

FN-ARH-242

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Report on the Radio Science Pilot Lessons  
for Grade Four

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## Introduction

Three lessons designed for the beginning for Grade 4 were produced and pilot tested in October, 1986. These three lessons were designed and written by Friend Dialogues in August and September, and were revised (slightly) and produced in October during a visit by Jamesine Friend to the project site in Papua New Guinea. Two of the lessons, Lessons 1 and 3, are given primarily by radio, while Lesson 2 is given entirely by the teacher. Each lesson was planned to be about one-half hour in duration.

The content of the lessons was chosen by Kerrison and Friend and was intended to form part of the fourth grade series to be produced in the 1987 school year. The purpose of the lessons is primarily to introduce children to ways of working with interactive radio lessons--how to respond orally and in writing to the requests of the radio teachers. There is also some substantive content, primarily in the areas of linear measurement and language development. Also, in exercises designed primarily to teach children the response modes that will be used in future lessons, there is some content related more obviously to science, specifically visible characteristics of common animals--number of legs, body coverings.

Because production of the pilot lessons did not start until October 20, and time was pressing, the baseline testing that had been recommended could not be done. Most of the suggested baseline testing had to do with picture recognition and nominal vocabulary, and, as it turned out, would not have added greatly to our knowledge (and the efficacy of the lessons). We could have avoided difficulties with a few of the examples chosen (the stool on Exercise Page 1 and the cassowary mentioned in Lesson 1) but these did not cause substantial problems in the lessons.

It had also been suggested that preliminary work include a revision of the language used in the scripts and teachers' guides, and the examples of animals, etc. to take into account language usage in PNG, animals commonly seen in PNG, and the level of language development of the children in PNG. This was not done previously so it was one of the first tasks undertaken in October. The scripts were revised by Friend and Hill with the advice of Marion Ballard, Head of the English Group in the Curriculum Unit. Changes that were made included changes in vocabulary and examples (changing "turkey" to "cassowary", changing "horse" to "pig") and simplifying the syntax (reducing the lengths of some sentences, rephrasing "if...then" constructions, and eliminating conditional moods).

The teachers' guides prepared by Friend Dialogues were written in language that was judged to be too complex for PNG teachers so the guide was entirely rewritten by Friend and Jon Hughes, Head of the Science Curriculum Group.

The plan for the exercise pages was revised (slightly) by Friend to bring them in line with changes made in the scripts.

The pre/posttest written by Friend Dialogues was not substantially revised. Only one item was changed; "abbreviation"

was changed to "short form" in the item that required the children to write the abbreviation of the word "centimeter."

The observation forms prepared by Friend Dialogues were not revised.

An artist from the Graphics Unit was employed to work over the weekend to complete the artwork for the exercise pages and for the tests. This work was supervised by Friend, and while not completely satisfactory, was generally acceptable. (For future work, the artist will need some training in both the kinds of drawings desired and in more efficient production techniques.) Copying was done in the project offices on a photocopy machine. (For future work, where the volume of copying will be substantially greater, other methods of reproduction will need to be found.)

Printed materials (teachers' guides, instructions for giving tests) were produced by computer and copied on the project photocopier.

The production of tapes, handled entirely by Hill, of course, was done in the Media Unit's studio which is conveniently located in the same building complex. Neither the studio technician nor the actors had ever worked with this kind of production before and had considerable difficulty controlling the speed of speech, using the right intonation for instructions for children, and adjusting to the idea of timed pauses. As a result, the production took more studio time than one would expect for regular production but not as much as other initial lessons have taken. The actors used are not the ones who will be hired for permanent positions but were the best available on such short notice. There was some difficulty with the quality of the finished product because of the low quality of the recording heads which must be replaced before further lessons are recorded.

Despite the production difficulties, the quality is exceptionally high for pilot lessons. The music chosen, the overall timing, and the control over the educational quality of the lesson is excellent, as can be heard by listening to the enclosed tapes. The hum (which is heard only by people with more acute hearing than mine) will not continue once the recording heads are replaced. The director is to be complimented.

Although it had been suggested that three or four third-grade classrooms as well as a few fourth-grade classrooms be selected for the pilot testing, only two classes were chosen, one fourth and one third. The school selected, Sogeri, was later found not to be the best choice since it is in one of the more well-to-do regions of the country and to have children of generally better-than-average-educated parents.

The remainder of this report is divided into sections detailing the different aspects of the pilot study, as discussed below:

CALENDAR: A brief calendar of activities that took place during the pilot testing. These notes include task assignments and materials needed for each day in the school.

DESIGN: This section includes a list of the design parameters assumed by Friend Dialogues when preparing the lessons. There are also parenthetical notes (added later) pointing out places where the assumptions used in these lessons will not apply to future lessons.

GOALS: This a brief description of the instructional goals used in designing the lessons. The original design for these lessons also included instruction in area, preparatory to introducing the concept of discrete density (population density); since area was not taught in the three pilot lessons produced, the material on area was omitted in this report.

MASTER PLAN: This is the master plan for the lessons. The topics are shown here in detail and prerequisites are listed for each topic. This plan covers more topics than were actually taught in the first three lessons, especially in the area of language. The topics that were not taught are indicated.

