Field Test Data

Number	Average	Standard Deviation	Variance	Range
19	10.89*	1.83	3.35	5

* Maximum score possible = 15

The high average, the small standard deviation, and the limited range of the set of scores are characteristics of examinees who have already been instructed or have been through a program cycle. Since this was not the case with our sample, two factors might be responsible for the skewed distribution of scores: (a) the instrument utilized was unable to separate the instructed from the uninstructed i.e., it was too easy and (b) due to the format chosen (binary-choice items), the test placed no demands upon examinees while facilitating guessing. Perhaps the overriding weakness of the binary-choice item is the ease with which examinees can guess the correct answer. By chance alone, an examinee who knows nothing about the content being tested, ought to be able to get a 50 percent correct score. Given the inadvertent clues that sometimes are found in most sets of test items, the correct-by-chance score rises even higher.

Data from the pretest administration were utilized to compute the reliability of the instrument. Two procedures were conducted: (a) the split half technique -- the correlation coefficient yielded by this procedure is considered an estimate of the degree to which the two halves of the test are performing their functions consistently. Because longer tests are more reliable than shorter tests the Spearman-Brown prophecy formula was applied to estimate the reliability on the full test, and (b) the Kuder-Richardson index of homogeneity for a binary-scored test items (K-R20). Results are displayed on TABLE 2.

TABLE 2
Reliability Coefficients for Pretest

Procedure	Reliability Coefficient
Split-Half Reliability	.014
Reliability on full test (Spearman-Brown)	.027
Kuder-Richardson (K-R20)	.14

A perfect relationship is indicated by a coefficient of 1.00 (perfect positive relationship) or - 1.00 (perfect negative relationship). Erratic scores on the two measures (the two halves of the test), as noted when too much guessing is present, weaken the relationship and lower the correlation coefficient. The extremely low correlation coefficient (.027) yielded by the split-half reliability procedure is confirmed by the low reliability coefficient yielded by the K-R20 formula (.14). Based on this information, the data collected were considered unreliable.

In addition, two major technical flaws compounded the problem. First, there were only three NO answers as opposed to 12 YES answers. Since each time an item was introduced examinees were asked to write "Sí" o "No" (Yes or No), their natural reaction was to write "Sí" (Yes) because this alternative was always presented first. Also many examinees just wrote "Sí" throughout the test, thus guaranteeing a score of

12 (out of 15) regardless of how much knowledge they had.

The second flaw is related to one of the basic rules of binary-choice item construction, "rarely use negative statements, and never use double negatives". Two of the items (#12 and #13) disrespected this rule. They are respectively: "No me enfermo con diarrea, si lavo mis manos antes de comer". "SI" o "NO" (I won't get sick with diarrhea if I wash my hands before I eat.", "YES" or "NO") and "No me enfermo con diarrea, si lavo mis manos después de salir del baño" "SI" o "NO" (I won't get sick with diarrhea if I wash my hands after I leave the bathroom". "YES" or "NO"). Both items should have been rephrased to avoid the negative statement. Given the expected difficulty of answering a negatively stated item with a "YES" or "NO", one does not know whether the challenge resides in the item format or in the content it measures. TABLE 3 summarizes data collected by the Pretest.

TABLE 3
Descriptive Data of Pretest Scores
Indicators of Central Tendency

Group	Mean	Standard Deviation	Variance	Range
Spanish	10.55*	1.83	3.35	9
Quechua	10.22*	2.00	4.00	10

* Maximum score possible = 15

Analysis of pretest data show patterns similar to those already noted in the field test data. High averages and small standard deviations -- both characteristic of instructed examinees. If these data reflect reality, then one may decide to discontinue the program since examinees appear to master the content of the lessons without the benefit of the program. In this case, however, it is our opinion that the low quality of the instrument and the high level of guessing are the real culprits. Additional Issues related to the validity and reliability of the pretest -- which caused the modification of the design of the study -- are discussed in the paragraphs that follow.

Content Validity. The question to be asked regarding content validity is, "Does the test deal with the content it is supposed to be measuring?" To demonstrate the content validity of a set of test scores, one must show that the behaviors examinees were asked to demonstrate constitute a representative sample of behaviors to be exhibited in a desired performance domain.

The content validity of the instrument could be assumed by the fact that it was developed by health education specialists under the supervision of the project director, a health educator specialist herself. However, it would have been advisable to follow a more formal process in the construction of the instrument -- a description of how the content was selected and how test developers made sure that all of the crucial content was included in the test, a prioritized list of all behaviors that students could be asked to exhibit after the tenth lesson, and a description of how a sample of behaviors was

drawn for inclusion in the test.

Reliability. P-values for each item as well as discrimination indices were determined for the two sets of scores. P-values tell us the level of difficulty of a test item. Discrimination indices tell us how frequently an item is answered correctly by those who perform well on the total test. TABLE 4 displays the pretest p-values and discrimination indices for each item for each group.

TABLE 4
P-values and Discrimination Indices
for Pretest for Experimental and Control Groups

Item Number	Experimental		Control	
	P-value	D-Index	P-value	D-Index
1	.78	.34	.56	.21
2	.57	.19	.69	-.06
3	.62	.49	.97	.19
4	.19	-.08	.41	-.13
5	.84	.25	.91	.23
6	.90	.14	.69	.43
7	.53	.22	.79	.23
8	.63	.31	.66	.30
9	.75	.34	.94	.17
10	.74	.25	.65	.42
11	.19	0	.13	-.06
12	.89	.22	.75	.42
13	.90	.14	.93	.15
14	.90	.07	.80	.36
15	.81	.27	.52	.21

P-values can range from 0 to 1.00 with higher p-values indicating items that more examinees answered correctly. The closer to 1.00, the easier the item can be considered. As it can be observed by the examination of the data displayed in TABLE 4, the vast majority of items can be classified as "easy". One of the reasons, of course, is that when a binary-choice item is involved, on the basis of chance alone, examinees should be able to produce a p-value of .50. The problem with tests with high p-values (showing that the majority of students answered them correctly) is that it leaves little room for growth, thus making comparisons between pre-and posttest, or between the uninstructed versus the instructed meaningless. Ideally, p-values should be low at pretest time because students have yet to learn the content the item covers, and high at posttest time when a well-taught group of examinees will answer the item correctly.

Discrimination indices are one of the most powerful indicators of a test item's quality. As it can be seen from TABLE 4, the higher the p-value of an item, the lower the

item's power of discrimination. Both Ebel¹ and Popham², well known experts in test construction, offer the following experience-based guidelines for indicating the quality of a test item: discrimination indices of .40 and above, very good items; .30 -.39, reasonably good but subject to improvement; .20 -.29, marginal items needing improvement; and, .19 and below, poor items to be revised or rejected. Based on these guidelines, we would be forced to revise or reject all but two of the test items. The problems identified in the instrument are summarized below.

1. The level of difficulty. If the instrument were reliable, the means, standard deviations, and ranges would have been ideal if related to a posttest set of scores. Means of 10.22, 10.55, and 10.89 (when the maximum possible score is 15) are characteristic of instructed examinees. Also, the small standard deviations show little variability in the manner in which examinees answered test items. Given the results, one might be led to conclude that the program is unnecessary since students have already mastered the concepts which it is designed to cover. However, it must be remembered that data are only as good as the instruments used for data collection.
2. The test format. As mentioned before, binary-choice items have a main weakness: the ease with which examinees can guess the correct answer. Examination of test data provides ample proof of this. Some examinees answered "YES" to all questions (thus, guaranteeing a score of 12 out of 15) while others alternated "YES" and "NO". An abundance of guessing distorted results. These two problems resulted in an unreliable test as shown by the low reliability coefficients displayed on TABLE 2.

