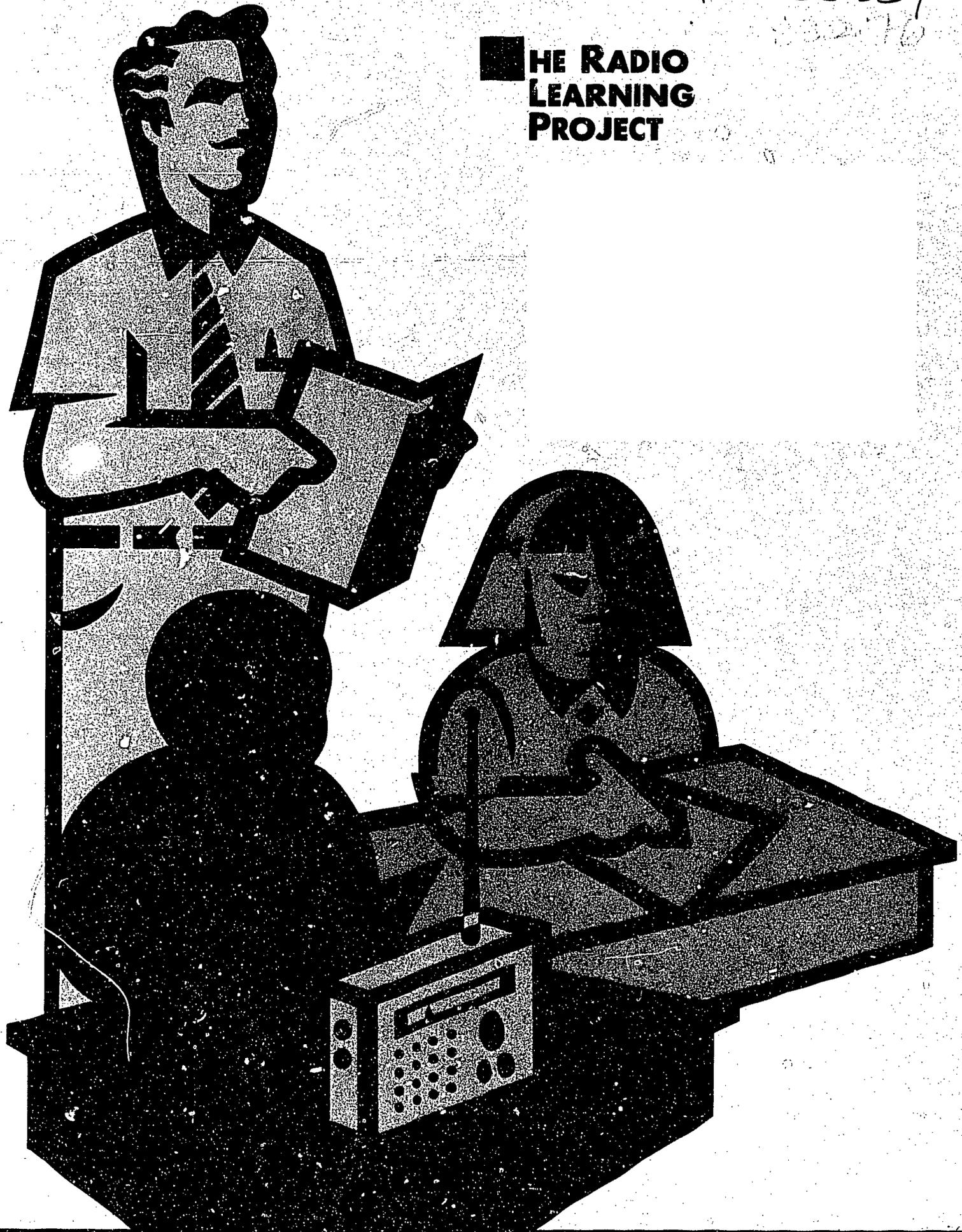


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**THE RADIO  
LEARNING  
PROJECT**



PDABG-354

**RADIO SCIENCE PROJECT**

**FINAL REPORT**

**December 31, 1990**

**RADIO SCIENCE PROJECT**

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**December 31, 1990**

**Submitted to**

**AGENCY FOR INTERNATIONAL DEVELOPMENT**  
**BUREAU FOR SCIENCE AND TECHNOLOGY**  
**OFFICE OF EDUCATION**

**Contract # DPE-5818-C-00-4087-00**

**EDUCATION DEVELOPMENT CENTER, INC.**  
**55 Chapel Street**  
**Newton, Massachusetts 02160**

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## RADIO SCIENCE PROJECT - FINAL REPORT

### I. INTRODUCTION

This final report summarizes the major activities and accomplishments of the Radio Science Project (RSP) in Papua New Guinea (PNG) and makes recommendations for its implementation under the auspices of the National Department of Education (NDOE). The key elements of the project are as follows:

**Objective:** To develop and test a radio-based science program for children in grades 4-6 in Papua New Guinea.

**Sponsors:** The project was developed jointly by the National Department of Education of Papua New Guinea and the Education Development Center (EDC), Newton, Massachusetts, USA, with funding provided by the United States Agency for International Development, Bureau for Science and Technology, Office of Education (A.I.D.).

**Duration:** 1986<sup>1</sup> - 1990

RSP annual reports are available from EDC, as are project materials including 170 broadcast tapes for grades 4-6, scripts, student workbooks, and Teachers' Notes. EDC can also provide information about interactive radio instruction (IRI), the methodology on which RSP is based.

### II. THE FIRST FOUR YEARS IN PAPUA NEW GUINEA (1986 - 1990)

The project developed and tested a radio-based science course for grades 4-6 based on the official national science curriculum. The purpose of the project was to improve science teaching in community (rural) schools -- to increase the children's knowledge of science, and to make sure that information was more interesting and relevant to the children of Papua New Guinea. Radio was chosen as the medium of instruction because it is widely available in schools through an existing schools broadcasting system, and because radio provides a means of delivering high quality lessons at low cost to schools throughout the nation.

For each grade, there are two 30-minute lessons per week, or a total of sixty lessons per year. Each 30-minute lesson is divided into two parts: a 20-minute broadcast and a 10-minute follow-up period for teacher-led activities.

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<sup>1</sup>The project began in 1984 without a specific host country identified. After a long search for an appropriate country led by A.I.D., Papua New Guinea was identified in 1985, and work began there in 1986.

The design of the radio programs incorporates the techniques of interactive radio instruction, a methodology used successfully in teaching mathematics and language in other developing countries. IRI lessons teach core instructional material (the lessons are not just supplementary or for enrichment) and they engage children as active learners during the broadcasts. Since its development in Nicaragua in the 1970s, IRI has provided standardized instruction of high quality in settings where classrooms are overcrowded, instructional materials are inadequate, and teachers are undertrained.

In Papua New Guinea, as in most developing countries, many different circumstances exacerbate the problem of teaching science. Financial resources are limited; many schools are isolated, which limits supervision and support for teachers; even simple science apparatus is not readily available; many children do not attend school; and teachers are poorly trained.

Although universal primary education is a national goal, teacher training institutions are overburdened, and supplementary funds for upgrading teachers already in the schools are extremely limited. In Papua New Guinea it is difficult to achieve an acceptable standard of instruction in any of the major areas of the curriculum in the primary grades. With science, the perceived difficulty of the content intensifies the problem.

The special challenge of the RSP was to adapt the interactive radio methodology, which is based on a highly structured approach to teaching including questions that emphasize single correct answers, to a discipline that requires an inquiry approach, questions that solicit a variety of correct answers, and hands-on activities. Given a concept like "Why is coffee grown in the Highlands?" or "When does the breeze blow towards the coast?". There is not just one right answer, nor are the various answers likely to be simple or straightforward.

The RSP was also the first IRI project to target students in the upper primary grades. The lessons were designed to require fuller participation of classroom teachers, both during and after the broadcast lessons as opposed to earlier IRI projects. During the broadcast, RSP teachers are often asked to call on children to answer questions, to write on the chalkboard and, occasionally, to perform a science demonstration. Following the broadcast, in addition to reviewing the lesson with their students, teachers are usually asked to direct hands-on activities in the classroom. Thus, more attention was given to teacher training than earlier IRI projects.

The RSP staff was constrained by budgetary limitations, materials distribution, and in-service training in the mountainous country, where roads are few and access to schools is difficult outside Port Moresby and the Capital District.

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The Radio Science Project and the National Department of Education began joint operations in 1986. Although the project was funded as a pilot study, its goal was a finished curriculum product that would be instructional and supportive to teachers as well as students; the IRI lessons should improve learning gains significantly and be implemented on a national basis at low cost.

During 1986-87, the project staff secured facilities, began work on the research design of the project, and designed the radio curriculum for grade 4 based on the official national science syllabus. Ten pilot schools in the National Capitol District and the Central Province were selected for testing the new radio lessons, obtaining information on student response and achievement, and assessing teacher participation. During the 1988 school year, sixty thirty-minute, fourth-grade lessons were designed and tested in ten formative schools using cassette recorders.

To minimize costs, the RSP staff designed lessons that used locally available materials for science activities. The grade 4 lessons, however, required a very modest science kit. In addition, the lessons are supported by a student workbook that provides one page of drawings for each lesson.

The RSP teachers received two pages of instructions for each lesson. These teacher's notes were bound and delivered to the schools along with radio science student workbooks at the beginning of the school year. Teachers were also assisted in preparing for each lesson by a 10-minute radio broadcast the evening before the children's broadcast.

The RSP staff relied heavily on extensive formative evaluation to modify and improve the lessons throughout each year. Techniques on production, format, testing, questioning, presentation, activity, and teacher training were continuously modified based on the results of the formative evaluation. Also, input from the National Department of Education, the National Broadcasting Commission, and other policy makers was solicited on a regular basis to ensure that the final product -- effective radio lessons in science -- would be acceptable and implementable throughout Papua New Guinea.

In 1989, sixty grade-four lessons were broadcast in the East Sepik region and a summative evaluation was carried out. Encouraging results confirmed the efficacy of the lessons. At the same time, grade five materials were generated and tested in the formative schools. Grade five lessons were broadcast beginning in 1990.

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The summative evaluation for the grade 4 lessons was completed in 1990<sup>2</sup>. The radio classes scored 46.5 points; the traditional classes scored 41.5. This difference is highly significant statistically ( $p < .001$ ; the effect size was 0.36). The results demonstrate the potential of the radio science lessons for improving the quality of science education in the community schools of Papua New Guinea. The potential of the RSP lessons soon became recognized by teachers and supervisors throughout PNG. As the radio lessons became known around the country, there was an increasing demand for RSP lessons in the schools. In 1990, about 9,000 children used the radio science lessons. In 1991, the grade 6 lessons will be implemented on a national basis.

### III. THE LAST YEAR (1990)

At the beginning of 1990, the RSP budget of \$750,000 was reduced by nearly 40 percent. After discussions with EDC, A.I.D. and NDOE officials about whether the RSP could still achieve viable goals, the plans for 1990 were modified. The key components were retained -- the grade 6 lessons would be prepared and tested, a modest training program would be developed, and plans for national institutionalization would be continued. But reduced funding necessitated economies -- staff reduction, cancellation of travel and consulting, elimination of plans to revise grade four lessons, and termination of proposals for further use of audio tapes in teacher training.

Despite these cutbacks, the RSP completed all major commitments established in the original proposal and scheduled for 1990. These included:

1. fifty radio lessons for grade six;
2. printed Teachers' Notes for grade six lessons;
3. printed Student Workbooks for grade six lessons;
4. "Using Interactive Radio," an in-service training package. Twenty teachers were trained to conduct a regional in-service program and there are plans to train additional teachers for this program in 1991;
5. collection of data for grade five evaluation. Significant problems occurred in completing the grade 5 evaluation (see the following page). Modifications have been made and a final achievement evaluation will be attempted in 1991;
6. development and trial of a grade six achievement test; and

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<sup>2</sup>Galda K., Friend J., Katak R., Watson F. "Radio Science Grade Four Science Summative Evaluation -V1," EDC, Newton, MA: 1990.

7. transfer of several trained staff members to the NDOE, and pursuit of employment opportunities for all other staff members.