BRIEF OUTLINES: In the materials originally submitted by Friend Dialogues, brief lesson outlines for nine lessons were developed. The outlines included here are for the first three lessons only.

OUTLINES: These are the detailed lesson outlines that would be used by members of the production team. Here again, only three outlines are included although six were originally submitted. The detailed outlines include notes for script writers, for artists, and for writers of teachers' guides. A rough plan of the exercise pages is also included.

SCRIPTS: This section includes the scripts for Lessons 1 and 3 (recall that Lesson 2 is given by the classroom teacher). These scripts are the version actually recorded.

EXERCISE PAGES: The two exercise pages used in the lessons are reproduced here.

GUIDES: This section contains the guide that was distributed to the participating teachers.

TRAINING: This section contains notes for teacher trainers. These notes were used by Chaytor and Kerrison in training the two teachers who participated in the pilot lessons.

OBSERVA. FORMS: This section contains copies of the special observation sheets that were prepared for the classroom observations of the three lessons. A report on the observations is found in a later section.

TIME: As part of the preparation of the pilot materials, Friend Dialogues used a recently developed computer program which estimates, from the script, the playing time of lesson segments and complete lessons. In this section, a comparison of the estimated and actual playing times of Lessons 1 and 3 is shown.

TEST: This section contains notes the test that was to be used as both pretest and posttest for the pilot lessons. The first two pages are a brief description of the test. Following is the

original sketch of the children's answer pages. Next are copies of the children's answer pages, as used in the classrooms. Following that is a copy of the test instructions given to the teachers (the classroom teachers administered the tests). Finally, there is a copy of the data form that was filled out by the teachers at the time the first test was given.

OBSERVATION SUMMARY: This section has summaries of the observations of the three lessons.

CHILDREN'S WORK: This section contains a discussion of the written work done by the children during Lesson 3.

PRE & POSTTESTS: This section contains comments on the analysis of the pretest and posttest.

CONCLUSIONS: This section contains a discussion of some of the implications of the findings.

APPENDICES: The appendices contain two analyses done of the pre/posttest data.

## Calendar for Pilot Lessons

Tues. 28 Oct: Training

Activity: Training of teachers for giving pretest, lessons, and posttest. Teachers are to fill out Pilot Lessons Data Sheet.

People: Dan & David, Teachers.

### Materials needed:

Brief Calendar for Radio Science Pilot Lessons (5 copies)  
Outline for teacher training session  
Cassette of Lesson 1 (2 copies, plus cassette recorder)  
Teachers' guides (5 copies)  
Children's exercise pages 1 and 2 (5 copies)  
Pilot Lessons Data Form (5 copies)  
Children's test pages (5 copies)  
Instructions for Giving Test (5 copies)

Wed. 29 Oct: Pretest

Activity: Pretest given in Grade Three and Grade Four classes.

People: Teachers give test.  
David helps in Grade Three.  
Dan helps in Grade Four.

### Materials needed:

Children's test papers (80 copies)  
Teachers' test instructions (4 copies)  
Pilot Lessons Data Sheets (completed forms for both grades)  
Extra sharpened pencils (1 dozen for each class)  
Pencil sharpeners (2, one for each class)  
Manila envelope to carry completed tests

Thurs. 30 Oct: Lesson 1

Activity: Teachers give Lesson 1 (radio lesson)

People: Dan and Jamey observe in Grade Three.  
Joyce observes in Grade Four.

Materials needed:

Cassette players (2)  
Batteries (4 sets)  
Cassettes for Lesson 1 (4 copies)  
Exercise Page 1 (80 copies)  
Extra teachers' guides (2 copies)  
Plain lined paper (80 sheets)  
Observation sheets for Lesson 1 (4 copies)  
Clipboards (4, to hold observation sheets)  
Manila envelope to hold materials

Fri. 31 Oct: Lesson 2

Activity: Teachers give Lesson 2 (no radio lesson)

People: Jamey and Joyce observe in Grade Three.  
David and Dan observe in Grade Four.

Materials needed:

Extra teachers' guides (2 copies)  
Pieces of string about one meter long (40 pieces)  
Observation sheets for Lesson 2 (4 copies)  
Clipboards (4, to hold observation sheets)  
Manila envelope to hold materials

Mon 3 Nov: Lesson 3

Activity: Teachers give Lesson 3 (radio lesson plus  
postbroadcast activity)

People: Joyce and David observe in Grade Three.  
Jamey and Dan observe in Grade Four.

Materials needed:

Cassette players (2)  
Batteries (4 sets)  
Cassettes for Lesson 3 (4 copies)  
Exercise Page 2 (80 copies)  
Extra teachers' guides (2 copies)  
Plain lined paper (80 sheets)  
Observation sheets for Lesson 3 (4 copies)  
Clipboards (4, to hold observation sheets)  
Manila envelope to hold materials

Tues 4 Nov: Posttest

Activity: Teachers give posttest

People: David helps in Grade Three.  
Dan helps in Grade Four.