After careful consideration of the alternatives available, the EDC evaluation consultant made two recommendations. First, that the design be modified to a control group post-test only design. This could easily be done since the design of the study was sound — schools, classrooms, teachers, and students had been randomly selected. The main question that the study needed to answer was, other things being equal, whether the two groups, as represented by their means, were significantly different. Because of random selection, it could be assumed that groups were equivalent, thus rendering the pretest unnecessary.

The second recommendation was the development of a new outcome measure. The rationale for this recommendation was the realization that a more reliable instrument was needed, if the findings of the study were to have credibility. If decisions are to be made based on the results of the study — for example, whether the added cost of utilizing Quechua as a language of instruction is warranted — they must be made based on data that present an accurate picture of reality, not a distorted view of it. The existing test, due to its technical flaws, did not reflect the reality of student learning.

Project staff accepted both recommendations and, under the guidance of the EDC evaluation consultant, directed their efforts to the development of an outcome measure that could provide a true picture of student learning. A three-option multiple choice

¹ Robert L. Ebel, Essentials of Educational Measurement, 3rd ed. (Englewood Cliffs, N.J.; Prentice Hall, Inc., 1979) p. 267.

² W. James Popham, Modern Educational Measurement (Englewood Cliffs, N.J.: Prentice Hall, Inc., 1981) p. 298.

format utilizing drawings, was suggested. The new format would reduce to 33% the chance of examinees selecting the correct answer by chance alone. The utilization of drawings would not penalize examinees whose reading and writing skills in Spanish were less than adequate. It must be pointed out that although students speak Quechua they have not been taught to read and write in Quechua. The following procedures were adopted for test development:

1. Content specialists examined the program and classified all content found in the first ten lessons into three main areas:

- . Habits of Hygiene
- . Nutrition
- . Prevention, Identification, and Care of Diseases

Because most of the content found in the ten first lessons related to the prevention, identification, and care of diseases, it was agreed that most of the items would be drawn from this area.

2. A Table of Specifications was created by listing under each of the three behaviors domains, the specific behaviors and knowledge that students could be asked to exhibit. These behaviors were then prioritized.

FIGURE 2
TABLE OF SPECIFICATIONS

NUTRITION	HABITS OF HYGIENE	IDENTIFICATION AND PREVENTION OF DISEASES
Foods that give energy	When and why wash hands	Diseases that children commonly have
Foods rich in Vitamin C	Where microbes live.	Why diarrhea is dangerous
Benefits of Vitamin C	Why dirty hands cause diarrhea	Why diarrhea dehydrates fast
Foods rich in Vitamin A	How microbes can be killed in fruits and vegetables	Symptoms of pneumonia and dehydration
Benefits of Vitamin A	Why we need to use a bathroom	What to do if a child shows symptoms of pneumonia and dehydration

3. Items were developed to address each area: Habits of Hygiene, 3; Nutrition, 3; and, Prevention, Identification, and Care of Diseases, 13 items.
4. Items were reviewed and revised by project staff and by the EDC evaluation consultant.
5. Two examples were prepared to familiarize students with testing procedures.
6. The test was field tested with a sample of 20 students in a school in the

periphery of Cochabamba. The field test was conducted both in Spanish and in Quechua. The purpose of the field test was to determine if any of the common impediments to good item writing were present: unclear directions, ambiguous statements, unintended clues, complicated syntax, or difficult vocabulary. In addition, the adequacy of test format to examinees' ability and developmental level was assessed. There were 7 correct A alternatives, 7 correct B alternatives, and 6 correct C alternatives. Correct alternatives were placed so as not to form a pattern that students could identify or that would facilitate guessing.

7. Field test data were analyzed in order to determine the mean and standard deviation of scores and to plot the frequencies and the distribution of test scores. P-values and discrimination indices were obtained for each item. Results are reported in Section IV, A. Results of Field Test. Appendix A includes a copy of the test.

D. IMPLEMENTATION MEASURES

Project staff had been observing classes from the start of the pilot study. They are capable, trained observers and committed to the program. Their initial observations, however, were inconsistent due to the lack of both an appropriate instrument to record observations and a focus for observations. The instrument they had developed was too open-ended and lent itself to an array of subjective interpretations.

Therefore, the first task of the EDC evaluation consultant was to work with project staff in the identification of ideal, acceptable, and non-acceptable classroom behaviors that teachers could be expected to exhibit during the observation period. The second step was to guide the group in the development of a reliable instrument for data collection. Data collected previously were, whenever possible, transferred to the newly developed instrument. In addition, before starting observations utilizing the new instrument, the group reached a consensus on terms and observation procedures. The instrument was field tested by five observers (including the EDC consultant) and then revised for the remaining observations.

To develop the instrument, behaviors were identified and selected for inclusion in the instrument based on PARI staff experience and on the content of the staff development sessions. Observations were refocused to address those behaviors relevant to the study. Project staff were reminded that they were not documenting the effects of PARI. Rather, they had to be specifically concerned with the following issues: (a) whether teachers were utilizing strategies and procedures recommended during training; (b) whether the program was being implemented in a similar manner in classrooms where Spanish was spoken and where Quechua was spoken; and, (c) how the language issues were being dealt with, i.e., "Were teachers in the Control groups using Spanish- only? Was it apparent that Quechua was a necessity to get meaning across?", among other questions.

Documentation of program implementation is important because unless implementation levels can be shown to be the same at experimental and control classrooms, differences in the achievement between the two groups can be related to inconsistencies in program implementation. For example, in classroom A the teacher conducts all five activities recommended in the Guide in the manner recommended during staff development sessions while in classroom B teacher only conducts one

activity; or, teacher in classroom A is experienced and committed to the program while teacher in classroom B has just started teaching and shows little enthusiasm for health education or radio instruction.

The language issue was of particular importance since the study revolved around it. Some points need clarification. First, teachers were randomly assigned to the experimental (Quechua) or control group (Spanish). A few teachers in the control group showed some resistance when told that they could not speak Quechua (their students' dominant language) during the lesson. Teachers are used to employing Quechua to clarify points and to facilitate learning. Their main objection was that "results will be bad if we only speak Spanish". During training, and before teachers were assigned to experimental or control groups, the objective of the study was emphasized in order to enlist their cooperation.

Additional data were collected by utilizing a protocol to interview participant teachers. The development of the interview protocol followed the same procedures as the Class Observation Form. With guidance from the EDC consultant, the focus of the interviews was defined, desired behaviors were identified, and questions were developed to tap those behaviors. Results of the analysis of the data collected by both instruments are presented in SECTION III, RESULTS OF THE STUDY. A copy of the Class Observation Form is included in Appendix C. Appendix D includes a copy of the Teacher Interview Protocol.

E. DATA COLLECTION

Data were collected in the ten villages where the study was being conducted. Seven observers made 23 visits to the various sites. During these visits they utilized the Class Observation Form to document program implementation and the Teacher Interview Protocol to interview teachers and the Student Interview protocol to interview students. The posttest was field tested in a school in the periphery of Cochabamba. The EDC evaluation consultant and four PARI staff conducted the field testing. The posttest was recorded on tape and administered by PARI staff on two days. Half of the students on the experimental group and half of the students in the control group were tested on each day.

