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CANADA

Teaching yourself in primary school

Report of a seminar on self-instructional programs

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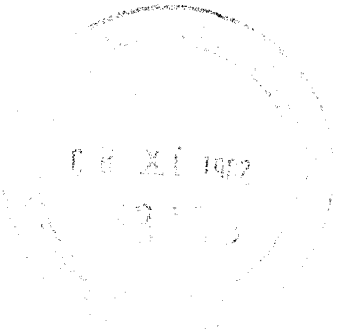

Report of a seminar on self-instructional programs held in Quebec, Canada, 12-15 May 1981

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Liberia's Improved Efficiency of Learning Project

The educational needs of Liberia are similar to those of many other developing countries; national goals are to improve the quality of education, access to it, and the efficiency of the delivery system. A *Liberia Education and Training Review Memorandum* (World Bank 1979) elaborated this approach, and an *Education Sector Policy Paper* (World Bank 1980) has endorsed it for developing countries in general.

The population of Liberia is about 1.8 million. About 70% of the people live in rural areas. The population is increasing at an annual rate of about 3.3% overall and 8% in urban areas. English is the official language and is used for instruction in all schools. About 16 languages are spoken in the country.

Access to education in rural areas is especially restricted. Although about 50% of school-age children are now enrolled in government and private primary schools, the availability and quality of schooling are skewed in favour of the urban centres, especially the capital, Monrovia. Liberia has adopted a policy of universal primary education, but extension of the present conventional model to achieve this goal is not economically feasible in the immediate future. The restrictive cost factors that Hultin and Jallade (1975) emphasize for developing countries in general apply to Liberia.

The efficiency of the school system is low. Of every 1000 students who enter at the preprimary level, only 175 complete primary school. More than half leave the formal system before reaching literacy. One major cause of the low quality of education is the lack of textbooks and related materials in most primary schools. Although only estimates are available, it is likely that fewer than 3% or 4% of students can afford the prescribed textbooks.

Quality of primary education is also affected by the severe shortage of trained teachers. In 1979, there were 811 government primary schools, staffed by 3480 teachers. Only 29% of these teachers were fully trained: 48% were underqualified (they were high-school graduates with no teacher training), and 23% were unqualified (they did not graduate from high school and had no teacher training). The two teacher-training institutes in Liberia, Kakata Rural Teacher Training Institute and Zorzor Rural Teacher Training Institute, do not prepare enough qualified teachers even to keep up with attrition in the teaching force and the growing school population.

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The general strategy for education is stated in *The National Education Plan 1978-1990* (Ministry of Education 1977). Over the next few years, the Ministry of Education will focus on: implementing the new curriculum, increasing rural access to schools, improving skills within the primary teaching force through preservice training and a new inservice training program, upgrading the facilities of all existing primary schools, supporting a new program to produce and distribute educational materials, and exploring an innovative program for increasing efficiency of primary school instruction.

PLANNING

The immediate technological antecedent of the Improved Efficiency of Learning (IEL) project is Project Impact in the Philippines. Project Pamong in Indonesia, Project Inspire in Malaysia, Project Rit in Thailand, Project Primer in Jamaica, Project SAGE in Canada, and Project Distar in the United States all reflect variations of the same general theme: separation of the design and planning function from the implementing function of teaching.

Initial planning began late in 1976, when the concepts of low-cost innovations in programed instruction developed and tested in Impact and Pamong were discussed with Liberian educators by members of the education staff of the U.S. Agency for International Development (AID) mission to Liberia. These discussions led to an AID/Liberia-sponsored visit to Southeast Asia by a delegation of senior Liberian educators. The purpose of the visit to Impact was to provide information not for a replication but for an assessment of whether the elements of Impact could feasibly be adapted to Liberian efforts to improve the performance of underqualified and unqualified teachers. That visit led to the design of the IEL project, which is an excellent example of technology exchange between two developing countries.