Materials Needed:

Children's test papers (80 copies)  
Teachers' test instructions (4 copies)  
Pilot Lessons Data Sheets (completed forms for  
both grades)  
Extra sharpened pencils (1 dozen for each class)  
Pencil sharpeners (2, one for each class)  
Manila envelope to carry completed tests

Wed 5 Nov: Meeting with teachers

Activity: Discussion with teacher about their reactions to  
lessons, suggestions for improvements

People: Dan, David, Jamey, Joyce, teachers

Materials Needed:

Completed observation forms  
Extra copies of teachers' guides (4)  
Extra copies of teachers' test instructions (4)  
Notepads for notes of discussion  
Clipboards (4)  
Letters thanking teachers and head of school

Lesson Design Parameters  
Radio Science Project  
Pilot Lessons

Lessons are numbered consecutively although not all lessons are broadcast. Lessons for children will be numbered S1, S2, etc., to distinguish them from lessons for teachers.

The plan is for three half-hour lessons per week. Two of these are given by radio and one is given by the classroom teacher, using a teacher's guide prepared by the Radio Science Project. The schedule will be:

Lesson S1	Radio	Monday	30 minutes
Lesson S2	Teacher	Wednesday	30 minutes
Lesson S3	Radio	Friday	30 minutes
Lesson S4	Radio	Monday	30 minutes
Lesson S5	Teacher	Wednesday	30 minutes
Lesson S6	Radio	Friday	30 minutes

and so on.

(In the final version there will be only two half-hour lessons per week rather than three; each lesson will contain 20 minutes of radio and 10 minutes of teacher led activities.)

The instructional package to be delivered to the schools will contain:

- Cassette player
- Taped lessons (on cassette)
- Exercise pages, one per child
- Paper (lined paper, graph paper), one per child
- Teachers' guide
- Equipment and extra supplies as needed.

(Note: The above instructional package will be for the first step of the two step formative evaluation cycle. In the second step the lessons will be broadcast on the radio so the package will include a radio receiver instead of a cassette player and taped lessons on cassettes will not be included. The rest of the materials in the package will remain the same.)

To control recurrent costs, at most one exercise page per lesson is used; these will be reusable, not disposable, pages. Additional supplies and science equipment will be minimal, with most materials gathered locally.

The exercise pages will be numbered consecutively regardless of the lesson number. The intent is to prepare exercise pages that can later be distributed in bound form.

The exercise pages will be printed on 8.5"x11" paper using two columns. Each exercise will be enclosed in a box. Exercise identifiers will be numbers in boxes to the left of each exercise. Exercises may contain subexercise that will be labeled with capital letters. In exercises, parts of drawings may also be labeled with

capital letters. Each exercise page will have the heading "Page X" centered at the top of the page. At a later time, it will be decided whether to print the page number on the left on even-numbered pages and on the right on odd-numbered pages (this might best be done just before the pages are to be bound).

## Conventions Used in Scripts

The broadcast lessons will fit into a 30-minute slot. The instructional part of the lessons will be 27 minutes long, including intro and conclusion, leaving three minutes to fill with music at the end. These three minutes allow for a radio receiver to be carried from one classroom to another. By sharing radios, recurrent costs can be kept down.

(In the final version, the radio lessons will be 20 minutes long with 17 minutes of instruction.)

The sequence of exercises within a broadcast lesson will follow these rules:

The first teaching segment will be oral exercises in which each exercise is independent of preceding ones (so children can start anywhere if teachers tune in late).

Work with the exercise page will not be interrupted with other types of activities, except for a possible entertainment break between columns.

Entertainment breaks, such as songs and physical exercises, will be put in the last half of the lesson, usually after work with the exercise page.

There will be a standard intro that includes the name of sponsoring agency, the name of the series, and the lesson number. Dates will not be included since the lessons might be broadcast at different dates in different years.

There will be no extensive conclusion in the pilot lessons. At a later time, it will be decided whether or not to include an announcement of special materials that will be needed in the next lesson.

To ease work in the recording studio, only two voices plus an announcer will be used. (In the final version, more voices will be used.)

In the scripts, no mention of the day of the week or the (real) time of day will be made since lessons might be broadcast on different days or at different times in the future.

The first time in each lesson that the exercise page is used, the pause for finding the page will be sufficient so that children could find the page in a bound book. All references to the exercise pages should be phrased so as to be equally appropriate for loose sheets and for bound books.

In the pilot lessons, a large number of different exercise types will be used in a very few lessons; this will give us an opportunity to find out how well the children follow instructions and which of these exercise types are workable. In a couple places, response formats will be introduced but not used in following lessons. The purpose is to test how well the children learn the formats. In future lessons, new exercise types should be introduced only as needed.

## Conventions Used in Teachers' Guides

The teachers' guide will consist of an introduction plus one or two pages for each science lesson. For the lessons to be taught by radio, only one page will be used. For the teacher-led lessons there will be two pages. The pages will be arranged so that when the books are printed double-sided the two pages for the teacher-led lessons will be on facing pages (Lessons S2, S5, S8, etc.).

Two different formats will be used, depending upon whether the lesson is led by the radio or by the classroom teacher. These formats are as follows:

<u>Radio Lesson</u>	<u>Teacher-led Lesson</u>
Grade	Grade
Lesson number	Lesson number
Materials needed	Materials needed
Goals of lesson	Goals of lesson
	Reduced copy of students' exercise page, if used
Before the broadcast	List of activities to conduct
During the broadcast	Optional activities
After the broadcast	Identifier
Identifier	

(In the final version, only the "Radio Lesson" format will be used since there will be no independent teacher-led lessons.)