SECTION III: RESULTS OF THE STUDY

In this section the results of the data analysis are presented. Both quantitative and qualitative data were collected and analyzed. Data collection instruments include the following: (a) outcome measure; (b) interview protocols; and, (c) observation forms.

A. RESULTS OF FIELD TEST

The posttest was field tested with 20 students at a school in the periphery of Cochabamba. One of the two third grade classes was selected at random and, from that classroom, 20 students were randomly selected to participate. These students were then divided into two groups: those to whom the test would be administered in Spanish and those to whom the test would be administered in Quechua.

The first purpose of the field test was to determine ease of administration, clarity of

instructions, and appropriateness of the layout to the target group. One test administrator and one observer worked with each group. The instrument proved to be easy to administer and its format and layout to be appropriate. Based on comments made by staff after test administration, instructions were slightly revised and recorded both in Spanish and in Quechua and the test administration booklet was finalized. The Test Booklets are included in Appendix E.

Item difficulty (p-values) and discrimination indices were secured in order to allow revision of the instrument. TABLE 5 presents those data.

TABLE 5
P-values and Discrimination Indices for Field Test

Item	P-value	D-index
1*	.65	.10
2*	.90	0
3*	.80	.40
4*	.70	0
5*	.85	.30
6*	.80	.40
7*	.65	.10
8	.45	.50
9	.50	.60
10	.60	.20
11	.65	.30
12	.45	.30
13*	.85	.10
14	.55	.30
15	.45	.50
16	.70	.20
17*	.90	.20
18	.60	0
19	.40	.40
20*	.90	.20

Starred () items were reviewed and revised when appropriate.*

Because the field test was conducted with uninstructed examinees and the study participants would have received the program when they took the test, a decision was made to keep items within the .40 - .70 range of difficulty. The recommended range of difficulty for pretests is generally between .40 and .60, but the differences to be expected between the field test group and the study participants (periphery versus rural schools), provided the justification to accept items with up to .70.

Items with levels of difficulty above .70 were scrutinized and, most of them revised. In three cases, a decision was made to keep items with a low level of difficulty (as indicated by the field test). This was done because it was the staff's opinion that the items were "easy" for children living in the periphery of a major city due to the

influence of television and health campaigns. Television, however, is not a factor for students in the villages where the population of the study is found.

Items 1, 2, 7, and 17 had the least attractive distractor (the one no one selected) modified. Item 6 had its two distractors changed. For item 3, the question (item stem) was changed because it was found to give students an unintended clue. Items 5, 13, and 20 were not modified. The content of the item was considered crucial (use of bathroom and identification and treatment of diarrhea) and it was felt that the study population, due to the lack of exposure to television and health campaigns, would not be as apt to select the correct response as the students who participated in the field testing.

B. RESULTS OF THE OUTCOME MEASURE

One September 27 and 28, the posttest was administered to 219 students (115 in the experimental and 104 in the control group) in ten third grade classrooms in ten rural schools. The five test administrators were all PARI staff and worked under the guidance of the EDC evaluation consultant. To ensure uniformity, test instructions and questions were recorded for administration. The test administrator's role was to make sure that the operation was going smoothly and that students understood the mechanics of the test. Descriptive statistics related to the outcome measure are presented in TABLE 6.

TABLE 6
Descriptive Data of Posttest
Indicators of Central Tendency

Group	Mean	Standard Deviation	Variance	Range
Spanish	8.38	3.01	9.10	14
Quechua	12.42	2.82	7.99	12

* *Maximum Score possible = 20*

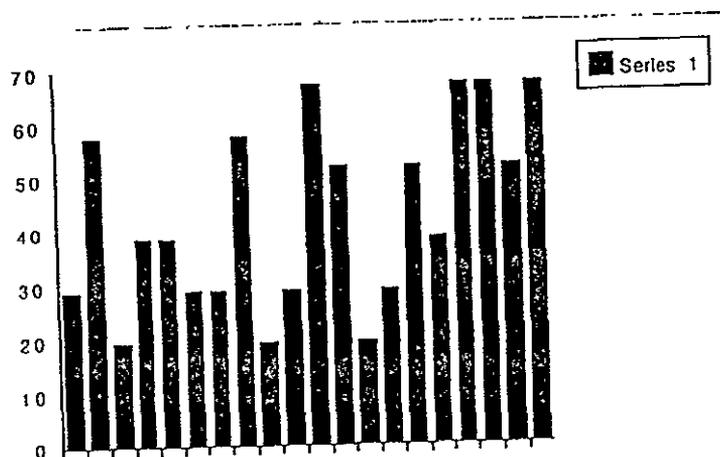
Split-half reliability procedures yielded a coefficient of .70 on the whole test. P-values and Discrimination indices for the outcome measure are presented in TABLE 7.

TABLE 7

P-values and Discrimination Indices
for Posttest for Experimental and Control Groups

Item Number	Experimental		Control	
	P-value	D-Index	P-value	D-Index
1	.50	.10	.30	.30
2	.80	.20	.60	.30
3	.30	.49	.20	.27
4	.50	.30	.40	.50
5	.90	.20	.40	.50
6	.40	.50	.30	-.01
7	.60	.30	.30	.40
8	.70	.20	.60	.40
9	.30	.40	.20	.35
10	1.0	.20	.30	0
11	.40	.05	.70	.46
12	.60	.20	.50	-.08
13	.40	.40	.20	.10
14	.30	.30	.30	.20
15	.70	.27	.50	.05
16	.70	.20	.40	.46
17	.70	.20	.70	0
18	.90	0	.70	.10
19	.50	0	.50	.50
20	.90	.10	.70	.60

P-values, which indicate the percentage of students who answered the item correctly, are graphically depicted in Figure 3 for the Control (Spanish) group.



P-values for the Experimental (Quechua) group are graphically depicted in Figure 4.