The visit was followed by about a year of intense planning, involving Ministry of Education staff, other Liberian educators, and AID/Liberia professional staff. This process delayed final approval of the IEL project for about a year, but it was important for two reasons. First, it ensured that the project was designed to suit the unique educational requirements of Liberia, rather than being a simple replication of an approach that had worked elsewhere. Second, because Liberians were involved in all aspects of the design, it ensured endorsement of the project by the educational establishment.

Although a few project planners, inside and outside Liberia, regarded this delay as unnecessary, the nontraditional aspects of the project made it wise to wait until support was widespread. Endorsement by a number of Liberian educators has more than justified the delay and has helped considerably with the process of implementation. I emphasize this point because many projects are designed and promoted by consultants and development agency personnel without sufficient local involvement. This approach may facilitate planning and funding, but it often results in projects that do not conform to the constraints of local resources and tradition and are seen, correctly, as externally imposed.

They may be accepted by a developing country eager for external funds but often fail to operate after foreign advisers leave.

MODEL

Most educational models assign teachers the dual role of planning instructional strategies as well as executing them. It is sometimes useful, however, to separate these two responsibilities. The planning and the development of instructional strategies require a high level of expertise. Their implementation, however, can be done by persons not formally qualified as teachers. Ellson (1973:42) makes this clear:

> One who teaches according to a program planned by others needs far less training than the professional teacher who is expected to plan as well as to teach.
>
> The separation of the planning and execution functions in programmed teaching may be compared with the separation of the functions of composers and performers which occurred in the field of music several hundred years ago in Europe and a thousand years ago in Asia. When all performers were also composers, good music was a rare commodity, and expensive. When composing was reserved for those who have the necessary very special qualifications and performers were not required to compose, it became possible for many more people to perform. Simultaneously, the quality of music improved and it became more generally available. In music, good composers are rare, potential performers are many. The same is true in education.

Planning and execution (composer and performer) were clearly separated in Impact: a highly qualified research staff developed programs, and a group of older elementary students executed the programs in teaching young students. A similar separation is planned in Liberia, although performers will be underqualified and unqualified teachers.

The following description of the IEL project model is tentative, as this report is being prepared midway in the project. As instructional materials are tested and the model itself is tried in a number of schools, adaptations will be made in the light of formative and summative evaluations.

INSTRUCTIONAL MATERIALS

Two basic modes of teaching, programed teaching (PT) and programed learning (PL), were selected. All prescribed or controlled instructional processes are referred to as "programed instruction." When the teacher and the teaching process are guided by procedures that specify precisely what and how to teach, it is termed PT. When the learner and the learning process are so guided, it is termed PL, the form of programed instruction that typically produces learning without direct involvement of a teacher.

Instructional materials are organized in modules for both PT and PL. PT modules are prepared for most of grades 1-3 and PL modules for grades 4-6. Grade 3 is transitional, with PT used in the first half

year and PL in the second. About 40 PT modules are being prepared for each of the first two grades and 20 for the first half of grade 3. Sixty PL modules are being prepared for the second half of grade 3, and 145 modules for each of grades 4-6. Subjects covered are language, reading, mathematics, science, and social studies for all six grades, plus arts and crafts for grades 4-6.

Content for all PT and PL modules is based on the revised national curriculum (RNC) of the Ministry of Education. The RNC sets out the philosophy of education; its broad goals; and, for each grade and subject, general and specific objectives, scope and sequences, and content and activities. Before development of the modules began, the RNC was fully analyzed. It was found to need refinement and clarification. There were wide variations in the details among subjects and grades and much repetition. The project staff developed a working curriculum, based on the RNC, that was then reviewed by a subcommittee of the project's steering committee.

MANAGEMENT

Instructional supervisors will each supervise the work of 25–30 teachers — the average number of teachers in four to five rural schools, each with six grades and one teacher to a grade. Supervisors will have no teaching duties and will probably be recruited from the fully trained teachers now in the Liberian system. Most teachers will be responsible for a single grade, but in small schools one teacher may be responsible for several grades, both PT and PL.

During each 45-minute lesson the first third of the time is devoted to PT, the second to practice, and the third to review. Active participation by the teacher is not required for the practice and review parts of lessons; thus, one teacher can manage three groups of 15 students, simultaneously with a resulting student:teacher ratio of 45:1.