In the teachers' guides, the terms "cassettes" and "taped lessons" will be used. For the next version of these lesson, these references should be changed to refer to "radio" and "radio lessons."

J. Friend  
November 1986

Instructional Goals for  
Radio Science Project Pilot Lessons

The pilot lessons for the Radio Science Project are intended to form the first part of a series for fourth grade. The content was chosen to be appropriate for this grade level and to be an essential part of a science course.

The Radio Science pilot lessons will contain three major topics:

- (1) response modes and use of supplementary materials
- (2) science-related vocabulary,
- (3) linear measure

The response modes to be taught include oral responses, written responses, and some work with folded and cut paper as a supplementary material. Table 1 contains a list of the response modes to be taught.

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Table 1  
Response Modes and Materials

Oral

Answer orally, yes/no questions  
Answer orally, multiple-choice questions  
Answer orally, constructed responses

Paper only

Write letters or numbers on paper in response to oral instructions  
Fold paper  
Fold and tear paper

Exercise sheets

Read aloud from exercise sheet  
Answer aloud, multiple-choice exercises on exercise sheets  
Copy letters or numbers from exercise sheet  
Trace drawings or figures from exercise sheet

Other

Raise hand (to answer questions)  
Work in pairs.  
Do physical exercises (bending, stretching, etc.)

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In science-related vocabulary, the words to be taught include:

- (1) words related to ordering (in space, not time),
- (2) comparisons (partly preparatory to linear measurement activities), and
- (3) logical quantifiers and modifiers.

The words and phrases to be taught are listed in Table 2. Some of these words will be familiar to the students but they may not have been taught to use the words as precisely as will be required in science classes. Most of the words will be taught almost incidentally, with the meaning made clear from context. Others will be taught by association with similar, presumably known, words. Much of this instruction will be done using the pretext of teaching response modes or in the context of measurement activities.

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Table 2  
Words to be Taught in Pilot Lessons

Ordering

first, second, third, fourth  
next, last  
before, after

Comparisons

same, different, alike, like, similar  
other, others  
size, shape, length, height, width  
big, bigger, biggest  
little, littler, littlest  
large, larger, largest  
small, smaller, smallest  
long, longer, longest  
short, shorter, shortest  
tall, taller, tallest  
wide, wider, widest

Logical quantifiers and modifiers

all, none, some, part, half, most, none, many, several, more  
nearly all, almost all  
any, both, each, few, a few  
only, just (one, two,...)  
no, not  
nearly, almost, not quite, a bit more, how (big, little)  
with, without  
but, but not

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In linear measure, it is assumed that the students have some knowledge of linear measure, that they know (more or less) how to use a ruler, and that they have worked with centimeters as a unit of measure. These topics will be reviewed briefly in the context of explaining the difference between direct comparison and measurement, of teaching how to construct a ruler from paper, and of doing various activities in estimating lengths in centimeters. It will be assumed that the students may have difficulty in measuring with a ruler from a non-zero point on the ruler, that they may not have a good idea of how long a centimeter is, and that they have a tendency not to report units when describing the results of a measurement. A list of behavioral objectives for linear measure is given in Table 3.

Table 3  
Behavioral Objectives  
for Linear Measure

Determine which of a pair of objects is longer (wider, taller) by direct comparison.

Decide when direct comparison can be easily used; examples are to be like the following:

- one child's height compared to another
- a blanket compared to a bed
- a belt compared to a person's waist
- a belt in a store compared to a person who isn't present
- a child's height this year compared with last year

Use indirect comparison for comparing the length (width, height) of pairs of objects like:

- desk and doorway
- one desk and another
- one child's mother with another.

"Measure" pictures of objects (pencils, nails, needles) where a picture of a ruler is printed alongside a picture of the object to be measured.

"Measure" pictures of objects (pencils, nails, needles) where a picture of a ruler is printed alongside a picture of the object to be measured but neither end of object is lined up with zero-point of ruler.

Make a ruler by folding a piece of paper and marking 10 places at one centimeter spacing, using a ruler printed on an exercise sheet.

Measure pictures of relative thin objects (pencils, nails, needles) whose length is exactly 1 cm, 2 cm, ..., 10 cm.

Measure diameters and widths of pictured objects (buttons, leaves, stones) where the required measurement is exactly 1 cm, 2 cm, ..., 10 cm.

Measure pictures to closest centimeter; actual length to be within 3 mm of nearest centimeter. Vocabulary includes "nearly", "almost", "not quite", "a bit more", "a little less", "exactly."

Measure pictures to closest centimeter. Vocabulary includes "between", "closer to \_\_\_ centimeters than to \_\_ centimeters."

Measure to closest centimeter actual objects like pencils, fingers, fingernails, keys, nails, hair.

Select the correct comparative when given examples (with picture showing object and ruler) like this:

- The pencil is (nearly, a little more than) 15 cm long.
- The book is (more than, less than) 18 cm wide.
- The boy's thumb is (almost, not nearly) 8 cm long.

Estimate the lengths in centimeters of objects like pencils, fingers, chalk. Confirm by measuring with a ruler.

Measure length and width of printed figures and drawings (square, rectangle, comb, leaf).