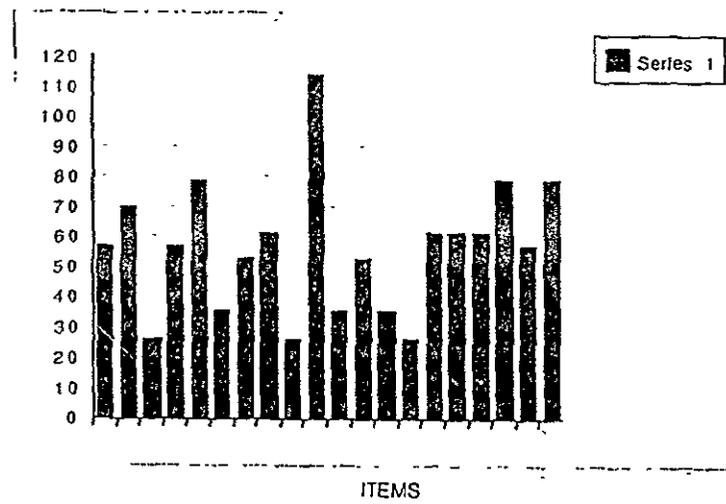
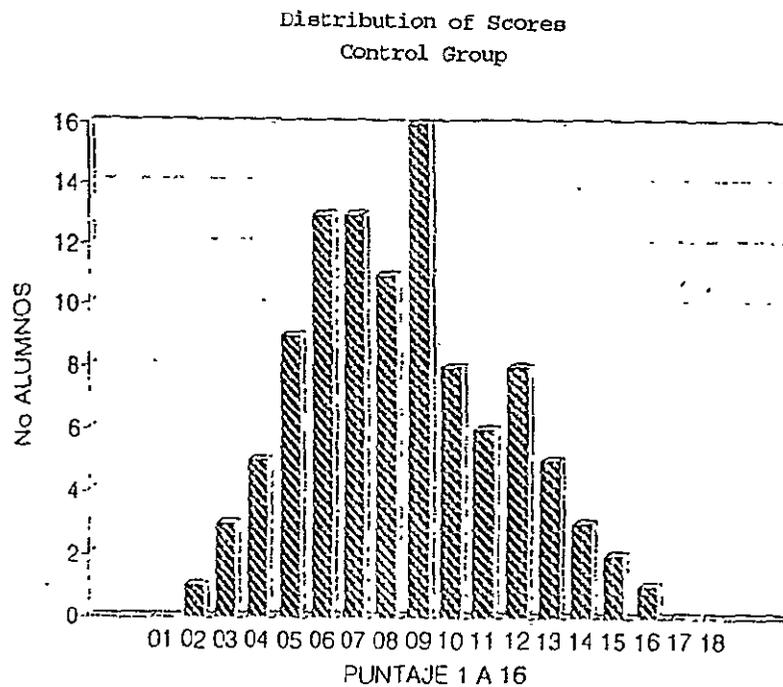
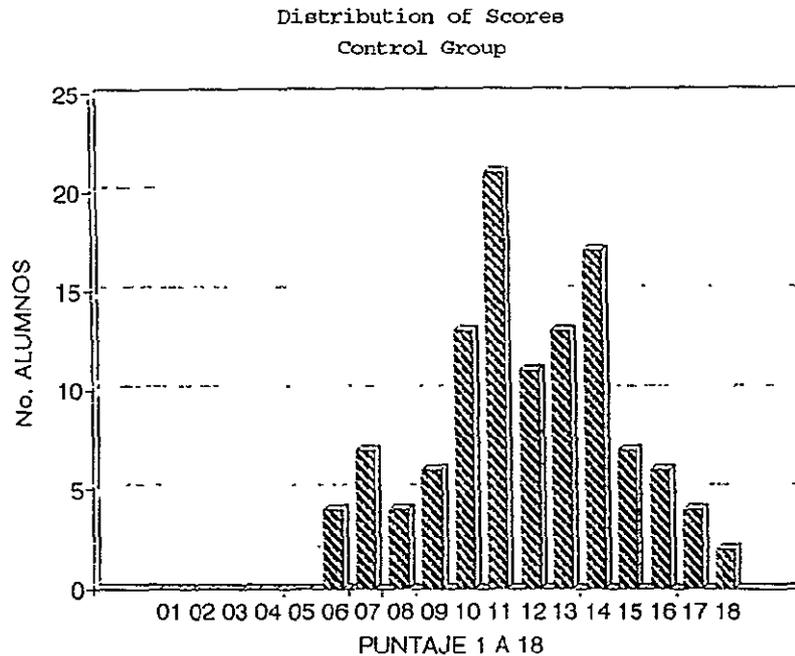


Figure 5 displays the distribution of scores for Control-(Spanish) group.



The distribution of scores for the Experimental (Quechua) group is displayed in Figure 6.



A comparison of the distribution of scores in Figures 3 and 4, shows the Experimental group with a more pronounced negatively skewed curve, that is, with the bulk of the scores towards the higher scores. It is easy to see that the whole distribution has moved towards the right (high scores). Also lowest scores for this group start at 6 (fewer than five students) while the highest is 18.

In addition to the descriptive statistics presented above, a t-test was used to test the null hypothesis that the difference between the two group means was not significantly different. The t-test is used to determine just how great the difference between means must be in order to be judged significant. Since groups were randomly selected and the instructional strategies were the same, as documented in C. Results of Implementation Measures, any significant difference in students' means might be related to the language of instruction -- Quechua or Spanish, the research question this study attempted to answer.

The first step was to establish the homogeneity of the two population variances. To test the hypothesis that $s = s$ the F ratio was employed. The obtained value of F was 1.13, lower than the tabled values both at 10 and 5 percent values, therefore, non-significant showing that the variances can be considered homogeneous. The results of the t-test are displayed in TABLE 8.

TABLE 8

A Comparison of Pretest Scores
for Spanish and Quechua Groups

Group	Number Deviation	Standard Score	Mean Posttest	t
Spanish	104	3.08	8.38	10.90*
Quechua	115	2.82	12.42	

* *Significant beyond the 0.005 level*

In educational situations one encounters numerous occasions when it is important to determine whether the mean performances of two groups are significantly different. In the specific case of this study, the experimental group received the program in Quechua while the control group received it in Spanish. Since the mean performance of the experimental group was better than that of the control group, one might conclude that the use of Quechua as a language of instruction for third grade students in rural areas is so effective that it should be employed in other classes of similar nature. But just how great does the difference between the two group means have to be in favor of the experimental group? The larger the value of t , the greater the probability that a statistically significant mean difference exists between the two groups under consideration.

As it can be seen by the highly significant value obtained, (tabled t -value is 2.617) the two groups are distinctively different. Given the value of t , the fact that the groups were randomly assigned to experimental and control treatments, and program implementation was carefully monitored, the conclusion that the difference in means are related to language of instruction is warranted.

C. STUDENT INTERVIEWS

Data collected show Quechua as the dominant language for communication within and among students and their families. Students use Quechua when they play, when they talk to each other, when they speak to teachers outside of the classroom and in their homes and communities. When the interview was conducted in Quechua, students talked more, showed greater enthusiasm, volunteered answers and answered questions more promptly. When the interviews were conducted in Spanish, students needed more probing and were more reticent.

Students show great interest in the radio lessons and are able to describe behaviors that they have acquired as a result of the program. Some quotations taken from the interviews are presented below. "I washed my hands every day before coming to school but did not know that I should wash my hands before eating." "The radio teacher taught (us) that we must wash our hands before we eat.", "I wash my hands in the river before I come to school.", "The radio teacher taught (us) to eat vegetables.", "We like the radio teacher.", "The games are beautiful, the songs we don't understand

very well.", "I did not know about diseases (diarrhea and pneumonia) and their causes. I learned with the radio teacher."

D. RESULTS OF IMPLEMENTATION MEASURES

Before data displayed in the three tables that follow are discussed, a clarification becomes necessary. The percentages under 0 are not in themselves good or bad. They simply mean that the observer, for a number of reasons, could not observe it. It could be that the lesson did not call for the specific behavior. For a example, the behavior expressed as, "Teacher conducts experiments related to the topic", but the specific lesson observed did not include an experiment. In that case, observers were instructed to check 0 (Cannot be observed. Class observation showed that teachers kept their end of the bargain. Only exceptionally, and in desperate circumstances would they utilize a word of Quechua to clarify meaning in a control group classroom.