In addition to meeting the production goals for 1990, it was also necessary to work towards institutionalization of the RSP. Two key goals were to build an infrastructure that would support the continued administration of radio science within the NDOE, and to obtain approval for airing the science lessons on the National Broadcasting Commission's (NBC) Karai radio service.

The NDOE approval process is clearly defined. First, a proposal for curriculum change is made to the appropriate Board of Studies. The RSP Advisory Committee met to produce a document of support that was delivered to the Community School Board of Studies along with a presentation by RSP staff. The Community School Board of Studies granted approval for the RSP lessons, but because of the current lack of funds in the national budget, decided to phase in the lessons beginning with grade six in the 1991 school year. Grades five and four will follow in 1992 and 1993.

Next, approval for broadcasting the lessons by the NBC was sought. The administration of the Broadcasting Commission was eager to change programming (many educational programs were out of date and the subject of frequent complaints). However, no procedure for approving such a change existed. RSP staff members suggested to NDOE and NBC that a Broadcasting Committee be established. After several months of work by members of the NDOE Materials Unit and others, the committee was established. It is made up of representatives of several disciplines and meets regularly to approve programs for broadcast. The Committee has recommended that priorities for replacement of out-of-date educational programming be set.

All members of the RSP staff, the Advisory Committee<sup>3</sup>, members of the Curriculum and the Materials Units of NDOE, and officers in the Public Service Administration were instrumental in the acceptance of the RSP by the National Department of Education. Of particular help were RSP staff members Iti Didiga and Harold Ure, Superintendent of the NDOE Materials Unit, Kwapena Makara, Dr. Sheldon Weeks and Dr. George of UPNG, Dave Eyrich in NDOE Research and Evaluation, NDOE Assistant Secretary for Curriculum Development, Peter Baki and NDOE First Assistant Secretary, William Penias.

On August 24, 1990, First Assistant Secretary of the NDOE, William Penias and Assistant Secretary, Peter Baki convened a meeting of members of the educational community and issued a press release (Appendix II) that established "radio science" as a formal part of the national curriculum. Final work to prepare the lessons for February

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<sup>3</sup>See Appendix I for a list of the Advisory Committee members.

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1991 broadcasting would be the responsibility of the NDOE Materials Unit. The in-service program for teachers would be administered by the NDOE In-service College and the Curriculum Unit. RSP staff members would complete the final drafts of the grade six student and teacher books and have the tapes ready for broadcast by the end of 1990. Administration of all these activities would be the responsibility of the National Department of Education.

With the approval of RSP lessons as part of the standard elementary curriculum and with the establishment of a broadcast schedule, institutionalization in the NDOE is assured. This doesn't mean that work on the radio science lessons is over. There was much interest in building upon the success of the project. In Papua New Guinea, the NBC broadcasts radio programs to community schools every school day. Teachers need help with the curriculum, and children enjoy (and learn from) these programs. But some radio programs are nearly thirty years old and no longer meet the needs of the children and teachers. One NDOE goal is to use the expertise gained during the A.I.D.-sponsored Radio Science Project to develop or adapt IRI programming for other areas of the curriculum.

As the RSP completed production of materials in the final year of the project, several experienced staff members moved into jobs in the NDOE. By August, five of our staff members had been hired by the NDOE. Other staff members found employment in the private sector. Furthermore, towards the end of the project members of the Curriculum Unit and the Materials Unit had been working with RSP administration to assume administrative duties.

The results of the grade four evaluation are reported on page 4. The summative evaluation of the grade five materials was not completed because Radio East Sepik did not broadcast half the lessons due to mechanical failure; in addition, several of the classrooms did not receive printed materials (see Appendix V for field notes and charts). Grade six lessons are to be broadcast in 1991. Thus, the summative evaluation of grades five and six is the responsibility of NDOE's Research and Evaluation Unit. A.I.D.'s LearnTech Project based at EDC, is prepared to assist the Research and Evaluation Unit if requested.

The last major accomplishment was the placement of project staff in new positions. At the end of most projects, staff members must find other employment unless specific steps have been taken in advance to incorporate staff into permanent agencies. In the case of the RSP, nearly all eighteen staff members were placed in positions with government agencies or in the private sector.

The RSP employees ranked the following features of the RSP as important to them: working on a project that benefits their country; training that will allow them to secure

new jobs when the project ends; support in the workplace; and help with their job searches at the termination of the project.

From the beginning, RSP staff members felt that the project would benefit PNG. Several members had teacher training experience and had worked in the field. Others had children in the community schools. All staff saw the need for better science teaching, and believed that the RSP could meet that need. This conviction, even in the face of pessimistic views from other sectors of the Curriculum Unit, helped to unify the staff.

The RSP also had a strong program of staff training. From 1987-88, the writers participated in a special development program. During the daily process of writing scripts, their language and scriptwriting skills improved significantly. There was also continued training in studio production throughout the life of the project.

In October of 1989, with a staff of eighteen, the RSP produced two lessons per week using nearly twenty hours of studio time. Lessons were completed the day before they were needed in the field. Eight months later they were producing two lessons per week with a staff of eight, using four hours of studio time, and completing the lessons three weeks before broadcast. Clearly, staff members had learned their jobs well.

#### **IV. WHAT THE RSP ACCOMPLISHED**

Over the course of this pilot project, there were contract changes (a time extension and budget reduction) and occasional difficulties with project administration. Nevertheless, the RSP has accomplished all of its major objectives (see Appendix III).

The RSP produced a tested model for using radio to provide effective primary science instruction at low cost. This model consisted of the following:

Sixty broadcast-quality tapes for grade four.  
Teachers' Notes to accompany the broadcasts.  
Student Workbooks for the children.

Sixty broadcast-quality tapes for grade five.  
Teachers' Notes to accompany the broadcasts.  
Student Workbooks for the children.

Fifty broadcast-quality tapes for grade six.  
Teachers' Notes to accompany the broadcasts.  
Student Workbooks for the children.

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An in-service package for teacher training.

An evaluation of the grade 4 lessons that demonstrates significant improvement in student achievement.

The RSP objectives specified that the radio system should be manageable and sustainable in a developing country. After trying several curricular models, it became increasingly obvious that simplicity would be crucial to the success of the radio lessons. For example, because of problems associated with purchasing, distributing and replacing the simple science kit for grade 4, it was decided not to require a kit for grades 5 and 6. RSP staff designed lessons for low-cost or no-cost hands-on materials that are readily available throughout the country. Additionally, the Teachers' Notes were redesigned, standardizing the two-page format (see Appendix IV) to include vocabulary for the lesson, teaching instructions, key science concepts, and an additional lesson on the same topic. The Student Workbook contains one page for each lesson; each page is a series of drawings for the students to refer to during the broadcast.

All materials were finalized using the infrastructure existing in the NDOE. Curricular development is done in the Curriculum Unit; the materials are produced, stored and distributed by the Materials Unit; evaluation is executed in the Research and Evaluation Unit; and in-service education is done through the In-service College.

## V. WHAT WE LEARNED

The grade-four summative evaluation demonstrated that IRI can effectively teach science to children. Although learning gains for students who used the radio science lessons for grades five and six remain to be measured, there is a substantial amount of anecdotal information from the classes that used the radio lessons. Both an external evaluator from the Research and Evaluation Unit of the Public Service Administration and the RSP Director made trips to the Wewak and Maprik areas to query teachers, inspectors, and headmasters about their experience with the Radio Science Project. Others were queried as well, including the Chief Inspector and his assistant, the Materials Officer, the radio station manager and staff members. Tom Seta, the external evaluator, is a respected national from the Maprik area who speaks local languages as well as pidgin. In September of 1990, he first visited the area to collect preliminary data for the grade six study and the final data for grade five. He made a follow-up trip in late November.

The following is a summary of what was learned about radio science from informants in East Sepik. These findings reflect experience in the Central Province and the National Capitol District as well.

1. Radio lessons provide important help to the teachers.

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2. Teachers find interactive radio science lessons more helpful than other school broadcasts, many of which are out-of-date and irrelevant to the current curriculum.
3. Teachers report that the children enjoy and learn from these broadcasts. This is especially noteworthy in that several of the classrooms did not receive student workbooks or Teachers' Notes, which are required to use the lessons effectively.
4. Teachers recommend development of interactive radio programming for other areas of the curriculum.
5. Teachers and headmasters report that the teaching skills they practiced using radio science helped them teach other subjects as well.
6. Since using radio programs is required of teachers, the NDOE should help NBC to stay on the air.
7. Teachers and headmasters identify the following barriers to instructional change -- not knowing what changes are expected, materials distribution problems, lack of community support, and theft. The first two involve problems in communication. Often the materials or programs are available from the NDOE, but teachers and school officials do not know how to access them.
8. Teachers are very patient and will wait for several years for an announced curriculum change to take place. They do not feel that they are in a position to ask questions like when or how. Consequently, they don't follow up when changes are announced, and may work without important materials that are stored and waiting to be used.
9. No teacher or headmaster with whom we spoke knew that there was a program to train in-service educators through NDOE's In-service College.
10. Materials Officers share teachers' concern for failures of communication. Often the Materials Officer is chosen from the pool of teachers looking for a teaching position. As soon as a teaching position opens, he takes it. This turnover means that a new person must be trained every few months. The lack of continuity that results could be eliminated if the position were filled with a responsible person who wasn't a teacher.

## VI. WHAT REMAINS TO BE DONE

This section concentrates on issues that must be considered if radio science is to continue to fulfill its promise to students, teachers, and the NDOE in Papua New Guinea.

## **A. Evaluation**

An evaluation of grade four student achievement was conducted in the fall of 1989. The data showed that there was a significant improvement in performance for students who learned from the radio science lessons. The evaluation of grades five and six were scheduled for 1990 and 1991. The evaluation for grade five was not completed for several reasons, the most important was that the radio station broadcasting the lessons in the treatment area was off the air during half the year. In addition, there were problems in distributing the materials, resulting in Teachers' Guides and Student Books being unavailable in several treatment schools. Although labelled packages were delivered to East Sepik, the materials officer handed them out on a first come, first served basis. The result was that many schools outside the treatment population have materials, and target schools do not.

The NDOE's Research and Evaluation Unit is prepared to collect data on learning gains for grades 5 and 6 in the fall of 1991. The usefulness of this data will depend on regular broadcasting of the lessons and an efficient distribution of teacher and student materials. See Appendix V for some evaluation data for grades 5 & 6.

**Recommendation:** That Tom Seta of the Research and Evaluation Unit be given the responsibility for monitoring and data collection. Seta has begun the process and has shown himself to be an excellent field researcher and a very reliable worker. This recommendation assumes communication between him and Dave Eyrich of the NDOE.

## **B. Materials**

The Student Workbook and Teachers' Notes for grade five must be printed and distributed. In the short term, copies of these materials must be put in the hands of the teachers whose classes are to be tested in October of 1991. In the longer term, monies must be allocated for the printing of copies for all provinces, the materials must be proofread, camera-ready text must be prepared, printing must be scheduled, and distribution must be guaranteed.

Grade four materials must go through the same process. In addition, grade four Teachers' Notes must be revised using the same format as Teacher's Notes for grades five and six.

**Recommendation:** That Harold Ure and Tom Seta work together to determine which treatment schools need grade five materials and to distribute materials to those schools. Copies of Student Workbooks are available in the RSP office.

**Recommendation:** That a letter be sent to Kwapena Makara establishing a calendar for the printing and distribution of the grade five materials and offering encouragement in the administration of new radio programming.

### C. Communication

Responsibility for every aspect of radio science implementation must be clearly established. At present there is no clear plan for continuing work. The NDOE's Curriculum and Materials Units employ many capable staff members and command sufficient resources to accomplish the tasks required to implement radio science and to create new radio lessons once a plan is established.

**Recommendation:** That a plan of action be offered to Peter Baki, Assistant Secretary of the NDOE, for the continuing implementation of radio science and for additional program development (which is a stated goal).

Communication between teachers and the NDOE must be improved. Teachers are often unaware of what is being done in the Curriculum Unit, what is available from the Materials Unit, and what their own roles should be. Several different measures can be taken to resolve such problems. A postal mailing can advertise the availability of RSP lessons, follow-up communications with grade five teachers in the ESP can be undertaken, a postal or radio message to inspectors and headmasters can advertise NDOE's in-service program, etc. In conjunction with the Materials Unit, the Curriculum Unit has produced a wealth of excellent teaching/learning materials that are not being used in classrooms because teachers and headmasters are unaware that they are available or how to get them.