Measure the circumferences of cylindrical objects (cans, jars, wrist, ankle) by wrapping paper rulers around them.

Estimate the circumferences of cylindrical objects. Confirm by measuring with a ruler.

Measure objects between 10 and 100 centimeters using a 10-cm ruler.

Construct a one-meter "tape measure" from string.

Tell how many centimeters there are in a meter.

Measure to the closest meter things like classroom windows, doors, floors, playgrounds.

Lay out the course for a 10-meter dash.

Choose the correct unit (of centimeter and meter) for examples like the following:

The child is about one (meter, centimeter) tall.

The child's finger is around 6 (meters, centimeters) long.

Read and write the words centimeter and meter and the abbreviations cm and m.

J. Friend  
November 1986

## Master Plan for Radio Science Pilot Lessons

<u>Response Modes and Use of Supplementary Materials</u>	<u>Prerequisites</u>
MISC 1 R; Oral Responses	
MISC 1.1 R; Answer orally, yes/no questions	None
MISC 1.2 R; Answer orally, multiple-choice questions	MISC 1.1
MISC 1.3 R; Answer orally, constructed responses	MISC 1.2
MISC 2 R; Written Responses, No Exercise Page	
MISC 2.1 R; Write letters or numbers on paper in response to oral instructions	MISC 1.3
MISC 3 R; Physical actions	
MISC 3.1 R; Stretching, bending, raising arms	None
MISC 3.2 R; Raising hand to answer questions	MISC 3.1
* MISC 3.3 R; Work with physical materials	MISC 3.1
* MISC 3.4 R; Physical exercises, standing	MISC 3.1
MISC 4 R; Paper Folding	
MISC 4.1 R; Fold paper	None
* MISC 4.2 R; Fold and tear paper	MISC 4.1
MISC 5 R; Oral Response, With Exercise Page	
* MISC 5.1 R; Read aloud from exercise page	MISC 1.3
MISC 5.2 R; Answer aloud, multiple-choice exercises on exercise page	MISC 1.2
MISC 6 R; Copying from Exercise Page	
MISC 6.1 R; Copy letters or numbers from exercise page	MISC 2.1, MISC 5.1

\* Not included in Lessons 1-3

Vocabulary and Language Usage

Prerequisites

LANG 1 R; Ordinal Vocabulary

LANG 1.1 R; <u>first, next, last</u>	None
LANG 1.2 R; <u>second, third, fourth</u>	LANG 1.1
LANG 1.3 R; <u>before, after</u>	None

LANG 2 R; Comparative Sizes

* LANG 2.1 R; <u>size</u>	None
* LANG 2.2 R; <u>big, bigger, biggest</u>	None
LANG 2.3 R; <u>how (big, little,...)</u>	None
* LANG 2.4 R; <u>little, littler, littlest</u>	None
* LANG 2.5 R; <u>large, larger, largest</u>	None
* LANG 2.6 R; <u>small, smaller, smallest</u>	None
LANG 2.7 R; <u>long, longer, longest</u>	None
LANG 2.8 R; <u>length</u>	LANG 2.7
* LANG 2.9 R; <u>short, shorter, shortest</u> (opposite of long)	None
LANG 2.10 R; <u>tall, taller, tallest</u>	None
* LANG 2.11 R; <u>height</u>	LANG 2.8
* LANG 2.12 R; <u>short, shorter, shortest</u> (opposite of tall)	None
* LANG 2.13 R; <u>wide, wider, widest</u>	None
* LANG 2.14 R; <u>width</u>	LANG 2.13
* LANG 2.15 R; <u>long (tall, wide, big) enough</u>	None

LANG 3 R; Similarities

* LANG 3.1 R; <u>same, different, alike, like</u>	None
* LANG 3.2 R; <u>other, others</u>	None
* LANG 3.3 R; <u>similar</u>	LANG 3.1
* LANG 3.4 R; <u>shape</u>	None
* LANG 3.5 R; <u>with, without</u>	None

LANG 4 R; Logical quantifiers

* LANG 4.1 R; <u>all, none, some</u>	None
* LANG 4.2 R; <u>part, half, most</u>	LANG 4.1
* LANG 4.3 R; <u>many, several</u>	None
* LANG 4.4 R; <u>any, both, each, few, a few</u>	None
LANG 4.5 R; <u>more, less</u>	None

\* Not included in Lessons 1-3

Linear Measurement

Prerequisites

- LENGTH 1 R&T; Direct and indirect comparison
- LENGTH 1.1 R; Determine which of a pair of objects is longer (wider, taller) by direct comparison. MISC 5.2
- LENGTH 1.2 R; Decide when direct comparison can be easily used R; examples are to be like the following: LENGTH 1.1
- one child's height compared to another
  - a blanket compared to a bed
  - a belt compared to a person's waist
  - a belt in a store compared to a person who isn't present
  - a child's height this year compared with last year
- LENGTH 1.3 R&T; Use indirect comparison for comparing the length (width, height) of pairs of objects like: LENGTH 1.2
- desk and doorway
  - one desk and another
  - one child's mother with another.
- LENGTH 2 R&T; Measuring with ruler, in centimeters
- LENGTH 2.1 R; "Measure" pictures of objects (pencils, nails, needles) where a picture of a ruler is printed alongside a picture of the object to be measured. LENGTH 1.1
- LENGTH 2.2 R; "Measure" pictures of objects (pencils, nails, needles) where a picture of a ruler is printed alongside a picture of the object to be measured but neither end of object is lined up with zero-point of ruler. LENGTH 2.1
- LENGTH 2.3 R; Make a ruler by folding a piece of paper and marking 10 places at one centimeter spacing, using a ruler printed on an exercise page. LENGTH 2.1