TABLE 9
Class Observations
Activities Before Transmission

Teacher Behaviors	Yes %	Sometimes %	No %	0 %
Teacher is conducting recommended activity when observer arrives.	46	4	14	36
There is evidence that teacher has prepared materials prior to start of radio lesson.	59	14	9	18
Teacher follows all instructions included in the Guide.	55	41	4	-
Teacher uses time efficiently.	73	27	-	-
Teacher writes number and title of lesson on the board.	86	14	-	-
Teacher motivates students with a pre-lesson activity.	23	68	-	9
The radio is placed with the speakers directed to students.	68	32	-	-
Students participate in the classroom procedures (handing out materials, etc.).	13	5	27	55

The data displayed in TABLE 9 are surprisingly good for a program at such an early phase on implementation. It is important to remember that this is a new program for participant teachers. They attended only two days of training in late August and started implementation in early September. Their experience with the content and

methodology of the program is still very limited and they are still experimenting with the various class activities. Their level of commitment to the program, however, makes up for their inexperience.

Some of the behaviors showing the highest level of implementation, were emphasized during training. For example, in 86% of observations, teachers wrote number and title of the lesson on the board and in 73% it was noted that teachers utilized class time effectively. They usually placed the radio correctly and followed instructions in the Guide -- all emphasized during training. Item 8, however, which requires student participation in classroom procedures, shows a very low level of implementation. Since it was not mentioned during training, teachers did not take the initiative to involve students in that manner. Because PARI staff see it as highly desirable to counteract the traditional manner in which a number of teachers still conduct instruction, it was included in the observation form. TABLE 10 displays behaviors related to implementation of project activities during the radio lesson.

TABLE 10
Class Observations
Activities During Transmission

Teacher Behaviors	Yes %	Sometimes %	No %	0 %
Students participate in the lesson by giving oral answers.	32	27	0	41
Students participate by writing.	59	36	5	-
Students participate by singing.	32	32	36	-
Students participate by playing.	59	36	5	-
Students show interest in lesson.	45	46	9	-
Students cooperate in demonstrations.	32	14	9	45
Teacher uses non-verbal language during lesson to avoid interruptions.	59	27	14	-
Teacher uses non-verbal language to encourage student participation.	41	37	18	4
Teacher participates in activities.	59	33	4	4
Materials are used as instructed.	68	14	9	9
Materials are used to their full potential.	32	41	18	9
There is evidence that students understand summary of lesson.	27	41	23	9
Teachers pay individual attention to students who need help.	23	27	41	9

As it can be seen by an examination of data displayed in TABLE 10, during transmission, implementation of program activities has not reached its ideal level. To confirm this, one has just to look at the percentages under 1 (expressing what teachers are NOT doing). More student participation is needed -- and student participation is a direct result of teachers' ability to draw students into a task. If teachers themselves participate more actively instead of remaining passive during transmission, student participation will most certainly increase. The findings summarized in the above table point to the need for more training in many areas: in student centered instruction, in non verbal communication, in the utilization of materials to their full potential, in interactive radio methodology. TABLE 11 summarizes implementation of after transmission activities.

TABLE 11
Class Observations
Activities After Transmission

Teacher Behaviors	Yes %	Sometimes %	No %	0 %
Teacher reviews content of lesson.	27	9	9	5
Review of lesson in interactive.	36	32	27	5
Teacher expands content of lesson during review.	50	18	27	27
Teacher selects at least one or two activities in the Guide for use in after lesson period.	32	36	23	9
Teacher conducts practical demonstrations in class.	36	5	45	14
Communication between teacher and students is easy and open.	32	54	9	5

The data summarized in TABLE 11 confirm the comments made previously. Teachers are more apt to follow recommendations that are related to a more traditional mode of teaching (for example, item 22 "Teacher reviews content of lesson") than recommendations that involve "doing" (for example, conducting experiments) or shared leadership of classroom processes (interactive review of lesson, open communication with students). Based on these data, future training events should focus not only on the methodological aspects of the program but also on teachers' attitudes that influence the way in which instruction is conducted.

As it often happens with objective measures, some of the richness of the observations could not be captured by simply selecting a statement or a number. Therefore, it was agreed that observers would also record facts or actions that escaped the constraints of and objective observation forms. The comments recorded by observers are summarized below:

1. In general, children participation is still limited. In some classes children participation in giving responses to the "radio teacher" as well as in songs and games is timid. It may be that student participation is not emphasized in other areas of the curriculum. If students are not encouraged to participate actively in other classes, it is understandable that they fail to do so in the Health Education class. It is important to remember that children participation is a direct result of teachers' attitudes towards participatory instruction.
2. The level of participation for the experimental group (Quechua) is much higher than for the control group (Spanish). Groups that utilized Quechua as a language of instruction showed a much higher level of enthusiasm when giving responses, singing, and playing games. This is understandable, and confirms the findings of this study described in C. Results of Outcome Measures. Students' Spanish skills are still too limited in third grade for effective classroom participation. Often, students fail to grasp the meaning of concepts, they have limited vocabulary in Spanish, and pronunciation problems. Consequently, and for fear of making mistakes when the program is transmitted in Spanish, they remain quiet and participate less.
3. Children show great interest in sounds (animal sounds, water falling, thunder, etc.). Overall, the radio transmission catches the attention of students. Attention peaks however, when sounds, voices, stories are part of the lesson.
4. Many teachers are uncomfortable with non-verbal language. Because teachers were trained not to interrupt the transmission, non-verbal language becomes a necessity to encourage student participation, to call attention, to give directions, and to clarify certain points. It often occurs that more traditional teachers find it difficult to be playful in front of their student for fear of being ridiculous or of losing their students' respect.
5. Some teachers still feel that their place is in front of the class and do not circulate and mingle with students. It is true that in two or three classrooms the disposition of the furniture did not allow teachers to circulate. However, even when this was not the case, some teachers failed to walk around and give students individual attention. As a result, students sitting in the back of the class received much less attention than those sitting in front.
6. The separation by gender could be observed in some classes. In some classes girls and boys could be seen sitting in separate areas. In one class, when the teacher thought she was going to select students for participation in a certain activity (before the observer made it clear that it would be random selection), she selected a group of ten boys. There were approximately 15 boys and 15 girls in the classroom.
7. Materials are not being used to their full potential. Conducting experiments is still a foreign concept to many teachers who have been trained in more traditional forms of instruction. For example, a teacher justified not conducting an experiment (to show the effects of dehydration an orange had to be cut in two and squeezed so that students could see the liquid coming out of the fruit) for lack of "an orange" forgetting that the same effect could be achieved with a lemon, a wet cloth, or other props.

E. TEACHER INTERVIEWS.

Teachers who participated in the bilingual study are all bilingual. Like their students, Quechua is their home language and Spanish the language they learned in school. The interview questions focused on the role played by the two languages. Teachers answers provide additional insights into how Spanish and Quechua interact and into the roles they play in the schools and classrooms.

1. Lessons are taught in Spanish ("Because it is determined by the official program.")
2. In the classroom, during formal instruction, Quechua is used as an ancillary language. ("We use Quechua to teach better...", "...to explain better", "...so that students understand us better..." "...to give instructions so that students understand what they must do..." "...we utilize Quechua when they have doubts....").
3. During formal school events (Civic Education twice a week) Spanish is the preferred language. ("We talk to them in Spanish but we're not sure if they understand.").
4. Outside of the classroom all communication with students is in Quechua. ("...because it's the language they use in their homes...", "...they speak Quechua all the time...", "...when they walk to and from the school they go in groups and speak Quechua among themselves...", "...when they are playing they use Quechua...").
5. Communication with parents is in Quechua. ("...for the most part in Quechua...", "...it's up to the teacher...").
6. Teachers are aware of the instructional problems they face. ("...we have many instructional problems..", "...students have trouble understanding and interpreting what they read...", "we find it necessary to use Quechua to help them understand the content...", "...the books we use are not contextualized...", "...the readings do not make sense to them...").