**Recommendation:** That a series of letters and radio communications (Appendix VI) be offered to the Assistant Secretary for use by his staff in notifying members of the educational community about radio science and how they can access the program. These notices can be used as models for other such communications.

### D. In-Service Teacher Training

The response to the in-service program (Appendix VII) was very positive. The model was to train a cadre of teachers in every province, each of whom who could teach RSP in-service sessions in their home districts. Because of budget constraints, a group of only twenty teacher trainers, one from each province, were trained in November of 1990. In the second year, the number of in-service trainers would increase to two in each inspectorate (approximately 300). The two-day program teaches participants to give in-service programs in educational radio to inspectors, headmasters, and teachers. Note that, although we have given in-service education to all radio science trial teachers, many

teachers use the program successfully without in-service training. The radio lessons guide teachers through the required activities and the Teachers' Notes contain all pertinent information on the use of radio science.

**Recommendation:** That Harold Ure be asked to produce a mailing and a radio announcement to inform educators in the field. A sample is found in Appendix VIII.

**Recommendation:** That Ruben Egan be encouraged to continue his letter of support to the NDOE First Assistant Secretary, William Penias.

#### **E. Advocacy**

We know that strong advocacy within the NDOE is required for a program to be sustained. There are strong advocates for radio science within the department, but no one has sole responsibility for the program. Given the range of activities required within the department and the relatively small number of radio science tasks, it would be unreasonable to suggest that a director be appointed for the program. However, some coordination of radio science tasks is necessary.

**Recommendation:** That a small radio science committee be established to report to the SSM through Peter Baki's office. Members might include Peter Baki, Kwapena Makara, Guy Muscord, Harold Ure, Ruben Egan, Dave Eyrich or Tom Seta, and others selected by the Assistant Secretary. The committee might meet bi-monthly to discuss radio science needs, to schedule tasks, and to make sure that the tasks are carried out in a timely way.

#### **F. Cooperation Between the NDOE and the NBC**

The NDOE must rely on the infrastructure of other governmental agencies to help with its work. This reliance reduces unnecessary duplication of equipment and services, but it also exposes delivery of instruction to the uncertainties of the serving agency. The NDOE mandates that teachers and their students listen to educational broadcasts as part of the standard curriculum. It has not been determined where radio signals actually reach in PNG, and there are no recent data that track whether children do, indeed, receive the broadcast portion of the curriculum. Teachers are dependent upon local educational boards for replacement batteries for their radios. (Many teachers and headmasters are unaware that they can purchase radios duty free.)

Although radio is a proven medium of instruction that remediates some of the deficits of undertrained teachers, there is no method of feedback from the NBC to the NDOE when a transmitter breaks down or other problems of transmission or reception occur. It is essential that educational decisionmakers be aware of operating difficulties within the

NBC, and how those difficulties impact educational broadcasts. Officers of the NBC have demonstrated strong interest in working with the NDOE on these issues.

**Recommendation:** That a specific liaison officer be appointed to facilitate communication between the NDOE and the NBC. This person would communicate with an officer of the NBC and with Peter Baki. The liaison officer would collect information on which provincial stations are receiving and relaying the educational programs. Data would be made available to all decision makers on a bi-weekly basis. Transmission and reception problems could be solved before they became critical.

**Recommendation:** That a questionnaire be designed and distributed through the inspectors to collect data from schools. The questionnaire should determine which schools receive school broadcasts and attempt to identify specific breakdowns (antenna, radio, batteries, transmission, etc.). A reply date should be established, and schools not responding by that date should be contacted again.

**Recommendation:** That the NDOE publish a concise manual for communication among all educators. This should contain a hierarchy of staff members from the Minister to the teacher, directions on how headmasters and teachers are to be notified of required curriculum materials, how they are to be distributed, and who is responsible for each program and its supporting materials.

## **G. Clients and Components**

As new curricula is developed, it is important to keep in mind the need to match clients (e.g., children, teachers of communities) with components (e.g., instructional materials, training, etc.).

### **1. The Schools: Where the Information Is**

Educators often begin by reviewing statistics of the school system. But one must also look beyond the statistics and visit schools, talk to headmasters, teachers, children, and parents. Examples from experience in Papua New Guinea illustrate the importance of consulting schools and teachers directly:

- The NDOE Curriculum Unit relied on a report that science kits had been "sent to every Community School." But a visit to area schools showed that fewer than fifteen percent had the materials.
- Some advisers assured RSP staff that teachers could use "tok ples" (local language) rather than English to explain difficult topics in the science lessons. But teachers in local schools seldom come from the area in which they teach. There are 700

different local languages in PNG. Few teachers share a local language with their students.

- The RSP used particular vocabulary, relying on the fact that the same vocabulary was used in a standard text book. A visit to schools showed that the textbook was not in most classrooms (although it was to have been shipped four years earlier). In some classes where the textbook was available, it was not in use because there had been no teacher training.

**Recommendation: Visit schools, observe classrooms and talk with teachers regarding assumptions about what is going on in schools. Don't rely just on school records and reports.**

## 2. What to Teach

In many classes, teaching techniques rely on recognition and recall. Often teachers lack science skills themselves. For these reasons it is important to select curricular options carefully. The following are suggested goals for a science curriculum. Children should be able to:

- answer open-ended questions,
- observe and collect data,
- read graphs and charts and construct them from data,
- manipulate materials that are found in their environments in their study of science,
- see and discuss different points of view on complex questions in science, and
- state alternatives and choices that must be made to accommodate problems in their environments.

If these goals are to be met, children and their teachers must make some fundamental changes in their classrooms. The first step is to provide a curriculum designed to promote these changes. Teachers are eager to make changes if (and only if) they are given appropriate curriculum materials.

**Recommendation: That content be chosen from among concepts that lend themselves to question and discussion (balance in nature, health, environment, pollution, population, etc.).**

**Recommendation:** That delivery strategies include teaching teachers to use open-ended teaching/learning techniques.

### 3. The Special Objective - Teaching Thinking Skills

Children must know how to think. Children must discuss issues, and learn that there are several points of view and that compromise is a reasonable solution to many problems. They must learn that the general is more important than a specific.

For these reasons, one cannot be satisfied with traditional instructional content or the facts of yesterday. Curriculum specialists must understand that their specialties, science or math, language or the social sciences, include much more content than they can ever teach. Since they are at liberty to choose alternatives, they should choose items that spur discussion, encourage creativity, promote divergent thinking, and foster flexibility - all critical skills that they will need in the years ahead.

For example, it is common to teach reproduction in plants using flowers. It is relatively easy for children to learn the parts of the flower and to understand the joining of pollen and egg cell. It's also relatively easy to test this knowledge. But it's far more important that the learner understand the process of fertilization, and be able to draw parallels to fertilization in other plants and in animals. It's important that learners be able to frame questions about the process as well -- for example, what are some of the barriers of fertilization?

This is not an argument against teaching nomenclature, but a reminder that children in developing countries have little time in school, often have little practice in discussion and problem solving, and little chance to try out their thinking skills. Content and activity selection can enhance their opportunities to think for themselves, and give them the confidence they will need to attack and solve problems as they struggle towards self-sufficiency.

**Recommendation:** In revising and expanding the science curriculum (and other subject areas as well), give special attention to problem solving, discussion and flexible thinking. Choose activities accordingly.

### 4. Training the Teacher

Many teachers in PNG, as in other countries, feel that they lack sufficient training. Teachers learn a certain repertoire of teaching and learning styles from their own experience, their training, and from their colleagues. They are eager to learn new techniques, but the opportunity to do so is limited. In-service education should give teachers the opportunity to learn and practice new techniques. When teachers are

learners, they must practice skills, like their students. For example, if teachers are to learn how to use a new piece of equipment, they should be given a demonstration. The teachers then should plan a lesson using the equipment, do a demonstration lesson with peers or children, and have the instructor or peers discuss the effectiveness of the trial. The radio science lessons introduced new techniques and supported teachers on how to use these techniques in subsequent lessons.

**Recommendation: Teachers need practice in new roles to broaden their teaching repertoire. Build this into the curriculum and into the teacher training program.**

For each year of curriculum development, choose two to three good teaching techniques that are not common in the existing teaching population and show the teachers how to use these techniques by modeling the behavior in the lessons. For example, teachers could be encouraged to promote discussion in the classroom. Discussion is an important tool in the adult world and in the learning process. The radio science teacher can model discussions among radio children. The Teachers' Notes for these lessons can suggest points for discussion and point out when it is likely to be useful. The notes can also show the classroom teacher how to set up the classroom for discussion and how to moderate the exchange. A subsequent lesson can end with an easy question for discussion and the classroom teacher can try out the technique again. Later lessons can provide additional opportunities to practice the skill. Thus, discussion becomes a part of the teacher's repertoire.

Anecdotal information from teachers indicate that they use techniques learned in the science lessons in other curricular areas. Over the course of time it would be possible to broaden the basic techniques of teachers.

## **5. Integrating the Curricula**

Use techniques that integrate curriculum areas. Through integrating the curriculum, subject matter may be taught more efficiently. But even more importantly, real world problems are usually interdisciplinary in nature. One simple device would be to refer to other areas of learning: "Just as we graph data in math, we can graph certain information about our community life." Or, we can cover two curricula in the same activity: "Write a paragraph about friction and heat. Be sure to include science, and take care to use good spelling and punctuation." Another method of integration is planned reinforcement: "We will be studying viruses. Please review with me the differences between a virus and bacteria that you learned in the health unit on sexually transmitted diseases."

**Recommendation: In designing all curricula, look for opportunities to emphasize the relevance and relationships to other disciplines.**

## 6. Expanding the Audience

In Papua New Guinea, there is a 15-minute time slot on national radio twice each week to communicate with teachers, and two 20-minute lesson slots for children from grades 4-6. Since there are few radio options in the rural areas, many adults are likely to listen to these programs. This provides a special opportunity to include messages relevant to adults as well as to children. In fact, there is even the opportunity to encourage joint activities between schools and their communities. In some of the RSP lessons, for example, health messages were included based on the World Health Organization's list of ten killers of women and children; these lesson segments were aimed at awareness and treatment of these diseases and medical problems.

**Recommendation: Look for opportunities to include content relevant to adults as well as children; consider using the radio lessons to encourage joint school-community activities.**

## VII. CLOSING

We hope that this report is helpful to those who have been interested in and have followed the Radio Science Project through its years of development, and that others engaged in projects in developing countries will find it useful.

We would like to thank our friends and colleagues in Papua New Guinea who have provided the leadership and support necessary for a successful project.

Betual Pearl, Secretary of Education  
William Penias, First Assistant Secretary  
Peter Baki, Assistant Secretary  
Kwapena Makara, Superintendent, Materials  
Balau Suag, Superintendent, Administration  
Brian Deutrom, Superintendent, Curriculum  
Tom Seta, Research and Evaluation  
David Eyrich, Research and Evaluation

Radio Science Project Staff:

Iti Didiga  
Isabelle Aihi  
Harold Ure  
Timothy Gaemate  
Igo Vagi

Radio Science Final Report

Anne Kukuh  
Isabelle Aihi  
Gwen Moide  
Sylvia Oa  
Paul Mungul  
Joyce Pala  
Patrick Ori  
Lydia Towle  
Frank Tauna  
John Moseturi  
Tazi Rom  
Pius Ripason  
James Kimala

And to all the teachers who tested the RSP materials, especially Elizabeth Oa.