J. Friend  
November 1986

Radio Science Pilot Lessons 1 to 3  
Brief List of Content  
(By lesson, unordered)

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Week 1  
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Lesson 1 Radio  
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- MISC 1.1 Answer orally, yes/no questions.  
MISC 1.2 Answer orally, multiple-choice questions.  
MISC 1.3 Answer orally, constructed responses.  
MISC 3.1 Stretching, bending, raising arms.  
MISC 3.2 Raising hand to answer questions.  
MISC 5.2 Answer aloud, multiple-choice exercises on exercise sheets.  
LANG 1.1 first, next, last  
LANG 1.2 second, third, fourth  
LANG 2.7 long, longer, longest  
LANG 2.10 tall, taller, tallest  
LENGTH 1.1 Determine which of a pair of objects is longer  
(taller) by direct comparison.  
LENGTH 1.2 Decide when direct comparison can be easily used.

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Lesson 2 Teacher  
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- LENGTH 1.3 Use indirect comparison for comparing the length (width,  
height) of pairs of objects like:  
desk and doorway  
one desk and another  
one child's mother with another.

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Lesson 3 Radio  
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- MISC 2.1 Write letters or numbers on paper in response to oral  
instructions  
MISC 4.1 Fold paper  
MISC 6.1 Copy letters or numbers from exercise sheet  
LANG 1.3 before, after  
LANG 2.3 how (big, little,...)  
LANG 2.8 length  
LANG 4.5 more, less  
LENGTH 2.1 "Measure" pictures of objects (pencils, nails, needles)  
where a picture of a ruler is printed alongside a  
picture of the object to be measured.  
LENGTH 2.2 "Measure" pictures of objects (pencils, nails, needles)  
where a picture of a ruler is printed alongside a  
picture of the object to be measured but neither end of  
object is lined up with zero-point of ruler.  
LENGTH 2.3 Make a ruler by folding a piece of paper and marking  
10 places at one centimeter spacing, using a ruler  
printed on an exercise sheet.

J. Friend  
November 1986

OUTLINE

Grade 4 Science, Lesson S1, Version 1

Radio

Materials needed: Exercise Page 1

Outline prepared 8/25/86 by J. Friend

Time: 27:00

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Segment 1            Oral response            No materials            Time: 1:30  
-----

INTRO

After the standard intro (lesson number, grade, credits, etc.), the radio teachers should introduce themselves, and then tell the children that this is the first science lesson for fourth grade. Mention some of the things they will be learning in the next few weeks but don't try to be exhaustive. Tell the children that we will start today with some questions that they are to answer aloud. They will not need their exercise page or their pencils right away so they should put aside pencils, books, and papers now and not touch them again until they are told to.

-----  
Segment 2            Oral response            No materials            Time: 3:30  
-----

MISC 1.1 Answer orally, yes/no questions.

Use questions like:

- Have you ever seen a chicken?
- Does a chicken have feathers?
- Have you ever seen a pig?
- Does a pig have feathers?

The purpose is to encourage the children to respond orally. Ask easy questions so that everyone is sure to know the answer. Be sure to intersperse questions that can be answered "no" with questions that can be answered "yes," so the children have to listen carefully to the questions.

-----  
Segment 3            Oral response            No materials            Time: 1:30  
-----

MISC 1.2 Answer orally, multiple-choice questions.

Use questions like:

- Which has feathers, a pig or a chicken?
- Which has four legs, a pig or a chicken?

The purpose is to introduce a slightly more complex oral response mode than the yes/no questions above. Ask easy questions so that all the children can participate.

-----  
Segment 4            Oral response            No materials            Time: 1:00  
-----

MISC 1.3 Answer orally, constructed responses.

Use questions like:

- Think of how many legs animals have. Think of a pig's legs... How many legs does a pig have?
- How many legs does a chicken have?
- How many legs does a dog have?
- How many legs does a man have?

The purpose is to introduce a more complex oral response mode than the multiple-choice questions above. In these exercises the children have to think a little so it is best to give them some warning of what they are supposed to think about ("Think of how many legs animals have").

---

Segment 5            Physical response            No materials            Time: 3:00

MISC 3.1 Stretching, bending, raising arms.

The purpose is to allow the children a chance to do something physical as a break from mental work, and to teach them to follow direction for simple physical tasks. Each move (stretch, bend to the side, etc.) should be introduced slowly with plenty of time to respond so that the children who don't understand what to do can learn by observing their neighbors or the teacher. After the children have learned what is expected, the pace should be increased and the actions performed several times to accompanying music.

---

Segment 6            Physical response            No materials            Time: 2:00

MISC 3.2 Raising hand to answer questions.

Use questions like:

Everyone, look at your clothes to see what color they are. See if you are wearing something red. If you are wearing red, raise your hand... If you're not wearing red, don't raise your hand. I want just the people wearing red to raise their hand... All right, put your hands down. Now: if you are wearing something brown, raise your hand...