For the PT part of the lesson, the teacher follows a prescribed procedure, using a PT booklet displayed so all 15 students can see it and asking questions that require group responses. If any student gives an incorrect response, the teacher follows a prescribed remedial sequence, such as modeling the correct answer, before asking again for a group response. The teacher uses signals, such as pointing to an item in the booklet, so that all students will respond together. Teachers are trained to recognize hesitation by any student so he or she can be given immediate help. As a further precaution, the programs have sufficient redundancy so that all students will learn all the material without the need for the teacher to diagnose every individual difficulty. (Some forms of PT, such as reading and writing, do not precisely follow these procedures.) After a 5-minute rest, the group moves to the practice session.

The purpose of the practice session is to allow students to master the content and skills of the PT lesson just completed. This usually is done without the direct guidance of the teacher, who by now will be managing a PT lesson for a different group. For practice, the group of about 15 students usually divides into three subgroups. They are given practice materials (usually flash cards) that repeat the content of the

PT lesson. They take turns asking each other questions in a programed sequence specified by the practice materials. During the practice session, the teacher is available to assist with any problems.

The review session follows the practice part of the lesson. Its purpose is to strengthen the mastery gained in previous lessons. The content of the review session, therefore, is that of the previous few lessons. Usually the subgroups of students are the same for practice and review. Various learning games and other activities are included, often with competition among subgroups. As with the practice session, review takes place without the direct intervention of the teacher, who is nonetheless available for assistance.

In the last 3½ years of school, students learn with PL in groups of five to eight. The PL modules are used, with the teacher acting only as a monitor and resource person. The groups use PL booklets, which they study as a group with leadership rotated among all members. A leader's booklet provides a detailed learning procedure and contains answers to the practice questions that are an integral part of each program. One teacher can supervise the activities of as many as 12 groups, making possible a student:teacher ratio of 96:1.

For all grades, a daily 45-minute period is scheduled for remedial activities. This allows the teacher, older students, and more capable peers to assist any student having difficulties. This time is especially valuable for students having problems with particular material or who have been absent. Tests, given after about 14 hours of PT learning and 5 hours of PL, identify students who need further assistance.

Teacher Training

Teacher training will be of two types. First, instructional supervisors and the PT and PL teachers will be trained in 2-week workshops. The second type of training will be on the job through instructions written into the materials themselves and through continued inservice training as needed.

Project Organization

The project is located in quarters provided by the Liberian government at Gbarnga, the capital of Bong County, about 200 km northeast of Monrovia. It is directed by Janice Vani, former head of the department of education, Cuttington College. She reports to the deputy minister for instruction in the Ministry of Education, and the deputy minister operates through a steering committee that develops and adapts policy for the project and continuously reviews project activities. There has been a reasonable working relationship between the project and the committee.

The project is organized into six units: instructional design, implementation and training, evaluation, production, administration, and teacher education. Each unit is headed by a Liberian, and one of the advisory field staff is assigned to work with each. From the inception, Liberians were placed in line positions to promote institutionalization.

Six full-time advisory field staff are provided to the project through the Institute for International Research (IIR).

Because of the large numbers of educational materials needed, special provisions were made for inhouse production. Besides general office equipment and furnishings, AID has provided two word processors, a printer, and two photocopiers. The word processors have been valuable for repeated revisions during production, and the photocopiers facilitated numerous layout changes without the costs and long delays of mimeograph or offset masters. Five vehicles have been provided for the extensive travel necessary between the project site, schools, and Monrovia.

STAFF DEVELOPMENT

Training for the Liberian staff is given high priority because of the project's emphasis on institutionalization. As specified in the project plans, training is of three types: long-term degree and nondegree, short-term, and on the job.

Long-term training consists of master's or equivalent training for the Liberian administrative heads of the evaluation, implementation, and instructional design units. This will take place at universities in the United States. The long-term training is now behind schedule, and there is some concern about the possible detriment to institutionalization.