F. MINI CASE STUDIES

In order to give the reader a feel for the type of community where the study was conducted two very brief case studies follow.

CASE STUDY # 1

The PAJCHAPATA LUX public school is located in a village approximately 25 miles from Cochabamba in a valley surrounded by hills which protect the village from the winds. In order to understand how isolated the school really is, one has to keep in mind that both the scarcity of paved roads in Bolivia and the mountains surrounding Cochabamba provide formidable barriers to the traveler. The mileage, then must be seen in the context of the Bolivian topography and reality. For example, twenty five miles may mean a three or four hour drive.

The community comprises about 50 families with an average of five members per family. The village inhabitants work in agriculture, and in a smaller scale, cattle, sheep, and goat raising. There is a Catholic church in the village and next to the

church a nursery for pre-school children, "Mama Huasi". The school is a comfortable, recently constructed building. The water used in the school comes from a well.

Quechua is the dominant language in PAJCHAPATA LUX. Everyday communication is in Quechua. Spanish is rarely used and only in those cases when strangers do not understand Quechua. The villagers' knowledge of Spanish is limited and their difficulty in pronunciation is apparent. In the school both languages are used. Spanish is only used as a formal language of instruction in the classrooms. Teachers constantly resort to Quechua to facilitate learning, to clarify concepts, and to expand explanations. Also, communication outside of the classroom between and among students and teachers and students occurs in Quechua.

Student population includes 107 students divided in the following manner: 21 first graders, 24 second graders, 24 third graders, 14 fourth graders, and 21 fifth graders. Drop out rates are higher in the lower levels with an average of three students per class. The teachers comment that when parents leave for Chapare to work, they take with them their younger children. An average of three students per class are retained each year.

The five teachers live in the community from Monday to Friday and travel to Cochabamba for the weekend. Housing for one couple -- husband and wife teachers -- is available in the community. All five teachers are graduates from the Normal Rural School and one of the teachers has a specialty in Health Education.

Parents support the school by repairing the school building when necessary and expanding its construction. Breakfast, which is served daily, is prepared by mothers on a rotation schedule. Breakfast consists of milk and bread. Bread is baked by the same mothers in the industrial oven of "Mama Huasi". Both the milk and the flour for bread come from CORDECO (Development Corporation of Cochabamba). For others expenses such as sugar, butter, and yeast, and gas, the school charges each student 1 Boliviano (US\$ 20 cents) a month.

CASE STUDY # 2

The MATARANI School is located in a mountainous area approximately 50 miles southeast of Cochabamba. The same comment which made in Case Study # 1 regarding the actual distance and isolation of the school, applies here. The community receives a number of services, the school among them. Construction is almost exclusive of adobe without any urban planning. The village inhabitants work in agriculture, and in a smaller scale, cattle and sheep raising. During the times of planting and harvesting, villagers usually stay away from the village working on their plots. The water utilized in the school comes from a stream and a small reservoir in a neighboring hill.

Quechua is the language used almost exclusively in the village of MATARANI. Villagers criticize those who communicate in Spanish -- not their native language. Students use Quechua to communicate with family and members of the community and when talking to each other. Spanish is used for formal classroom instruction but, outside of the classroom, teachers speak Quechua with students. They also use Quechua as an ancillary language to clarify instructions and explanations, to increase

understanding, and to relieve the conceptual burden for students. Teachers speak to students in both language but among themselves, speak preferably Spanish. Communication with parents, however, is in Quechua.

There are 307 students distributed in the following manner: 58 first graders (2 classes), 75 second graders (3 classes), 65 third graders (2 classes), 56 fourth graders (2 classes), and 55 fifth graders (2 classes). There are ten classrooms and thirteen teachers in the school, all bilingual, including the director. All teachers are graduated from the Rural Normal School. Housing is provided to teachers in the school grounds in houses where farmers used to live. Teachers travel to Cochabamba once a month for shopping.

Breakfast is prepared by the janitor and served on to half of the student population on alternate days. Ingredients for breakfast are provided by CORDECO. Bread for student breakfast is made by parents. Apart from that, parents participate very little in the school. Drop out rates are low -- approximately one student per grade this year. In 1993, thirty nine student were not promoted to the next level. The retention level is the highest for second graders.

SECTION IV: CONCLUSIONS AND RECOMMENDATIONS

Based on the findings described in SECTION III of this report, several conclusions can be drawn. They are summarized in this section. Also recommendations related to each conclusion are presented here.

CONCLUSION. Third graders in rural areas of Bolivia where Quechua is the dominant language learn health concepts through radio transmission more effectively when the content is transmitted in Quechua than when the same content is transmitted in Spanish. The difference between the two groups, as represented by their means, was found to be statistically and educationally significant.

RECOMMENDATION. Expand the radio program to rural areas where the need has been documented. Whenever Quechua is the dominant language in the community, make a decision to transmit the program in Quechua for more effective teaching and learning.

RECOMMENDATION. It is important to clarify the reasons for transmitting the program in Quechua since language of instruction is often a delicate, political issue. Clarification is needed to the effect that PARI is not advocating the replacement of Spanish as a language of instruction. Rather, PARI advocates, in very limited and specific circumstances, the use of instructional strategies that promote, enhance, and ensure learning. Utilizing Quechua to teach third graders in rural areas how to prevent and treat diseases, is a more effective strategy to reduce the high mortality rate of Bolivian children and infants than teaching the same content in Spanish.

Based on the findings of the study, third graders learn health concepts more effectively when Quechua is the language of instruction. This is understandable since their Spanish speaking skills are still very limited in third grade. But there is another reason for the utilization of Quechua in these specific circumstances. If these children are to become change agents in their families and communities, then they need to master the concepts in Quechua -- clearly the language they must utilize so that they can easily transmit their knowledge to younger siblings. Using Spanish as the language of instruction in this specific case, will place an added and unnecessary burden on the children both on the conceptual (learning) and practical levels (sharing with others).

CONCLUSION. The findings of the study could assist and guide decision makers, program developers, and educators in their efforts to more effectively reach and educate young children in rural areas.

RECOMMENDATION. Identify and utilize a variety of dissemination strategies in order to increase awareness of the results of the study and of the bilingual issues involved. Dissemination strategies should include press releases, newsletters, and submission of the results of the study to professional journals for publication and for presentation at conferences.

RECOMMENDATION. Organize a high level conference around the findings of the study and its implications. Invite a well known and influential official or legislators to

be the keynote speaker and set the tone for the conference. Invite a diverse and influential audience which should include high placed government officials, legislators, university and private sector leaders. Have presenters take the findings and implications of the study and move forth in a practical, "what works" orientation so that next steps can be discussed.

CONCLUSION. Teachers need assistance in overcoming well established and conventional patterns of teaching which do not promote student participation in the learning process.

RECOMMENDATION. During training emphasize and give practical demonstrations regarding the role of the teacher as a facilitator and as a promoter of learning. It is important that teachers understand the role that students can play as constructors of their own learning. Teachers need to be given suggestions and strategies in order to move students in that direction.