The purpose is to introduce a non-oral response mode. The questions should be such that it is correct either to raise your hand or not depending on circumstances. A problem that might occur is that children might raise their hands for every question. Allow plenty of time with the first few exercises so the teacher has time to correct students who are raising their hands when they shouldn't.

---

Segment 7            Oral response            Exercises 1-5            Time: 4:30

MISC 5.2 Answer aloud, multiple-choice exercises on exercise sheets.

LANG 1.1 first, next, last

This segment has two purposes, to teach a new response mode, using the exercise sheets, and to review and practice the words first, next, and last.

In each exercise there is a row of objects that can be discussed using the words "first", "next", and "last". The children can be asked to identify each object, starting from the left and moving to the right.

---

Segment 8            Oral response    Exercises 6-10            Time: 3:30

LANG 1.2 second, third, fourth

The purpose is to practice the words "first", "second", "third", and "fourth." Each exercise shows pictures of four well-known objects. The children should be asked to find the first, second, third, or fourth object in the row and tell what it is. You can ask several questions for each printed exercise but be sure to mix up the order of "first", "second", "third", and "fourth."

---

Segment 9            Oral response    Exercises 11-15            Time: 2:30

LANG 2.7 long, longer, longest  
LANG 2.10 tall, taller, tallest  
LENGTH 1.1 Determine which of a pair of objects is longer  
(taller) by direct comparison.

This segment has several purposes. One is to make direct comparisons to determine length and height of object, and the others are to practice the words "long", "longer", "tall", and "taller."

Introduce the segment by explaining that the next few lessons will be teaching something about measurement. Ask the children if they know how to measure with a ruler. Explain that sometimes one doesn't need to measure things. If all we want to do is find out which thing is longer, we can just put them side by side to see which is longer.

Ask questions like:

Which is taller, the man or the woman?

Which is longer, the first snake or the second?

(The latter question is more difficult than the former.)

---

Segment 10            Oral response            No materials            Time: 4:00

LENGTH 1.2 Decide when direct comparison can be easily used.

This is a discussion of when direct comparison of heights, lengths, etc. is feasible. Explain that sometimes we have to measure things with a ruler but sometimes we can tell which is longer or shorter without measuring. Examples are to be like the following:

one child's height compared to another  
a blanket compared to a bed  
a belt compared to a person's waist  
a belt in a store compared to a person who  
isn't present  
a child's height this year compared with  
last year

Use situations like these:

Suppose you want to find out if my belt is big enough for you. Do you need to use a ruler to measure?... No, you can just try it on.

Mrs. Jones has a piece of cloth she would like to use to make a tablecloth. She would like to find out if the cloth is big enough to cover the table. Does she need to measure the cloth?

Mrs. Jones is going to the store to buy a piece of cloth to make a tablecloth. She wants to buy something that is large enough to cover her table. Should she measure the table before she goes to the store?

These problems can be embedded in mini-dramas if desired. For instance, the two radio teachers could have a discussion about whether one's belt would fit the other.

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Exercise Page 1

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1. [ row of animals: chicken, cat, pig ]
2. [ row of furniture: table, chair, bed ]
3. [ row of tools: shovel, hammer, rake ]
4. [ row of people: man, woman, small child ]
5. [ row of animals: bird, dog, cat ]
6. [ row of clothing: shirt, shoe, sock, hat ]
7. [ row of vehicles: car, truck, bus, airplane ]
8. [ row of dishes: plate, cup, spoon, fork ]
9. [ row of kitchen utensils: pan, bucket, spoon, knife ]
10. [ row of wearing accoutrements: bracelet, necklace, belt, purse ]
11. [ a tall man, a shorter woman ]
12. [ a rake, a shorter shovel ]
13. [ a spoon, a longer fork ]
14. [ a comb, a longer comb ]
15. [ a snake, a shorter snake ]

---

Notes for artist: Be sure that all drawings are of common objects, that is, draw the kind of rake that would be commonly used in the country, the kind of dog that is commonly seen, etc.

## Notes for Teachers' Guide

Materials needed: Exercise Page 1

Before the radio broadcast, have the teachers explain to the children a little about the radio lessons. The teachers should make sure the children have Exercise Page 1 at hand to use when the radio teacher asks for it.

Tell the teachers about acting as a role model for the first part of the lesson in order to get the children to participate. The teachers should use non-verbal clues to indicate to the children that they are to listen, to answer aloud, to do the physical exercises, etc.

Tell the teachers to help the children find the right page and the right place on the page when the radio is using the printed exercises.

Tell the teachers not to interrupt the radio to explain words to the children.

If the teacher has time, there can be a few minutes postbroadcast discussion of the lesson.

## OUTLINE

Grade 4 Science, Lesson S2, Version 1

Teacher

Materials needed: Each pair of children will need a piece of string or twine at least one meter long.

Outline prepared 9/2/86 by J. Friend

Time: 27:00

-----  
-----  
Segment 1            Oral response            String

LENGTH 1.3    Use indirect comparison for comparing the length  
                  (width, height) of pairs of objects like:  
                          desk and doorway  
                          one desk and another  
                          one child's mother with another.