About 46 person-months of short-term training will be provided. This will consist of training in programed instruction for writers plus courses and project-site visits in the U.S. and other countries. Much of the short-term training has already taken place. A 1-month writers' workshop at Gbarnga in March 1979 focused on instructional techniques, covering behaviourally stated objectives, measuring achievement of objectives, principles of programed instruction, programed teaching, and group- and self-instructional programed learning. The 34 participants in this workshop were selected by the Ministry of Education in consultation with the project director. The ability to learn programing techniques and apply them with clear and simple language were the principal criteria for selection of 13 of the participants to attend a subsequent 3-month workshop in the United States.

A 3-month course on programed instruction at Indiana University was conducted May through July 1979 through a subcontract with Delta Associates. This course, designed for IEL project writers, emphasized application rather than theory. The programed instruction techniques taught were derived from Impact, other similar programs, and results of the Bloomington conference on instructional technology.

The on-the-job training is a mutual endeavour between the Liberian educators and their IIR colleagues. Because this is taking place on site, it tends to be more responsive to local requirements than out-of-country training. The full-time advisory field staff and consultants are a rich resource of technical expertise for this training. Daily interactions among Liberian staff and IIR advisers have proved effective for developing appropriate skills in both staffs. The fact that most of the advisory staff have had extensive experience in developing countries has made this interaction most effective. For example, two of them worked for

Table 1. Schedule for production and tryouts by grade.

School year (March-December)	Laboratory school	System schools	Experimental schools	Control schools
1980	1-3	-	-	-
1981	1-4	1-3	-	1-3
1982	1-5	1-4	-	1-4
1983	-	-	1-6	1-6

years full time on Project Impact; a third joined the advisory staff following a career with the West African Examinations Council and 2 years as a World Bank/UNESCO teacher-education adviser with the Liberian Ministry of Education. Another, born and educated in India, is thoroughly familiar with problems of education in developing countries, whereas a fifth member brought to the project her experience with PL in Brazil and with Project Distar in the United States, which uses instructional methods similar to those of Impact and Pamong.

Materials Preparation and Production

The schedule for production and tryout has four phases (Table 1). These involve use of the materials in the laboratory school, the system schools, the experimental schools, and the control schools. The laboratory school is located at Gbarnga and is used for initial tryouts of the materials. It provides early feedback to the writers.

The five system schools are representative of schools in the rural areas of Liberia and were selected because they are within a few hours of Gbarnga. There are 10 experimental and 12 control schools in which the third and fourth phases, based on revisions resulting from the earlier tryouts, will take place. A contract requirement to conclude evaluation in 1983 precludes earlier tryout of grade 6 materials.

The approval process is controlled by the steering committee, which has been kept informed of project development, including changes in plans and schedules, through periodic meetings. Interaction with the committee, which has been useful for all aspects of project development, ensures all project activities are highly visible within the Ministry of Education. No formal process for review of each module has been established; it probably would not be workable because materials for six complete grades must be developed within 4 years. The absence of formal review has so far presented no problems, nor are any anticipated in view of the close working relationships among the project staff, steering committee, and Ministry of Education.

The design process has five components, none of them discrete. These are task analysis, preparation of objectives by module, development of criteria by module, the module outline, and the module draft. These design tasks are all completed before any formative revisions are made, but the presence of experienced teachers among the project staff ensures even the early drafts are sensitive to local conditions.

Work proceeds from writers to editors and to the production coordinator, who deals with the typists, illustrators, printers, and staff

of the implementation unit to produce the first version of the modules ready for tryout.

Revisions are based on three types of feedback, two from formative evaluation and one to come from the summative evaluation. The formative-based changes come from tryouts in the laboratory school, which is 1.6 km from the project site. Its students were recruited from nearby schools; the school now has grades 1-4, with about 15 students in each grade; grade 5 will be added in 1982. Data for the revisions are obtained by observation, interviews with teachers and students, and results of the end-of-module tests. Formative evaluation will continue with the five system schools according to the schedule (Table 1) and will form the basis for any revisions before the summative evaluation, which will be in 1983.