RECOMMENDATION. During training expose teachers to mimics or storytellers who make good use of body language and non verbal communication so that they have a model to emulate. Teachers need to understand the educational value of non verbal communication and feel freer to use it to benefit their students.

RECOMMENDATION. Research literature has repeatedly described the discrimination patterns found in the classroom where boys, as a rule, receive more attention than girls -- regardless of the gender of the teacher. During training, seek to increase teachers' awareness of these patterns, to influence their attitudes, and to change their behaviors regarding seating arrangements and other forms of gender discrimination.

CONCLUSION. Both the program and the Guide could be revised to make them more relevant and more appealing to children.

RECOMMENDATION. Revise the program and the guide to include more games, more sounds, chants, and songs related to the topics to increase participation and maximize learning. It is obvious from observations conducted in the classrooms that attention peaks whenever those elements are present.

RECOMMENDATION. For the segment of the population that receives the program in Quechua, look for Quechua songs and stories that make sense in the context of the students' lives rather than relying on the translation of Spanish songs and stories.

CONCLUSION. The data collected during the study have the potential to be utilized in a number of research projects related to the topic.

RECOMMENDATIONS. Establish partnerships between PARI and the local universities with the aims of expanding the impact of the study. Prepare a list of research topics that PARI would like to have researched using the available data.

Some research questions could be, "Is there a significant difference between the means of boys and girls who participated in the study?" or "Is there a significant difference in learning by age group?"

RECOMMENDATION. Have university students in search of a thesis work under the guidance of the qualified PARI staff person research these topics. This strategy would have many advantages. First, it would draw to PARI the higher education segment. Second, it would expand -- at no cost to PARI -- the knowledge base related to issues relevant to the project's activities. Finally, it would be one step in the direction of creating a research/evaluation space and, in this manner, making a significant contribution to educational practice in Bolivia.

CONCLUSION. Some PARI/PER staff have the interest and the potential to become experts in the areas of research, testing, and evaluation.

RECOMMENDATION. Maintain the effort to raise the technical capability of the PARI/PER staff in the areas of research, testing, and evaluation. Specifically, target those individuals from the Cochabamba office who have worked in the bilingual study and provide them with the resources needed to realize their potential since they already have the necessary level of entry knowledge, the interest, and the ability. PARI's aim should be to create a solid core of technically skilled individuals who can, in turn, contribute to the raising of national standards in a much needed area. PARI/PER should acquire the expertise and position itself to be a service provider to other programs and agencies -- governmental, non governmental, and private in Bolivia.

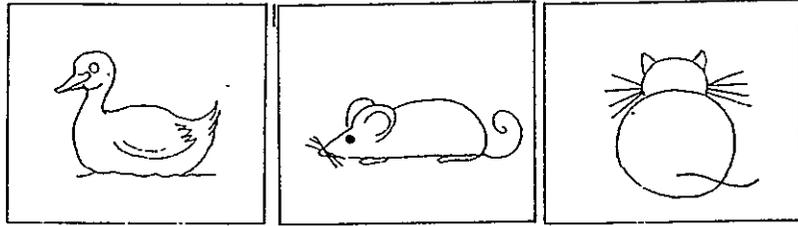
APPENDIX A
OUTCOME MEASURE: POSTTEST

PRUEBA OBJETIVA II

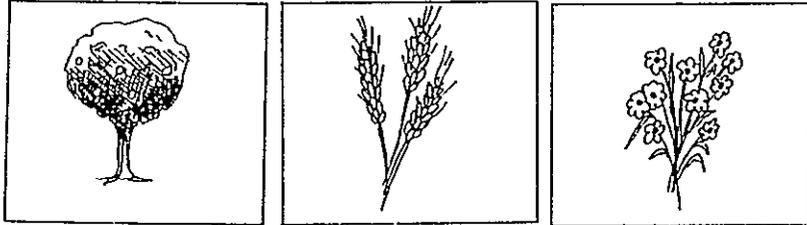
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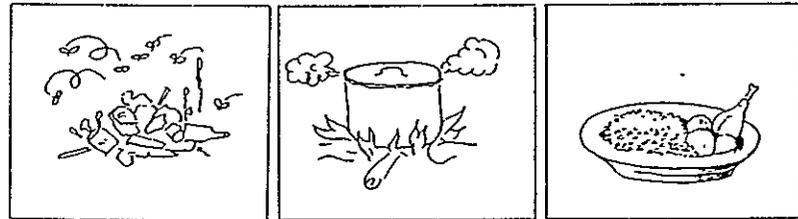
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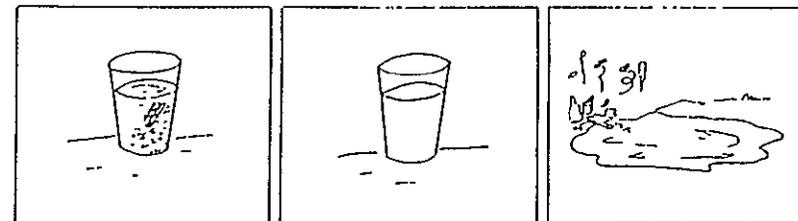
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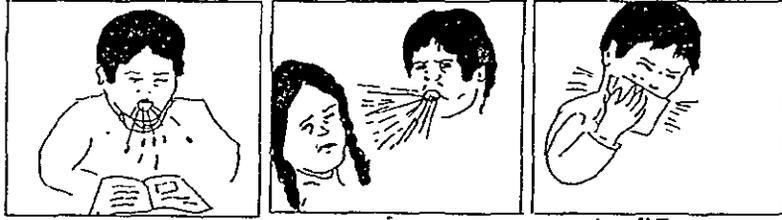
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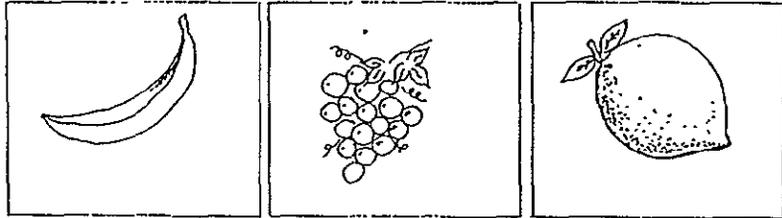
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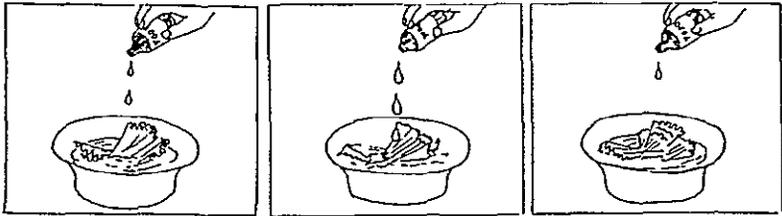
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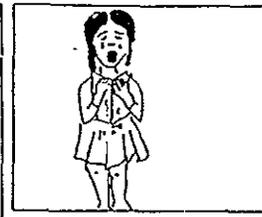
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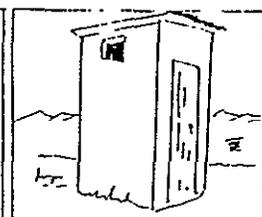
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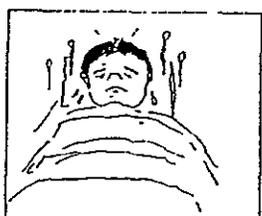
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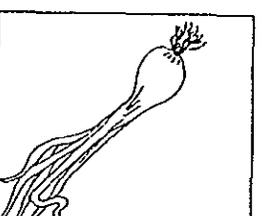
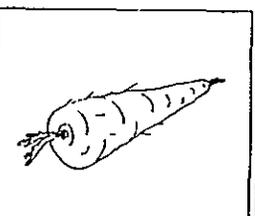
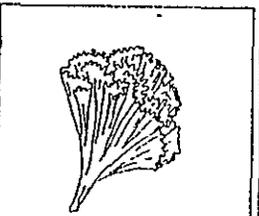
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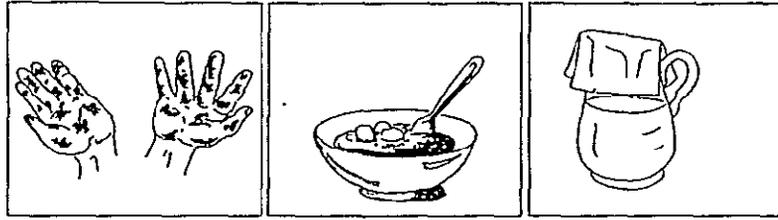
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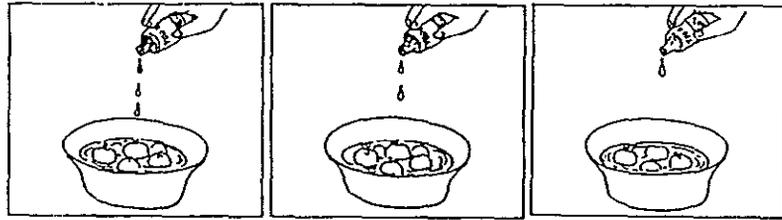
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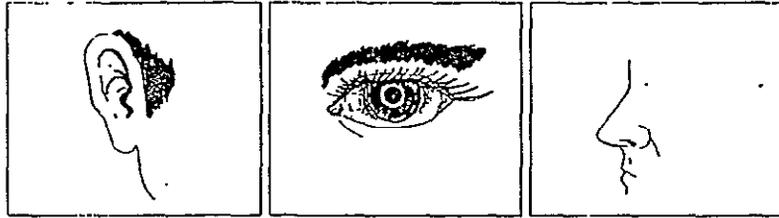
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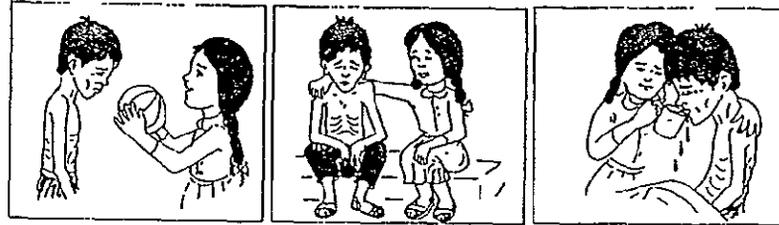
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APPENDIX B
STUDENT INTERVIEW PROTOCOL