**Appendix I**  
**Radio Science Project Advisory Committee**

RADIO SCIENCE PROJECT ADVISORY COMMITTEE

William Penias - *ex officio*  
First Assistant Secretary, General Education Services  
National Department of Education

Peter Baki - chairperson  
Assistant Secretary for Curriculum Development  
National Department of Education

David Eyrich  
Co-ordinator, Evaluation Unit  
National Department of Education

Dr Sheldon Weeks  
Director of Research Unit  
University of Papua New Guinea

Dr George  
Faculty of Education  
University of Papua New Guinea

Dr Lance Hill  
Biology Department  
University of Papua New Guinea

Iga Kila  
Assistant Director, Development Broadcasts  
NBC

Ms Anne Kona  
Sacred Heart Community School  
HOHOLA

Mr Modakewau  
Assistant Secretary Teacher Education  
National Department of Education

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Curriculum Unit

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Curriculum Unit

Kwapena Makara  
Superintendent, Materials Unit  
Curriculum Unit

Vali Vagiriavi  
Senior Inspector  
Central Province Education Division

Mr Meferamu Mero  
Assistant Secretary, Education Division  
National Capital District

Ken Rouse  
Senior Science Officer  
Curriculum Unit

Dean Welty  
Deputy Chief of Mission  
U.S. Embassy

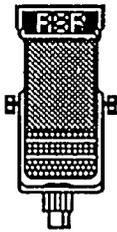
Louis Kuhn  
USAID  
U.S. Embassy

Godfrey Yerua  
Superintendent, Measurement Services Unit  
Curriculum Unit

Tom Roy  
Director  
Radio Science Project

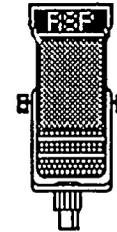
**Appendix II**

**Press Release, 24 August 1990**



## **RADIO SCIENCE**

The National Department of Education  
Waigani, NCD  
**Papua New Guinea**



PRESS RELEASE  
24 August 1990

The Radio Science Project has become Radio Science!

During the past four years the Radio Science Project has been developing and testing Interactive Radio Instruction lessons which teach the science curriculum in grades four through six in the Community Schools in Papua New Guinea. The Project is sponsored jointly between the United States Agency for International Development (USAID) and the National Department of Education.

The Project work is coming to an end, and the chapter of Radio Science is opening. This week the staff celebrated the completion of the final lesson for grade six. With the approval of the Community Schools Board of Studies and beginning with the 1991 school year, grade six Radio Science will be broadcast on the Karai service of the National Broadcast Commission. Grade five and four lessons will follow in 1992 and 1993.

The fifty grade six lessons work hand in hand with classroom teachers. Students have a book which includes drawings and science information and is referred to during the lesson by the radio teachers. The lessons are interactive which means that the children are asked questions by the radio teacher and a carefully timed pause allows them to answer. They are also directed to do a variety of activities during the broadcast. The classroom teacher is also an

integral part of each lesson. He or she calls on children, writes on the chalkboard, helps children with science activities and does demonstrations for the pupils in the classroom. In addition the teacher does a ten minute post-broadcast segment which completes the radio lesson. This combination of teacher and radio teacher is the strength of Radio Science.

These lessons are the work of eighteen national staff members including writers, actors, materials specialists, a science educator, production staff, and evaluators. This team creates lessons from the Community School Science Syllabus, carefully scripts a radio broadcast using national voices for four teachers and four children as characters. The scripts are edited and taken to the studio for recording. The completed lesson is taken to fifteen Community Schools for a trial run in actual classrooms. These lessons are observed by Project staff and each lesson is evaluated, modified, and edited before a final tape is made. The lessons have been produced and trialed in the National Capital District and the Central Province. They have been further evaluated in the East Sepik Province. Research shows that the students are learning more and the teachers' confidence is improved.

With the production of the final lessons, many changes are taking place. A small portion of the staff are working through December to complete revisions, editing, and an inservice programme for teachers. The Curriculum Unit is assuming full responsibility for the Radio Science broadcasts which have been developed by the Project. The Director is returning to the United States this week to write the final report for USAID. As the production phase ends, many staff members are using their experience to begin jobs in the National Department of Education and in the private sector.

The Director, Dr. Tom Roy, is very pleased with the work of the Project. There has been real growth in knowledge about radio teaching as a result of the work in Papua New Guinea. The radio programmes are of excellent quality and have received very high praise from many sectors of the educational community. Students in the Community Schools have the opportunity to enhance their learning while teachers report that they are better able to teach science as a result of Radio Science lessons. The cost per student of the Radio Science curriculum is far below other alternatives.

Other benefits have accrued. There is a renewed interest in other Community School Broadcasts which need to be revised and updated. There is a more active broadcast studio with former Radio

Science Project staff members and additional equipment provided by the Project. There is a Broadcast Committee to provide direction for future development. The Community School science curriculum is a priority for new work. A small library of science and education books have been transferred from the Project to the Curriculum Unit. Former staff members are using their expertise in the educational community in Papua New Guinea. Three staff members are pursuing college and university education to further skills begun at Radio Science Project.

While no perfect answer exists, Dr. Roy leaves Papua New Guinea very pleased with the staff members with which he has worked, the friends which have come from his tenure here, and the lessons which are Radio Science.

**Appendix III**

**Project Objectives (Contract # DPE-5818-C-00-4087-00)**

PROJECT OBJECTIVES (Contract #DPE-5818-C-00-4087-00)

-4-

SECTION C - DESCRIPTION/WORK STATEMENT

C.1 Objectives/Background

The project objective is to develop a tested model for using radio to provide effective primary science instruction at low cost. The project will use instructional broadcasting for primary school classes, with support by a science education resource center providing curriculum, materials and teacher orientation. This radio science curriculum will constitute the entirety of instruction in science for primary schools; it will not be designed to be a supplement to other forms of classroom teaching in science.

1. Project success will be measured by two criteria:
  - a) that pupils receiving radio science education show statistically significant gains in learning compared to pupils in control classes, taught by teachers using customarily available teaching aids such as guides, materials, and textbooks; and
  - b) that the radio science education program recurrent costs are low, and its administration is manageable for less developed country (LDC) Ministries of Education.

2. This Radio Science project will consolidate and build on prior LDC science curriculum development, and use radio to deliver improved science education widely and quickly.

- a) It shall be designed to compensate for the teachers' lack of science knowledge and will provide support systems for teachers, through the radio science lessons themselves, broadcasts especially for teachers, teacher workshops, and participation by host country science educators in developing methods and materials;
- b) Lessons and instructional materials will reflect children's daily experience and include post broadcasting activities for children to apply science lessons at school and at home;

- c) Rigorous formative and summative evaluation not only will test student learning, but will gather information on student, teacher, and parent attitudes and concerns about the radio science programs;
- d) Further progress will be made on local production of low-cost teaching materials. Some materials may be provided by teachers and students, but the project will work with government and private sector entities to achieve mass production at low cost;
- e) The project will be based in a Ministry of Education's Curriculum Division, and will seek MOE approval for official adoption of the final radio science programs. This will help to ensure its use throughout the national education system and its inclusion in pre-service and in-service teacher training programs.

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**Appendix IV**  
**Teachers' Notes**

TEACHERS' NOTES

## Radio Science Grade Six

Levers  
-----

GRADE 6

UNIT 3 SIMPLE MACHINES

LESSON 19 LEVERS

TIME FOR THE BROADCAST: 20 MINUTES

POST-BROADCAST TIME: 10 MINUTES

SPECIAL THINGS IN THIS LESSON:

During the post-broadcast lesson you will need a ruler (or small flat timber like a ruler), a pencil to use as a fulcrum, and some stones about the size of a chicken egg or a little larger for each pair of students.

New vocabulary words:	fulcrum	- the hinge for a lever
	force arm	- end of lever where force is applied
	weight arm-	end of lever where weight is applied.

The children should be able to spell these words and to use them in the science lessons. The children will learn to say these words by hearing the radio children use them in the lesson.

THINGS THAT YOU WILL NEED:

- \* Radio Science Book for each pair of children.
- \* A pencil and an exercise book for each child.
- \* Fresh batteries for your radio.
- \* Have the children sit in pairs so that they can share materials.
- \* Tell the children not to write in the Radio Science Book.

FINISH THE BROADCAST LESSON BY:

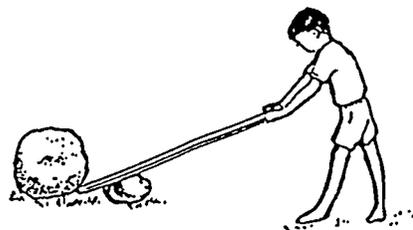
Revising the lesson. Have the children write the vocabulary in their exercise or vocabulary books. Do the following activity: Each pair of students should have a ruler, a pencil for a fulcrum, and a few egg-sized stones. Have the children set the levers up like the drawings in box three of page 10 of the Radio Science Book.

They should try lifting a stone with the fulcrum close to the stone, in the middle, and with the fulcrum near the end where they are applying force.

They should be able to answer the following questions:

1. Which position of the fulcrum makes it easiest to lift the stone?
2. Which position makes it the hardest?
3. Which position moves the stone the most?
4. Which moves it the least?

And this last activity will let you know if the students understand the concept: Make a drawing of how you would set up a lever and a fulcrum to move a 100 kilogram stone. (The drawing should have the fulcrum very close to the large stone like this).



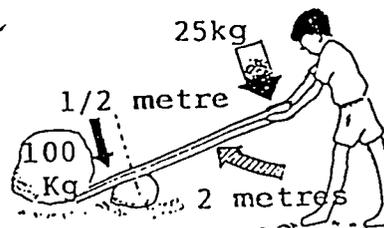
**SCIENCE NOTES FOR THE TEACHER:**

A lever is a simple machine. There must be a balance between three things: the weight of the object, where the fulcrum is placed and the force used on the force arm. There is even a mathematic formula to show this relationship, but the children do not have to know it. For your information it is: Force (w) x Distance (w) = Force(f) x Distance(f)

Where the 'w' stands for the weight arm and the 'f' stands for the force arm. So if we want to lift a very heavy weight, we need to have a short weight arm and a long force arm like this.

$$100 \times \frac{1}{2} = 25 \times 2$$

$$50 = 50$$



**AN ADDITIONAL LESSON ON THIS TOPIC:**

Use a big timber outside in the school yard to have the children try many positions of the fulcrum and many objects to lift. The children will often try to lift very heavy objects and need your supervision so they don't spoil something. (For instance it is possible to lift a car or the classroom, but usually the metal on the car will bend or something on the bottom of the classroom will break first.) It is fun but you need to have them be careful that they don't spoil something.

**Appendix V**

**Evaluation Field Notes and Tables**

EVALUATION FIELD NOTES AND TABLES

SCHOOLS TESTED	GRADE 5			GRADE 6		
1.Mahli	30	8	22	25	3	22
2.Brikiti	30	3	27	36	0	36
3.Mandi	0	0	0	25	0	25
4.Balupwine	30	6	24	30	6	24
5.Yarapos	0	0	0	30	10	20
6.Kaugia	30	2	28	30	12	18
7.St.Mary's	0	0	0	45	1	44
8.Wingei	30	8	22	30	7	23
9.Kunjigini	30	18	12	40	3	37
10.Hieisi	30	12	18	30	6	24
11.Motugei	0	0	0	25	3	22
12.Nindiwi	30	4	26	35	9	26
13.Kusambuk	30	9	21	30	0	30
14.Aresili	30	5	25	30	4	26
15.Yangoru AOG	30	0	30	35	6	29
16.Brugam	30	3	27	45	11	34
17.St.Thomas	30	11	19	29	1	28
18.Burui	30	0	30	40	12	28
19.Kwary	30	18	18	26	0	26
20.Warabung	30	5	25	20	20	0
21.Katkwo	30	13	17	40	40	28
22.Handra	30	18	12	20	20	17
23.Kubalia	30	30	0	0	0	0
24.Marinumbo	30	16	14	0	0	0
25.Sosoya	0	0	0	0	0	0
26.Bai	0	0	0	0	0	0
27.Kaindi Dem	0	0	0	0	0	0
28.Biwat	0	0	0	0	0	0
TOTAL	600		417	696		567

Table #1:

Numbers of Test Given by School

SCHOOLS TESTED	GRADE 5	GRADE 6
1. Mahli	22	22
2. Brikiti	27	36
3. Mandi	25	25
4. Balupwine	24	24
5. Yarapos	0	20
6. Kaugia	28	18
7. St. Mary's	0	44
8. Wingei	22	23
9. Kunjigini	12	37
10. Hieisi	18	24
11. Motugei	0	22
12. Nindiwi	26	26
13. Kusambuk	21	30
14. Aresili	25	26
15. Yangoru AOG	30	29
16. Brugam	27	34
17. St. Thomas	19	28
18. Burui	30	28
19. Kwary	18	26
20. Warabung	25	0
21. Katkwo	17	28
22. Handra	12	17
23. Kubalia	0	0
24. Marinumbo	14	0
25. Sosoya	0	0
26. Bai	0	0
27. Kaindi Dem	0	0
28. Biwat	0	0
TOTAL	417	567

TABLE:

RSP Schools by Location showing Lesons and Materials received

SCHOOLS	Location	GR.5 B/Cast	GR.5 Mat
1.Mahli	rural	listened	none
2.Brikiti	rural	listened	has
3.Mandi	rural	listened	none
4.Balupwine	rural	listened	none
5.Yarapos	rural	listened	none
6.Kaugia	rural	listened	none
7.St.Mary's	Urban	listened	has
8.Wingei	rural	listened	has
9.Kunjigini	rural	-----	none
10.Hieisi	rural	listened	none
11.Motugei	rural	-----	none
12.Nindiwi	rural	?	?
13.Kusambuk	rural	-----	none
14.Aresili	rural	-----	has
15.Yangoru AOG	rural	listened	none
16.Brugam	rural	-----	one
17.St.Thomas	rural	-----	has
18.Burui	rural	?	?
19.Kwary	rural	-----	none
20.Warabung	rural	-----	none
21.Katkwo	rural	listened	none
22.Handra	rural	listened	none
23.Kubalia	rural	listened	none
24.Marinumbo	rural	listened	none
25.Sosoya	rural	listened	has
26.Bai	rural	?	?
27.Kaindi Dem	Urban	listened	none
28.Biwat	rural	?	?