TEACHER EDUCATION

Assisting the Ministry of Education with teacher education is an important part of the IEL project. One person has been given primary responsibility for this component. He is a full-time member of IIR's advisory field staff assigned to the Ministry of Education at Monrovia. He closely coordinates all ministry plans for teacher education, particularly with the anticipated effects of the IEL project.

The primary responsibility of this adviser is to assist in developing a national plan to improve education for teachers in elementary and junior secondary school. This activity is closely coordinated with IEL activities in four areas:

- The analysis of the current primary curriculum required in the early stages of the project.
- Determination of teacher characteristics, as they were at the beginning of the project and as they are being changed by current developments in preservice and inservice teacher training.
- Similar determinations of teaching methods and educational systems as they evolve during the project.
- Encouragement of interaction between the design of the various components of the project and corresponding components of the existing education system.

This adviser will ensure that all aspects of the project's technology will be compatible with the national educational system should the evaluation prove satisfactory and the decision then be made to expand the IEL model. Considerable advance planning will be necessary if Liberia adopts the IEL model nationwide, and this adviser thus has a critical role in determining the success or failure of any widespread implementation.

Project staff at Gbarnga have developed a 2-week PT course to train teachers; a similar PL course is almost completed. Thus Liberians with no formal teacher training and only a high-school education will be trained to manage learning with the PT or PL modules or both under an instructional supervisor. Their skills are expected to improve continually on the job. One source of the improvement will be the information directed toward teachers within the materials themselves; a

second will be feedback from supervisors; and a third will be actual practice.

Teacher education under the fourth World Bank education project in Liberia, currently in the planning stages and expected to begin in April 1982, is fully coordinated with the IEL project. Although the content of the World Bank project is not yet finally decided, it will probably provide about 3000 training months through on-site workshops to enhance the teaching skills of all government primary schoolteachers — about 3000 of them, including expected newcomers to the teaching force in the 4-year life of the project. Continuation of the training will be achieved by inexpensive, self-contained, mobile, teaching-skills workshops.

If the IEL project is not effective for Liberia, this component of the World Bank project will continue to provide inservice training. If the IEL project is effective and is widely implemented, this component will form the infrastructure for the 2-week PL and PT workshops. Cooperative planning will thus result in the more effective use of assistance from both AID and the World Bank.

EVALUATION

The evaluation will determine whether appropriately supervised underqualified and unqualified teachers with some additional training can manage PT and PL classroom activities with no reduction in student achievement. The results that these teachers obtain will be compared with those of teachers using traditional methods.

The preparation of effective instructional materials will benefit most from the formative evaluation, and the model itself will be tested by the summative evaluation. The formative evaluation, discussed earlier, will provide feedback during all stages of project development.

The summative evaluation will assess administrative aspects of the IEL model as well as student achievement. It will be based on an experiment involving 30 schools. There will be 10 IEL schools, 10 *status quo* control schools (SQ), and 10 optimal conventional control schools (OC). The IEL schools will be operated to match as closely as possible the conditions that would exist if the IEL model were adopted throughout Liberia. The SQ schools will represent present primary schools, with underqualified and unqualified teachers predominating, insufficient textbooks and other materials, and with much student time being spent copying material written by the teachers on chalkboards. The OC schools will have full sets of prescribed textbooks, and their teachers will get special inservice training in the use of the textbooks with the present curriculum.

The 30 schools for the summative evaluation were selected from a pool of 49, with the IEL, SQ, and OC groups matched from reading and mathematics tests in grades 5 and 6, school enrollment, and attendance. With the above matching restrictions, 10 schools were randomly assigned to each of the IEL, SQ, and OC groups.

Achievement tests will allow the IEL model to be compared with the present model (IEL *vs* SQ), the present model to be compared with its fully implemented version (SQ *vs* OC), and the IEL model to be

compared with a fully implemented version of the present model (IEL *vs* OC).

From the 10 IEL schools, 5 were selected as system schools. They were selected because of the practical requirement that schools be within reasonable commuting distance of the project site, with the restriction that differences in the range of school size and achievement levels were well represented. In the 1981 school year, the IEL materials and management system are being introduced in grades 1-3 of the system schools. These materials and methods previously were tried in the laboratory school in 1980 and revised on the basis of the results. Grade 4 will be added to the system schools in 1982. In 1981, 10 comparison schools were selected from the OC and SQ groups. The OC teachers were given inservice training by the Kakata Rural Teacher Training Institute, and textbooks were provided to all students.