STUDENT INTERVIEW PROTOCOL

1. In school, when you are playing with your friends, which language do you speak -- Quechua or Spanish?
2. Which language do you speak at home -- Spanish or Quechua?
3. Before the radio teacher, did you know about diarrhea, pneumonia, and other diseases?
4. Before listening to the radio lessons, did you wash your hands before eating?
5. What did you like the best about the radio lessons?

APPENDIX C
CLASS OBSERVATION FORM

TERCER CURSO "CUIDEMOS NUESTRA SALUD" - 1994 PROGRAMA PILOTO - CASTELLANO - QUECHUA

HOJA DE OBSERVACION

LECCION No. _____

Escuela: _____ Observador: _____

Curso: _____ No. Alum: _____ Turno: _____ Profesor(a): _____

Lugar y fecha: _____

Haga un círculo alrededor del número que corresponde a su observación:

SI = 3 EN PARTE = 2 NO = 1 NO SE PUDO OBSERVAR = 0

Utilice el espacio de los comentarios al final de la hoja para aquello que considere relevante.

ACTIVIDADES ANTES DE LA TRANSMISION

1. Cuando llega el observador, el profesor está haciendo actividades propias del programa?
3 2 1 0
2. Hay evidencia de que el profesor ha preparado su material antes de la transmisión de la lección?
3 2 1 0
3. El profesor sigue todas las instrucciones de la guía para el aprestamiento?
3 2 1 0
4. El profesor utiliza el tiempo adecuadamente?
3 2 1 0
5. El profesor pone el número y el título de la lección en el pizarrón?
3 2 1 0
6. El aprestamiento lleva a la motivación?
3 2 1 0
7. El radioreceptor está ubicado con los parlantes en dirección a los alumnos?
3 2 1 0
8. Los alumnos participan en la organización de la lección, por ejemplo, distribución de cuadernos, hojas y otros materiales?
3 2 1 0

ACTIVIDADES DURANTE LA TRANSMISION

9. Durante la transmisión, los alumnos participan dando respuestas orales?
3 2 1 0
10. Los alumnos participan escribiendo? (por ejemplo el título de la lección, los mensajes, etc.)
3 2 1 0
11. Los alumnos participan cantando?
3 2 1 0
12. Los alumnos participan jugando?
3 2 1 0

13. Los alumnos muestran interés en la transmisión?
3 2 1 0
14. Los alumnos cooperan en las demostraciones?
3 2 1 0
15. Los profesores utilizan el lenguaje NO VERBAL durante la transmisión para no interrumpir el programa?
3 2 1 0
16. Los profesores utilizan el lenguaje NO VERBAL para estimular el proceso?
3 2 1 0
17. Participa el profesor durante la transmisión en las actividades?
3 2 1 0
18. Los materiales son utilizados por el profesor de acuerdo a las instrucciones?
3 2 1 0
19. Los materiales son utilizados por el profesor en toda su potencialidad?
3 2 1 0
20. Hay evidencia de que los alumnos entienden el resumen al final de la transmisión?
3 2 1 0
21. Los profesores efectúan control individual, acercándose a los alumnos que necesitan ayuda?
3 2 1 0

ACTIVIDADES DESPUES DE LA TRANSMISION

22. El profesor hace un repaso de los contenidos de la lección?
3 2 1 0
23. El repaso que hace el profesor es interactivo?
3 2 1 0
24. Amplía el profesor los contenidos de la lección durante el repaso?
3 2 1 0
25. Selecciona el profesor una o dos actividades de la guía?
3 2 1 0
26. El profesor realiza demostraciones prácticas relacionadas con la lección?
3 2 1 0
27. La comunicación entre el profesor y los alumnos es abierta?
3 2 1 0

OBSERVACIONES ADICIONALES:

APPENDIX D
TEACHER INTERVIEW PROTOCOL

TEACHER INTERVIEW PROTOCOL

1. In general, which language -- Quechua or Spanish -- do you utilize to conduct your classes?
2. Do you use Quechua for instructional purposes? If so, why?
3. When the students want clarification or want to ask questions, which language do they use?
4. Do you give classroom directions in Quechua or in Spanish?
5. During formal school events, which language is used -- Quechua or Spanish?
6. Which language do students use to communicate outside of the classroom? outside of the school?
7. Which language do teachers use to talk with parents both informally and formally?
8. What types of instructional problems related to language, do you face when conducting your classes?

APPENDIX E
TEST BOOKLETS