RADIO SCIENCE TABLE 2

SCHOOLS	TEACHER'S NAMES
Mahli	Mr. Cephas Malum (H/T)
Brikiti	Mr. Jeffrey Walange
Mandi	Mr. Alfred Ban
Balupwine	Mr. M. Rahiria (H/T) Mr. Pius Langu
Yarapos	Mr. Boniface Vai
Kaugia	Mr. Ben Kiminja Mr. Martin Kuian
St.Mary's	Mr. Augustine Sana (H/T) Mrs. Julie Nakau
Wingei	Mr. Jeffrey Harold
Kunjigini	Mr. Albert Vigata Mr. Patrick Baiba
Hieisi	Mr. Sansan (H/T) Mr. Philip Paul Mr. William Senus
Motugei	Mr. Cornelius Bial
Nindiwi	
Kusambuk	Mr. peter Nawayeu Mrs. Carol Kamblijambi
Aresili	Mr. Francis Kurpaku Ms. Joan Heminie
Yangoru A.O.G.	Mr. Andrick Yangro (H/T) Mr. Jacob Malken Mr. Jeffrey Kara
Brugam	Mr. Eliaking Oku (H/T) Mr. Tim Miaiatau
St.Thomas	Ms. Maria Hasifagu
Burui	
Kwary	Mr. Roy Giwarkun (H/T) Mr. Yehilomo Mr. Philip T. Tinut

RADIO SCIENCE TABLE 2

Warabung	Mr. Simon Parihao (H/T)
Katkwo	Ms. Jacqueline Wapi
Handra	Mr. John Kiatis Mr. Peter Marin Mr. Joseph Dawary
Kubalia	Mr. Jerry Jiki
Marinumbo	
Sasoya	
Bai	
Kaindi Dem	Mr. Felix (H/T)
Biwat	

Katkwo Community School: Jacqueline Wapi Gr.5

## About The Test

Pupils: 17

- \*Gave the test herself.
- \*Enough time, some finished before the time was up.
- \*Wording on the test was difficult.
- \*No problems
- \*No they didn't go over the test.
- \*No copies made.

## About The RSP Itself

- \*Lessons stopped on Lesson number 30.
- \*Term one and two were all right.
- \*Term 3 week 6 the program stopped.
- \*There is no Gr.5 books with sheets to follow up on what is on the radio.
- \*Generally it's a good little broadcast.
- \*If only there is material for the children to learn, they would learn better.

Kwany Community School: Mr. Yehilous Gr.5

## About The Test

Pupils: 22

- \*No Special copies.
- \*Didn't go through the test.  Given by class teacher.
- \*Instructions okay - Children found the whole subject difficult  
When actually doing the test.
- \*Gr.5 had difficulty because the science folders were not available.

## About The RSP Itself

- \*Up till now no broadcast (stopped after lesson 8). Because they didn't have this they didn't bother listening. They just went on with the normal science syllabus. The teacher was discouraged because Hlm made no effort to get material.
- \*Project radios are not at school.
- \*Project kits for grade 4.
- \*The programs with aerial are clear.
- \*Towards the end of the term one broadcast stopped (they sometimes get lost due to radios without batteries and they miss out on lessons).
- \*Generally it is a very good Program. It not only helps in science, but many other skills.

Hieisi Community School: Mr. Philip Paul Gr.5A  
after recess. appr. 10:30 11:30

**About The Test**

- \*Ann finished quickly.
- \*Instruction was clear - content was clear.
- \*Went through the test.
- \*No test were duplicated.

**About The RSP Itself**

- \*1st Term & 2nd Term.
- \*Third term there was a lot of disruption. ] disruptions due to
- \*Term four started again. ] different activities.
- \*Sometimes they play the lessons missed, but not all the time.
- \*NBC does not notify teachers on changes that take place: such as playing two lessons at one time.
- \*Folders for Gr.5 teachers & pupils are absent.
- \*Very interesting - the class enjoyed the program a lot.
- \*Terms used are difficult for the class.

Hieisi Community School: Mr. William Senus Gr.6

**About The Test**

**Pupils: 27**

- \*It was give by Gr.5B (not project class).
- \*The teacher didn't give the instructions.
- \*Went through test with class teacher.
- \*\*They never listened to any radio science lessons.
- \*Questions similar to RSP and syllabus.

**About The RSP Itself**

- \*Generally it's good, they have materials.
- \*Program a lot more detail in it than lessons prepared by teacher.
- \*Separate from each other.
- \*Science kit with teacher.

Brugan Community School: Mr. Tim Miejatau

**About The Test**

**Pupils: 27**

- \*Gave the test by didn't go over it with the class.
- \*Instruction okay.
- \*Pupils and teacher understood.
- \*Content not hard, but some questions the pupils didn't understand. Topic not covered.
- \*Timing was okay, no problem with that. From 9:00 - 10:00 AM.
- \*No extra copies were made.
- \*The teacher gave the test.

### About The RSP Itself

- \*No pupil notes, so pupils just listen.
- \*Term A missed. 3rd week, because 1) Radio off air  
2) Exam

### Notebooks For Class

- \*Term 1,2, & 3 no programs.
- \*Teacher was not aware until end of term 3.
- \*RSP radios can not receive transmission, so we use our own radio.
- \*No aerial in school. Former Grade 4 teacher transferred.
- \*Grade 4 kit used by class

\*Generally is very good - Extra lessons are good for the class.

Brugan Community School: Mr. Eliaking Oku Gr.6

### About The Test

Pupils: 37

- \*Timing is okay.
- \*Took up time for other subjects.
- \*Generally the test are okay.

### About The RSP Itself

- \*It's a good program. BETTER!!
- \*Separate the two science projects and then ? later strengthen the subjects involved.
- \*Gr.4 & Gr.5 classes have ? the lessons in their programs very well.

- 1)made available and then provided to all schools.
- 2)Revise the program for the future.
- 3)Very effective if broadcast in Provincial regions.

Mahli Community School: Mr. Cephas Malum Gr.5

### About The Test

Pupils: 28

- \*Instructions generally - both for teacher & pupils
- \*Timing okay. Class completed it before the time.
- \*8:30 - 9:30 AM test was given.
- \*Class teacher gave the test for both Gr.5 & Gr. 6.
- \*Yes, we went through the test with Gr.5, not Gr.6.

### About The RSP Itself

- \*No materials to go with the radio, so teachers have difficulty.
- \*Term 3 no lessons altogether & term 4.
- \*There are messages from NBC WWK on what lessons to be on, but when the station is off there is no messages.
- \*There is a radio science kit, but the project radio plus the school radio was stolen.

- \*The school has no good aerial system.
- \*Decentralized office for RSP for quicker feedback/communication and monitoring.

Opinion:

- \*Very effective.
- \*Better because it helps with the concept of understanding science better for both teacher and pupils.

Areseli Community School: Mr. Francis Kurpaku Gr.6  
Ms. Joan Heiminie Gr.5

About The Test

Pupils: Gr.5:20

Gr.6:20/23

Gr.5: 9:00 - 10:15

Gr.6: 10:30 - 11:30

\*Gr.5 Instructions okay.

Time: One hour was too short for slow learners.

\*Gr.6 Instructions okay.

Time: Some left out questions.

\*Gr.5 topics covered and questions easy for them. Terms used not really a problem.

\*Gr.6 dull ones found it hard.

About The RSP Itself

\*Up until this term Gr.5 there was no lessons, Lesson No. 31.

\*Teachers were not aware that Gr.5 broadcast were not on. Therefore, they were never tuned into the radio.

\*Didn't know about Gr.5, so they didn't enquire about any materials.

\*The whole project is very well done, because the teachers and pupils enjoy it - very enriching.

\*Should be made a national project.

\*Gr.5 although not heard on radio the teacher thought it was good for them.

\*Reception not clear.

\*Should be on NBC - aerial was taken away.

\*Radio there.

\*Gr.6 kit here.

Kwary Community School: Mr. Tengis Tinut Gr.6

About The Test

Pupils: 28

\*28 present when the test was given.

\*10:30 - 11:30 PM.

\*Not gone through with the pupils.

- \*Instructions clearly understood by both teacher and pupils.
- \*Content - was clear and easy.

#### About The RSP Itself

- \*Receptions okay.
- \*Gr.6 uses some of Gr.4 kit in some of their experience.
- \*Generally very useful - teachers and class both understand it, enriching their understanding in other science lessons.
- \*Ordinary teaching is not good, but radio program is very good.
- \*Community school should have a specialist science teacher, Grades 4 - 6, because the lessons are quite similar.
- \*Some inservice run on Radio Science (suggestions).
- \*Extend it to two lessons a week rather than on a week.
- \*Besides the kit there should be more aids for the radio, even better we need better radios.

Brikiti Community School: Mr. Jeffery Walage Gr.5

#### About The Test

Pupils: 37

- \*1 hour testing time.  Made extra with other papers.
- \*Timing was okay.
- \*Content was easy - instructions were understood.
- \*Did not interfere with lesson.
- \*Self administered to own class.

#### About The RSP Itself

- \*Picked up all lessons except when transmitter not working, Substituted lessons with other science topic.
- \*There were enough pupil's books and teachers guide.
- \*Lessons that were not broadcast came later, but teacher had already taught them.
- \*Sometimes due to delay NBC will let teachers know.
- \*The radio's reception, that was given by RSP, is not clear. Other radio is good.
- \*Aerial available for only Gr.4.
- \*Kit is okay. Torch stolen by thieves in 2nd term.

#### Opinion:

- \*Good - with all materials.
- \*Normal lessons have no materials.
- \*The class finds it very easy.
- \*Teachers guide easy to follow/correlated with other subjects: eg. Community Life Health, and Expressive Art should be broadcast to all schools.

Balupwine Community School: Mr. M. Rahria Gr.5

#### About The Test

Pupils: 24

- \*10:30 - 11:00

### About The RSP Itself

- \*Gr.4 kit available.
- \*Reception is okay with aerial from RSP.
- \*1st term and 2nd term lessons were not received even terms 3 and 4.
- \*No booklets for Grade 5.
- \*Gr.4 program is very good, enjoyed it.
- \*Radio from RSP is not good not working.
- \*Disruptions from Radio ESP.

Balupwine Community School: Mr. Pues Langu Gr.6

### About The Test

Pupils: 28

- \*Went through the questions and instructions before the test.
- \*Went through the questions with the class after testing.
- \*Content - papers were some difficult ones.
- \*Terms used were difficult.
- \*\*There should be some examples used to help students to understand them.

### About The RSP Itself

- \*Comments: Good: Give some extra understanding.