In 1983, the summative evaluation will take place in all 30 experimental and control schools. By this time, grades 1-5 will have been tried in the laboratory school, and grades 1-4 in the system schools (Table 1). Learning materials and procedures for all grades will be prepared in time for the 1983 school year. Grade 6 will not have been tried, and grade 5 will have been tried only in the laboratory school.

This is not ideal but is necessary because of a shortage of time and funds. Nevertheless, the project staff believes that feedback from the laboratory and system schools for the earlier grades can be used in preparations of the two higher grades without serious consequences.

All students were given pretests developed by the project staff and administered in grades 1-3 for all 15 schools now involved in the project (i.e., 5 schools each in the IEL, SQ, and OC groups). In March 1982, pretests will be given to students in grades 1-4.

Approval of this design for the summative evaluation, as well as details of the achievement criteria and analysis, will be under the technical control of an independent consultant to the project, who will report on the evaluation directly to the Ministry of Education and AID/Liberia. The measuring instruments will be developed by the Liberian national office of the West African Examinations Council (WAEC), an international organization for educational assessment and related research serving the member countries of Nigeria, Ghana, Sierra Leone, Gambia, and Liberia. The IEL project staff will work closely with the consultant and WAEC to agree on criteria for the final design, detailed plans for the experiment, and the proposed data analyses. The project staff, however, will have no direct involvement in test development, administration, scoring, or analysis. This stipulation will ensure that the final assessment of the model is independent and objective, free from even the appearance of bias. This is regarded as essential by the project staff, the Ministry of Education, and AID/Liberia.

Results of the summative evaluation will have significant implications for the future of primary education in Liberia. If the summative evaluation is positive, the number of primary students may double relatively soon with no increase in current expenditures. This is the outcome projected from extensive evaluation of the related technology of Impact.

Table 2. Projected costs for IEL expansion (U.S.$000).

Category	9-year cost	Average annual cost
Materials	4835	537
Distribution	242	27
Teaching training	1962	218
Research, development, and evaluation	1389	154

Tentative plans are — if results are positive — to extend the model to approximately 90 schools after any changes in the instructional materials or management system suggested by the summative evaluation. The general intent, although the policy decision has yet to be made, is to expand the system nationwide if it is proved effective. This would require considerable changes in the teacher-education program as well as promotion to ensure public support and acceptance.

AID/Liberia is making tentative plans to assist the Ministry of Education with an implementation phase to begin in 1985, contingent on evidence that the IEL model is an acceptable and cost-effective alternative to current practice.

Costs

Development costs are of two types, those underwritten by the Liberian government and those underwritten by AID. The current estimate of the total development cost is approximately U.S.$6.9 million for the 5 years of the project. This consists of about U.S.$1.9 million provided by the government in cash or kind and about U.S.$5 million by AID. The government's contribution is in the form of staff salaries, office space, some operational fees, and some local and international travel. AID pays for approximately 25 work-years of full-time advisory services (six positions), 24 work-months of expert consultant services, training for Liberian staff, office and household furniture, materials, office equipment, vehicles, operating expenses, and IIR home-office support services.

Operational or recurrent costs are difficult to estimate as yet. Dougharty (1982) has made rough estimates (Table 2) as part of an assignment as a consultant to project overall educational costs for Liberia for 10 years. His estimates are based on expansion of the IEL model to all present government primary schools over 3 years, one-third of the schools yearly. Some of his assumptions have not been examined carefully by ministry and project staff.

Dougharty examines several alternative strategies. One recommendation is to use methods — such as those of the IEL project or available through educational radio — that need fewer fully trained teachers and materials.

If the summative evaluation of the IEL project is positive and costs of implementation are as low as estimated by Dougharty and others, this low-cost alternative to traditional education may be a significant contribution to quality basic education for many Liberian children.