Wingei Community School: Mr. Jeffery Harold Gr.5A

### About The RSP Itself

- \*1st term missed out because of materials.
- \*Kept in WWK by inspectors and didn't inform the school.
- \*Reception is not clear - radio is not working.
- \*\* RADIOS are not working.
- \*H/M - Comment: very effective - better than teacher teaching.

Gr.6 Teacher

### About The Test

- \*Instructions were clear for teacher and pupils.
- \*class just did the test without questions asked on terms.
- \*1 hour was sufficient.
- \*9:00 - 10:00 AM.
- \*Collected them all before they went trough the test.

Warabung Community School: Mr. Simon Parihas Gr.4&5

### About The RSP Itself

- \*Reception is not good, the aerial there but not effective during the day.
- \*Timing of broadcast is not good-morning should be okay.
- \*RSP radios not good, not effective.

- \*Gr.4&5 have not been consistent with program due to poor reception.
- \*Kit not used much due to non-receiving of lessons.
- \*Gr.5 didn't get any materials.
- \*The year before had same problem.
- \*Program is very good, the problem is clear.
- \*Set very nicely with more practical work.

St. Tomas Community School(Yarrgouri): Maria Hasifargi Gr. 6

**About The Test**

**Pupils: 29**

- \*Instructions were clear.
- \*Understood by teachers and pupils.
- \*Content was easy.
- \*Words were difficult: such as reptiles/mammals.
- \*Mixture of questions multiple/open ended questions.
- \*Stuff in the test was not in the syllabus, therefore the test was hard.
- \*1 hour was sufficient - 10:30 - 11:30 AM. test given.
- \*Went through papers with class.
- \*\*Two sets of Grade six were given mistakenly noted.\*\*

**About The RSP Itself**

- \*Gr.5 very rarely received the broadcast.
- \*News comes on instead of RSP Lessons(See manager).
- \*Very well planned project - if given properly the children will enjoy it.
- \*Gives more detail to what teachers give.
- \*Gr.4 kit is here.
- \*RSP program is all there for teaching.
- \*RSP radio is not good for short wave receptions.
- \*Use only own radios.
- \*Use the books for Gr.5 after lessons.

Yangone (A.O.G.) Community School: Mr. Jacob Malken/Jeffery Kara  
Gr.6B

**About The Test**

- \*Instructions were okay - understood by teacher and pupils.
- \*Content okay - sam as what is treated in class.
- \*May have some difficulty, but didn't ask teacher.
- \*11:00 - 11:45 AM. test was done within the time.
- \*The test gone through with class.
- \*Questions were easy. 1/2 Multiple choice(A)1/2 Short answers(B).

**About The RSP Itself**

- \*Transmitter is problem.
- \*Aerial is okay.
- \*Program very useful and worthwhile.
- \*Afterwards there's follow up on the broadcast.

- \*Andrick Yargro H/M. Yangoru A.O.G. (Cyril Tapper Inspector)
- \*tape the broadcast/replay later morning.
- \*Gr.5 material didn't get it.

Kusambic Community School: Mr.Peter Nawiyeu/Carol Kamblijambi Gr.5

#### About The Test

- \*Instructions were clear.
- \*Content easy to understand.
- \*Less than an hour (Both classes 9:00 - 10:00 AM).
- \*Went through the test with both classes.
- \*No difficulty found.

#### About The RSP Itself

- \*Not notified of Gr.5 program so all this time they have not been listening to radio broadcasts.
- \*Reception clear when weather is good, not other times.
- \*No aerial in school - not put up by RSP.
- \*Radios from RSP not good - use school's radios.

#### Comments:

- \*Very good program.
- \*Easy for pupils, very helpful.
- \*Good because teachers have difficulty teaching the science syllabus.

Kubalia Community School: Mr.Jerry Jiki Gr.5

#### About The Test

- \*No questions on content.
- \*Test took about 25 minutes, 9:00 - 9:30 PM.
- \*Did go through the test afterwards.
- \*Questions not difficult.

#### About The RSP Itself

- \*1st term up to end of 2nd term problems with transmitter.
- \*1:30 sometimes news comes on instead of RSP lessons.
- \*Booklets Gr.5 have 1 between 2.
- \*Gr.4 kit is okay.
- \*There is an aerial and the reception is still very clear.
- \*RSP radios are no good.
- \*Very good program.
- \*Helpful to both teachers and pupils.
- \*Especially older teachers with material.
- \*\*Cassettes - when radio not on use play it.\*\*

Handra Community School: Mr.John Kiatis Gr.5 Peter Marin Gr.6

#### About The Test

- \*Instructions were clear for teacher and pupils both grades.
- \*1 hour okay, both grades.
- \*Morning 10:30 - 11:30 AM. both Grades.
- \*Didn't go over the test.
- \*Content clear, okay.

#### About The RSP Itself

Gr.5

- \*No teachers guide and pupil books.
- \*Receptions clear, but sometimes they don't air programs.
- \*Term 1,2,3 have been listening, but no follow up due to lack of guide eg. pupils' books and teachers' guide.
- \*Aerial is there, but need a pole.
- \*Gr.4 kit available.
- \*RSP radios not good, use school radios.
- \*Project is very good.

#### Handra H/M-Joseph Dawary

- \*Programs should be in the morning
  - \*\*Handbook for teachers, from CCD.
  - \*\*Broadcast notes/books should be on time.
  - \*\*No correspondence direct to school from CDD/Ponso.
  - \*\*Library not good in schools, needs improvement.
- \*Combine of Subject
  - \*\*Question 44/45 Elcom Bill (Rural School)??

Marinumbo Community School: Gr.5 (No gr.6 test given)

#### About The Test

- \*Instructions understood by teachers and pupils.
- \*Contents: Question on topics not touched.
- \*Nearly half finished before time - from 9:00 - 10:00 was testing.
- \*Test was gone over with class.

#### About The RSP Itself

- \*Started listening to program from term 1.
- \*Only problem is transmitter fault.
- \*Lessons missed before replayed over, after sending messages.
- \*Reception okay with aerial.
- \*No Gr.5 teacher's guide.
- \*Teacher made own materials.
- \*Term four is not good no lessons heard.
- \*Gr.4 kit okay.
- \*RSP radio is okay to pick up lessons.

#### Comments:

- \*It's better because it involves both teacher and pupils: eg. this lessons help lazy teachers as they provide all the activities, but must be with the pupils to be very effective.

- \*Other teachers feel the same.
- \*Program guide from Radio E.S.P. to school???

Varapos Community School: Mr. Bonifeice Bai Gr.5

**About The RSP Itself** **Pupils: 33**

- \*1st term and 2nd term picked up all lessons.
- \*Stopped around lesson 32.
- \*Other lessons coincide normal Gr.5 science lessons.
- \*Teacher made aerial and reception is okay.
- \*Instead of lesson news comes on.
- \*Some lessons not picked up, so teacher taught the lessons, using the RSP booklets given to them
- \*Booklets are shared one between two and kept by teacher.
- \*Gr.4 kit and booklets are here in school.
- \*RSP is a worthwhile project.
- \*Helps teacher and pupils - instruction are clear and concise and children enjoy the lessons.
- \*The program gets the children to actually do something.
- \*RSP is a good supplement to the normal science lessons.

St. Mary's(Wirru) Community School: Mrs. Julie Nakau Gr.5

**About The RSP Itself** **Pupils: 33**

- \*Term 1 and 2 was okay but it went on and off.
- \*It went on and stopped at Lesson 32.
- \*Reception not clear with project provided radios.
- \*All four Gr.5 classes have there booklets and teachers' guides.
- \*Teachers continue to teach despite program hold up using guide.
- \*No aerial for whole school.
- \*Sometimes interferes with teaching when lessons are repeated after they are stopped.

Opinion:

- \*In a way it is good because books provide more activities.
- \*Most of the normal science program is not Continuous, it jumps from topic to topic, but RSP is good as it is continuous.
- \*Put program on National NBC because ESP radio is not reliable.

Motungei Community School: Mr. C. Bial Gr.5

**About The RSP Itself** **Pupils: 36**

- \*I skipped test.
- \*Only when station on air.
- \*First and Second Term no radio so no lessons.
- \*Started in term 3, when radio was bought.
- \*Aerial was taken by former teacher.
- \*Gr.4 kit available.
- \*Radio Program lessons i very specific.
- \*What teacher teach is general.
- \*Difficult without material.

- \*More effective.
- \*Gr.6 not available.

Kurgigiri Community School: Mr. Patrick Barba Gr.6

**About The Test**

**Pupils: Two classes 19+19**

- \*11:00 - 12:00 AM
- \*Instructions understood.
- \*Didn't go over the test with pupils.
- \*Content okay - Covered in science lessons.
  - terms some understood, some not.

Gr.5 <sup>11</sup> pupils Mr. Albert Vigata

- \*Pupils shared 1 between 2.
- \*1 class went through the papers - don't know about other.
- \*Instructions were simple
- \*Content: some words were difficult, but on the whole good.
- \*Given in the afternoon 1:00 - 2:00 PM.

**About The RSP Itself**

- \*When lessons missed are not put on again.
- \*Reception is not clear/radio by RSP is not good.
- Aerial only for Gr.4.
- \*Science kit is available.
- \*Gr5 does not have activity book.
- \*Good/but needs materials to do it properly.
- \*Gr.4 does not have more activity.

Kangia Community School: Mr.Martin Kuian Gr.5

**About the Test**

**Pupils: 20**

- \*9:00 - 10:00 AM.
- \*Time was limited should add an extra 10 - 15 minutes.
- \*Test was gone through with the class.
- \*Instructions was okay for teacher, but slow learners had problems.
- \*Content was clear, but some had difficulty.

**About The RSP Itself**

- \*No Radio in school at the same time reception was not good, till end of term 2.
- \*Teacher's guide and pupils books for Gr.5 not available.
- \*No Gr.4 kit.
- \*Gr.5 has no kit and other materials to go with it.
- \*The 1:30 reception is not very good.
- \*No aerial in the school.

Opinion:

- \*Because it has a lot of different activities it is beneficial to

the class and teachers.

Mr. Ben Kiminja Gr.6

About The test

Pupils: 18

- \*Class teacher gave the test.
- \*Instructions clear, understood by teacher + pupils.
- \*Content: Illustrations  
Terms used.   
Common sense questions.  okay
- \*Learnt most things in their lessons.
- \*There should be more open ended questions.
- \*Class went over the test.

About The RSP Itself

- \*Radio Science is Helpful.
- \*Problem with Radio Station so no lessons.
- \*Observations: When message was sent there was no follow up on the lessons.

**Appendix VI**  
**Communications/PNG**

Mr. William Penias  
First Assistant Secretary  
Public Service Administration Haus  
Waigani, NCD

Dear Mr. Penias:

There has been a great deal of conversation about the use of Radio Science and other educational radio programmes among teachers, headmasters, inspectors and officials of the NDOE. The content of the final report of the Radio Science Project refers to evaluative remarks from many teachers and others which indicate the need for continued use of radio programming. We have been very pleased to have been a part of this effort.

There remains work to be done. The NDOE needs to work closely with the NBC to assure reliable broadcast of educational programming. There is established a committee to work in this area but they need to be encouraged to meet and to act. There is a need to up-date old programmes. Your support for the cooperation between the Curriculum Unit and the Materials Unit for the development of these programmes is essential. And finally, there is a need for inservice education. Ruben Eagen has begun this effort with the training of twenty educators who can offer programmes on the use of educational radio. He needs support to continue the effort with the training of three hundred additional staff members in 1991. Though it has been shown that teachers can use Radio Science with little training, this cadre of inservice educators are able to teach their colleagues how to set up and care for equipment, erect outside antennae, and how to plan the use of any educational radio broadcast. The training takes two days and those trained will be able to teach teachers in the field in a two hour time frame.

We would like to thank you for your constant professional and personal support while in PNG and stand ready to return the favor if the need should arise. Again, William, thank you.

Sincerely,

Tom Tilson  
Tom Roy

Mr. Kwapena Makara  
Superintendent, Materials Unit  
Inservice College  
Waigani, NCD

Dear Mr. Makara:

I spoke with Harold Ure this past week and he indicated that the Grade six materials are complete and being shipped through the Materials Officers to the teachers in the field. We are both very pleased with the quality of the printing and are excited about the beginning of the broadcasts. From our evaluation and the survey of the teachers, headmasters, inspectors, and inservice educators who are involved with these curriculum materials, we are pleased with our role and hope it provides a starting point to continued production of good educational radio programming. We are confident that you and your staff, together with the Curriculum Unit, will be of great help to the students of PNG with your cooperative development efforts.

Now that the printing of the grade six materials is complete and the programming is beginning it is time to look forward to 1992 and the grade five materials so that delays will not occur in the implementation of that curriculum. The printing is a large job. There is some minor work that needs to be done to the student book and the teachers' notes to establish proof copies ready for the camera. I suggest that Harold do this work as he is familiar with the process and the product as well as the problems that we experienced in the grade six production. It seems that if we start early that the print shop should be able to handle the print job much more efficiently. A good estimate of a beginning time is July for the initial print runs, this would give time for distribution and to communicate with teachers that the materials are available.

This communication with the teachers is a problem area even though your staff regularly sends out notifications. We have spoken with many teachers and headmasters in the field and they indicate that they do not always receive your notices or that they cannot access materials because the stores are not available from the Materials Officer. We suggest that you try a two-way memo (attached) so that you can follow-up to determine who is and who is not receiving your notices. This notice should be sent out in November so that teachers will be ready for the 1992 school year.

Kwapena, it has been wonderful working with you during my year and a half in Papua New Guinea and I should like to do so again. If that opportunity comes my way, I shall be much more efficient as I understand the parameters which which you work. I encourage you to continue to work through Peter Baki to form the close working relationship with the Curriculum Unit necessary to accomplish the important work that is before you. Thank you for your help and the friendship that you have so unselfishly shared with me.

Sincerely,

Tom Roy

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November 1992

Minute to Teachers, Headmasters, and Inspectors  
Copies to Assistant Secretaries, Materials Officers

The grade five Radio Science programme is ready for the 1992 school year. This radio programme is not a supplement to the science curriculum but teaches the science with you. It is fun for both teachers and students. There are three materials that you need for this programme. First you need a working radio, second is the book NOTES FOR THE TEACHER, and finally, you need enough Student Workbooks for each two students (if you have 36 children, you need 18 Student Workbooks). The print materials are available from the Materials Officer through your Inspector.

Though many teachers are familiar with Radio Science and others can teach it without help, there is help available.

1. An inservice programme is available in every province; see your Inspector.
2. Radios can be purchased through your school Duty Free; your headmaster can help or you can contact the Materials Unit of the NDOE.
3. Books are available through the Materials Officer. Remember: one student book for each two students. The programme is planned this way and if you take more there will not be enough for all the children to learn from Radio Science.

Please cut off the form below and return it to your headmaster so that he can arrange for your materials and return the form to the Materials Unit:

-----  
Teacher \_\_\_\_\_ date \_\_\_\_\_ School \_\_\_\_\_

Address \_\_\_\_\_  
-----

\_\_\_\_\_ I would like materials for teaching Radio Science.  
I have \_\_\_\_\_ children in my classroom.

\_\_\_\_\_ I do not need these materials because \_\_\_\_\_  
-----

Mr. Peter Baki  
Assistant Secretary  
Inservice College  
Waigani, NCD

Dear Mr. Baki:

We would like to thank you for all the help and support that you have given us in the Radio Science Project. Through contact with Harold Ure we understand that the implementation of the grade six Radio Science lessons are ready to begin. This is very pleasing to us and especially to Tom Roy as there were many difficulties to be overcome in the final year of the Project. The budget cut was devastating to all but with your support, this problem and the necessary obstacles were overcome to the benefit of the children of Papua New Guinea.

There is work yet to be done. Tom Roy, in his final report has outlined much of the Radio Science requirements and has offered suggestions to enhance educational radio in PNG. Further, he has offered suggestions and recommendations which he gathered from his PNG colleagues, which would ease some of the obstacles for further radio programming development.

There is certainly the expertise within the Curriculum Unit and the Materials Unit to revise and remake some of the older educational radio offerings. This goal has been stated and restated over the term of our work in PNG. There are, however, barriers. The final report of the Radio Science Project offers direction. You need to provide the leadership that you did for the RSP to get the Curriculum Unit to work with the Materials Unit. Without assigned staff members with a specific work plan and schedule we doubt that work will proceed. You have provided us with immense support and encouragement during our work in PNG. If we can be of help to you in this endeavor please feel free to contact us at EDC.

Again, Peter, thank you for your help and support. You have a formidable job and will have a positive impact on the children of Papua New Guinea for decades to come.

Sincerely,

Tom Tilson  
Tom Roy

**Appendix VII**  
**In-Service Program**

IN-SERVICE PROGRAM

TRAINING COURSE FOR COMMUNITY SCHOOL TEACHERS

# Using Interactive Radio

A three hour course

## CONTENTS:

- |                               |              |
|-------------------------------|--------------|
| 1. Objectives                 | Pages 1 - 3  |
| 2. Programme                  | Pages 4 - 5  |
| 3. Leader's Notes             | Pages 6 - 8  |
| 4. Role Of The Teacher        | Pages 9 - 10 |
| 5. Care Of The Radio/Cassette | Page 11      |
| 6. Handouts                   | Appended     |
| 7. Audio Cassette             | Appended     |

Field Based Inservice Section  
Port Moresby Inservice College  
and The Radio Science Project  
National Department of Education

## TRAINING COURSE FOR COMMUNITY SCHOOL TEACHERS

# Using Interactive Radio

A three hour course

### Duty and Competency

Duty: Teach teachers to use interactive radio programmes

Competency: Teach course as designed and answer questions related to the Radio Science Project and interactive radio.

### Background:

Teachers in Papua New Guinea will be using new interactive radio lessons and need to know how to care for the radio, the role of the radio instruction, the role of the teacher, how to use materials, and how to communicate with the Curriculum Unit of the National Department of Education.

### Purpose:

Participants will learn how to teach lessons of the Radio Science Project (and other interactive radio lessons).

### Aims:

This inservice programme teaches participants how to care for the radio, the role of the radio instruction, the role of the teacher, how to use materials, and how to communicate with the Curriculum Unit of the National Department of Education.

## Objectives:

At the end of this inservice programme the participant will be able to:

1. Build an outside antenna for a radio.
2. Clean a radio-cassette player and replace batteries.
3. List the differences between current radio programmes and interactive radio programmes.
4. Describe the role of the teacher before, during, and after interactive radio lessons including:
  - a. reading Teachers' Notes
  - b. preparing post-broadcast lesson
  - c. gathering materials
  - d. seating children
  - e. teacher cue
  - f. use of chalkboard
  - g. demonstrations
  - h. wet labs
5. Demonstrate the ability to communicate with the Broadcast Unit of the National Department of Education:

Kwapena Makara  
Supt. Materials Section  
Department of Education  
Private Mailbag  
Boroko, NCD

phone: 24-6484  
fax: 25-5902

Julius Natera  
Principal Materials Officer  
Department of Education  
Private Mailbag  
Boroko, NCD

Hitolo Avei  
Principal Broadcast Officer  
Department of Education  
Private Mailbag  
Boroko, NCD

# A Course for Community School Teachers: Using Interactive Radio

## PROGRAMME

10	10	1. Introduction	
		a. Welcome	
		b. Define interactive radio	I plenary (except as noted)
30	40	2. Lesson form and format	
		a. Play tape (lesson # 8)	I
		b. Demonstrate teacher's role	P
		c. Question for understanding	O
20	60	3. Teachers' Notes	
		a. HO ( <u>Teacher's Notes #8</u> )	I
		b. Discuss each section	P
		c. Question for understanding	O
20	80	4. Role of the teacher	
		a. HO: <u>Role of the Teacher</u>	I
		b. Review and demonstrate each role	P
		c. Question for understanding	O
20	100	5. Post-broadcast segment	
		a. Read HO ( <u>Teachers' Notes # 13</u> )	I
		b. Demonstrate activity	P
		c. Answer Questions	O
30	130	6. Lesson demonstration	
		a. Play tape of lesson #13	
		b. leader plays teacher's role	I,P,O

20 150 7. Care of radio cassette player/external antenna

- a. Handout Care of Radio I
- b. Demonstrate head cleaning or: P
- b. Demonstrate antenna building P
- c. Question for understanding O

30 180 8.

- a. Explain task HO Materials I
- b. Discuss barriers, prepare questions, suggest solutions, make lists P groups (5)
- c. Facilitator answers selected queries and post lists O

## Using Interactive Radio

### Leader's Notes

#### Section 1: Introduction

##### a. Introduction:

- i. Arrange chairs in a semi-circle.
- ii. Give your name and welcome all present.
- iii. If the group is large and teachers do not know each other, play an introduction game like the "Adjective game" (examples: I am happy Harold; My name is angry Anton; I'm lazy Lines).
- iv. Give your teaching background and where you are from.

##### b. Define Interactive Radio

- i. Give information on the aims and objectives; ask what they are doing with the current broadcasts; tell them the differences between the current broadcasts and Interactive Radio.
- ii. Write the responses on the chalkboard.
- iii. Have someone sum up by giving a definition of Interactive Radio.

#### Section 2: Lesson Form and Format

- i. Brainstorm by asking: How do we organize and conduct a broadcast lesson? Write the responses on the chalkboard.
- ii. Tell the group that Radio Science Lessons are prepared for in three parts: Preparation before the broadcast; Teacher's role during the broadcast; Post-broadcast activities.
- iii. Play tape # 8 Inferences, and demonstrate teacher's role while the tape is playing.
- iv. Group summarizes what they have seen.

### Section 3: Teachers' Notes

- i. Have teachers read the HO Teachers' Notes, lesson 8, Inferences.
- ii. Discuss each section
  - a. Special Things in this Lesson:
  - b. Finish the Broadcast by:
  - c. Science Notes for the Teacher.
  - d. Additional Lesson:

### Section 4: Role of the Teacher

- i. Distribute and read HO: Role of the Teacher
- ii. Review and demonstrate each role (a - h).
- iii. Question for understanding

### Section 5: Post Broadcast Segment

- i. Explain to the teachers what the post-broadcast segment is and what the teacher's role is.
- ii. Ask the teachers to refer to the HO Teachers' Notes "Inferences". Ask teachers to comment on the post-broadcast activities after trying one or two examples (i.e. a stone in a box; a marble in a tin).
- iii. Participants share their comments through questions and answers.

### Section 6: Lesson Demonstration

- i. The facilitator demonstrate a second lesson, lesson 13, Solutions.
- ii. The participants are involved in the lesson answering and observing.
- iii. The participants give comments and take the place of the facilitator.

### Section 7: Care of the Radio/Cassette Player

- i. Have participants read the HOs Care of the Radio and How to Set Up an Antenna.
- ii. Divide participants in pairs and distribute materials. Have each pair set up a model antenna following the diagram in the handout. Support groups by circulating and offering help and advice. Have participants view each other's antennae and offer comments.
- ii. (alternate) Demonstrate how to clean the head of a cassette player (if participants are using tapes to play lessons).

### Section 8: Materials

- i. Use HO Materials as a guide: Brief explanation and demonstration using some real examples of materials.
- ii. Ask participants to form groups of 4-6 and discuss problem which might prevent them from using the Radio Science lessons. List these on a sheet and discuss solutions.
- iii. Post these lists for other participants and close the workshop.

## **The Role of the Teacher**

The Radio Science Project has been developed to work for and with the classroom teacher to provide an interesting and complete science programme for our children. When you choose to use Radio Science lessons there are certain roles which you play which are different from traditional teaching and different from other radio programmes you may be used to.

If you read the Teachers' Notes and follow the directions for preparation and the post-broadcast segment, all of the concepts which are required by the Community School Board of Studies will be met. You do NOT need to do additional lessons. Of course you may choose to do additional lessons if you wish and if there is time in your curriculum but the fifty lessons which are broadcast along with the post-broadcast segments are approved by the Board of Studies as a complete grade six science curriculum.

These are the things that you must do:

1. Read the Teachers' Notes at least one day before the broadcast.
2. Prepare the ten minute post-broadcast lesson. This lesson is described in the Teachers' Notes but there will be preparation that you must do just as you would prepare for any other lesson.
3. Gather materials. The Radio Science Project lessons require hands-on activities. We have designed the lesson so that they may be taught with materials that are readily available throughout Papua New Guinea. We have also used things that do not cost you or the school much money. Most teachers gather lolly water bottles, dishes, old spoons, knives, plastic bags, SP bottles, soil, stones, pieces of wood and bark, and the like and put it in a special place for use all year long. This is a good idea for ANY science lessons whether Radio or traditional. If many of these things are gathered and kept in the classroom it will save time all year long.
4. Students should be seated in pairs near the radio. Two students will share one book. This sharing not only saves books but it also helps children share ideas. If you have a small room they may be at their desks. In a large room students will hear the broadcast better if they are seated in a small area on the floor near the radio.

5. During the broadcast there will be Teacher Cues. You will hear two taps on a Kundu drum and this is a cue that you will be asked to do something. This is often calling on a child or writing on the chalkboard. Sometimes there will be demonstrations to do but if there are, there will be directions in the Teachers' Notes. YOU MUST stay near the front of the room and LISTEN to the broadcast so that you will hear the Teacher Cues and be ready to work.

6. Sometimes you will be asked to write on the chalkboard during the broadcast of the lesson. If there is a word collecting (described in the Teachers' Notes) or other listing the activity will be in the Teachers' Notes. If you are to write what the children give for answers then it will be a part of the Teacher Cue.

7. There are demonstrations to do in about ten of the lessons. These are ALWAYS described in the Teachers' Notes. It is a ways a good idea to gather the materials and try the activity BEFORE you do it in from of the children. We have practiced these activities in classrooms like yours and give enough time. Sometimes you may work slowly and the radio teacher will begin talking before you are finished. This is OK; just keep working and finish. The children will watch you and listen to the Radio Teacher.

8. Wet labs are frequently done in the post-broadcast segments. These are carefully described for you in the Teachers' Notes. They use common materials and both the children and you will enjoy them. The most important thing about these labs is to have the materials ready and to practice them. We have a lot of fun doing these with the children and thing that you will also.

REMEMBER: Science is looking for answers. You do NOT need to know all the answers. We are trying to teach children to think for themselves and to find answers for themselves. Your job is to guide them to answers through study, books, asking parents, or even writing away for the answers. Enjoy teaching science whichever way you choose to do the job.

## Care Of The Radio Cassette Player

In order to use radios and cassette players in your classroom there are certain things that you should know.

1. Dirt ruins radios and cassette players. Keep your radio in a clean place and store your cassettes in the plastic boxes that they come in. Moisture also damages them so store them in a dry place.
2. Tape heads get dirty and the tape will sound bad or not at all. The head may be cleaned with spirits. A small bit of spirits on a cotton bud or a small cloth can be rubbed over the head to clean it. Your instructor will show you how.
3. Radios and cassette players work best when plugged into a power point. If you do not have electricity, you should keep a supply of fresh batteries. When the batteries get low the radio will not work well. Batteries will last three times as long playing the radio as playing a tape. If you use tapes you will need more batteries.
4. If you do not live close to a radio station, you may not receive a strong enough radio signal for the radio to work on its own. There are two things that you may do about this. One is to construct an antenna. It is easy to make the antenna. Just remember that the metal wire must be attached directly to the radio antenna AND that the antenna must be insulated from the ground. It can be insulated as shown in the attached drawing using wood, bamboo, plastic, or glass. Insulators may be purchased from many places but they can also be made very easily as shown in the drawing.

The second thing that you may do if you do not receive a good radio signal is to use tapes. These may be purchased through the Broadcast Unit (addresses are shown in the front of this booklet) for about two kina per lesson.

## Radio Science Grade Six

### Inferences

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GRADE 6

UNIT 1 PROCESS SCIENCE

LESSON 8 INFERENCE

TIME FOR THE BROADCAST: 20 MINUTES

POST-BROADCAST TIME: 10 MINUTES

#### SPECIAL THINGS IN THIS LESSON:

During this broadcast the children will be making inferences. The definition and use of inferences is very important so you need to read the Science Notes carefully.

In the post-broadcast lesson please have a container with an object in it. Pass it around the class and have children make observations. After they have made lots of observations have them make some inferences. Then open the container to show them the object.

#### THINGS THAT YOU WILL NEED:

- \* Radio Science Book for each pair of children.
- \* A pencil and an exercise book for each child.
- \* Fresh batteries for your radio.
- \* Have the children sit in pairs so that two children can share materials.
- \* Tell the children **not** to write in the Radio Science Book.

#### FINISH THE BROADCAST LESSON BY:

Revising the definition of the words observation and inference. Pass around your container with the object inside (suggestions are given below). List the observations on the chalkboard. Have them make inferences. List these. Now open the container. Did the children guess correctly? Did they make good inferences? Remember: the inference is good if it fits the observations.

Suggestions: containers: matchbox, Milo tin, Sunshine tin, small box.  
object: a coin, a shell, some rice, a piece of chalk, a biro.

## SCIENCE NOTES FOR THE TEACHER:

We all make guesses. Inferences are just special guesses. The guesses are special because we make as many observations as we can and then make a guess that fits the observations. Science people are looking for good answers to difficult questions so they make inferences. Then they test their inferences with experiments. It is sometimes difficult to tell the difference between an observation and an inference.

Observations state facts: It is green. It is hot. It is big. It is 100 years old. It is soft. It tastes sweet. It smells like a pineapple. It sounds like a kundu. It feels smooth (these are things you know).

Inferences are guesses: I think it is a mango. It might be a stone. It may be good to eat. Maybe it's a small worm (these are things that you don't know exactly).

Doctors make observations: He has mosquito bites, he has a temperature, he feels awful, he has aches in his joints.

Doctors make inferences: I think he has malaria.

Then they experiment to be sure: take a drop of his blood and look at it under a microscope. If there are malarial parasites then he has malaria, if not then they make another guess (e.g., he has the flu).

## AN ADDITIONAL LESSON ON THIS TOPIC:

Take several small containers and repeat the activity you did for the post-broadcast lesson. Children like these activities and you can do some easy ones and some hard ones. You can even trick the children like our teachers did with the tissue.

Children also like to put objects in containers for their classmates. It is like a game to make observations and inferences to guess what is in the container.

# INFERENCES

1					
	<b>Looking</b>	<b>Feeling</b>	<b>Hearing</b>	<b>Smelling</b>	<b>Testing</b>
<b>Inference</b>	small	heavy	rattles		
	oblong				

2	<b>A</b>	May be it is made of wood.
	<b>B</b>	It feels like a rubber ball.
	<b>C</b>	I think it's an orange.
	<b>D</b>	It is round like a ball.
	<b>E</b>	It may be a ball.

3

sunshine milk



A

sunshine milk



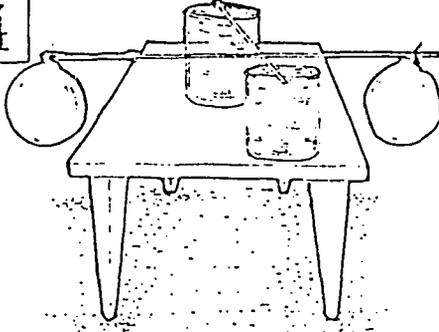
B

paper tissue

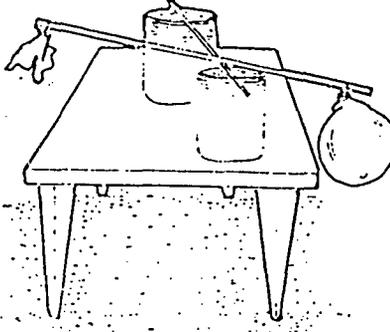


C

4



A



B

# Radio Science Grade Six

## Solutions and Mixtures

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GRADE 6

UNIT 2 CHEMICAL CHANGE

LESSON 13 SOLUTIONS AND MIXTURES

TIME FOR THE BROADCAST: 20 MINUTES

POST-BROADCAST TIME: 10 MINUTES

### SPECIAL THINGS IN THIS LESSON:

You need to make two lists of words on the chalkboard. The first one is **Soluble Substances** and the second is **Insoluble Substances**. Please write **Soluble** and **Insoluble** on the chalkboard and leave space to write the words that the children give you during the broadcast.

There are several important words that the children need to learn very well during the study of solutions. These are the vocabulary words:

Substance	Solution	Mixture
Soluble	Insoluble	Dissolve
Particles		

### THINGS THAT YOU WILL NEED:

- \* Radio Science Book for each pair of children.
- \* A pencil and an exercise book for each child.
- \* Fresh batteries for your radio.
- \* Have the children sit in pairs so that two children can share materials.
- \* Tell the children not to write in the Radio Science Book.

### FINISH THE BROADCAST LESSON BY:

Revise the vocabulary and have the children write the words in their exercise books. It is good to have the children make a small dictionary of the new words they learn. You could choose a place like the back of an exercise book or some other place and have the children add to the list during the year. Later they can revise the words and study them for tests.

Have the children add as many substances to the Soluble and Insoluble list as they can.

### SCIENCE NOTES FOR THE TEACHER:

This lesson has given a simple model of dissolving a soluble substance to make a solution. It is more complex than the description in the radio lesson, but it is also quite similar. Everything is made of small particles (the particles are called molecules but the children do not need to know this word) and there is space between them. It does not matter if the substance is a solid or a liquid or a gas, it is still made of small particles. These particles are different shapes and fit together in several ways but each has space between the particles. When we add a soluble substance to a liquid the particles begin to separate and fit between the particles of the liquid. If there is enough space all the soluble material dissolves. If there is not enough space, the soluble will fill as many spaces as there are and then the rest stops dissolving.

There are several things that control the solution. Heat is one; hot things usually dissolve more soluble substances than cold ones. How small we grind up the soluble substance will make it dissolve faster or slower. Some substances do not dissolve well in one thing (oil does not dissolve in water) but do dissolve in another (oil does dissolve in petrol).

### AN ADDITIONAL LESSON ON THIS TOPIC:

Have the children dissolve as much salt as they can in a lolly water bottle. Next have them dissolve as much sugar as they can in another lollywater bottle. To do this they will have to keep adding the sugar and salt and shaking the bottle until there is sugar or salt which does not dissolve. Have them then pour the saltwater and the sugarwater out into separate dishes.

Have them leave the dishes out in a safe place. They can observe them each day. After a few days they should notice that some of the water is disappearing. Later when all the water is gone, there should be sugar in one dish and salt in the other dish. Have them make observations which compare the sugar and the salt. Do they look the same? Do they look like the sugar and salt that they put into the water? Children can make inferences about what has happened. Why are they different? The best inference may be that when the particles come out from the spaces in the water they do not go back together the same way they were when they first went in there.

# SOLUTIONS

1

water particles

salt particles

salt particles fit in water particle spaces

A B C

2

A B C

3

List Of Objects

sugar

Coffee

Sand

Sawdust

4

Solubles	Insolubles
Sugar	Sand
Salt	Sawdust
Milo	Stones
coffee	wood

5

Mixture And Solution Song

Anything mixed together  
 May be a mixture  
 or a solution  
 Sand and water together  
 is a mixture  
 Salt dissolved in water  
 is a solution

**Appendix VIII**

**In-Service Announcement**

IN-SERVICE ANNOUNCEMENT

Minute to Headmasters and Teachers

During November of 1990 twenty teachers, one from each province, were trained to give inservice programs in interactive radio. These teachers were trained for teaching about Radio Science but are also able to help you learn about the use of any educational radio programme in your classroom.

Each inservice trainer listed below is able to show you how to set up an outside antennae, care for radios and cassette players, how to plan lessons using the radio programmes for instruction, as well as the use of Radio Science. Each of these teachers is willing and eager to share their knowledge with you. Since there is only one trained person in each province their time is limited but they could help some schools as time permits. Further, there are other trained staff members in the Curriculum Unit, the Broadcast Section and in the Inservice College. Contact Harold Ure at the address below if you should like to set up an inservice program.

During 1991 there are plans to train an additional three hundred trainers, two from each inspectorate. Additional help for inservice programmes will be available later this year. Contact your inspector if you should like to learn about using radio programmes to help you teach.

Attachment: list of trained inservice educators.