-----  

### Notes for Teachers' Guide

Materials needed: Each pair of children will need a piece of string or twine at least one meter long.

Explanation for teachers: Explain to the teachers that the object of the lesson is to find out when two things are the same length (width, height) or to find out which is longer (wider, higher) without measuring. The kind of questions to be asked are:

- Are these two things the same length?
- Is one of these things shorter than the other?
- Is this thing small enough to fit inside that thing?

Sometimes we have to use a ruler to measure things to find out the answers to such questions. But other times we can find the answers without measuring.

There are two methods of "measuring" without a ruler:

- (1) If the two things to be compared can be easily moved, they should just be held side-by-side to see if they are the same length or if one is longer.
- (2) Sometimes two things cannot easily be held side-by-side because they are too heavy to move, or because they are attached to the wall, or because they are not in the same room. Then we can use our hand or our arm or a string to "measure" each one to see which is longer.

Activities for children: Let the children work in pairs for these activities.

Find out which desk is wider by using your arm to measure them.

Find out which desk is wider by "measuring" with a piece of string.

Find out which of two chairs is higher by finding out how far up on your leg each chair comes. Try the same thing with a piece of string.

After a few such activities, the teacher should propose problems without suggesting how the "measurement" could be made. The children should be encouraged to discuss ways in which they can find out the answers. They should see that there may be several different ways that will work for each problem. Problems that can be used are:

Can we move this desk through the doorway (without tipping the desk on its side)?

Is the third-grade doorway wider than the fourth-grade doorway?

Are the third-grade desks higher than the first-grade desks?

There should also be some discussion of problems where the measurement cannot actually be carried out, for instance:

How could you compare the height of your mother (or father) and your teacher?

How could you compare your height this year with your height next year to see how much you've grown?

Suppose we wanted to buy a board long enough to make a bench for four children. How would we know what board to buy?

OUTLINE

Grade 4 Science, Lesson S3, Version 1.

Radio

Materials needed: Exercise Page 2

1 piece of ruled (lined) paper for each child

Outline prepared 9/2/86 by J. Friend

Time: 27:00

-----  
Segment 1

Oral response

No materials

Time: 1:30

INTRO

After the standard intro, remind the children of the names of the radio teachers. Remind the children that they are to answer aloud when asked questions. The term "exercise page" should be reviewed so that the children know that the page that has printed pictures is called an "exercise page." The children should be cautioned not to write on their exercise page; they should never write on the exercise page or fold it or damage it in any other way because other children will use the same exercise page later. The blank paper is for writing; the exercise page is just for looking.

Tell the children to put their exercise sheet aside now. The lesson today will start with the sheet of blank paper so they will need the blank paper and a pencil.

-----  
Segment 2

Written response

Paper

Time: 4:30

LANG 4.5 more, less

MISC 2.1 Write letters or numbers on paper in response to oral instructions

This is the first time the children have used blank paper to write on. They should be instructed to start at the top and write one answer per line.

The questions used should be as follows:

Today we are going to think about how many legs different animals have. Think about a goat's legs. How many legs does a goat have? ... Four. A goat has four legs. How many legs does a chicken have?... Two. So a goat has four legs and a chicken has two legs. Tell me, which is more, four or two?... Four. So four is the answer. Now, you will write four on your paper. Take your pencil and paper. Find the top line on your paper... Write the number four.

At the end of the segment, the children should put their paper and pencils aside for now.

Segment 3            Oral response            Exercises 1-5            Time: 3:30

LANG 1.3 before, after

To be sure that all children are using the same words to identify the pictured objects, begin each exercise with simple identification of the objects:

The first animal is a cat. Point to the cat... The next animal is a dog... Point to the dog... Now point to the goat...

Mix before and after questions:

What comes after the truck?  
What comes before the truck?

Several questions should be asked about each printed exercise.

---

Segment 4            Written response            Exercises 6-10, Paper            Time: 3:30

LANG 4.5 more, less

MISC 6.1 Copy letters or numbers from exercise sheet

In this segment, the children will use both the exercise page and their own piece of paper.

Use instructions like this:

Look at exercise six on your exercise page. For this exercise, you are going to write the answer on your paper. Get out your paper and pencil... Find an empty line on your paper and write the number six... Now look at the exercise page again, at exercise six. There are two animals shown here. Look at how many legs they have. Decide which animal has more legs... Find the letter under the animal with more legs and write that letter on your exercise page.

---

Segment 5            Physical exercise            No materials            Time: 3:00

MISC 3.1 Stretching, bending, raising arms.

This activity should be similar to Lesson 1, Segment 6. The movements introduced there should be re-explained briefly. One or two new movements can be added--twisting torso or touching chin to shoulder, for instance.

---

Segment 6 Oral response Exercises 11-15 Time: 3:30

LANG 2.3 how (big, little,...)

LANG 2.8 length

LENGTH 2.1 "Measure" pictures of objects (pencils, nails, needles) where a picture of a ruler is printed alongside a picture of the object to be measured.

When the first printed exercise is mentioned, be sure to direct the children's attention to the second column of the exercise page; this is the first time they have worked with a page that is printed in two columns.

For each exercise, ask the children how long each measured object is. Stress that these are measured in centimeters. Be sure the children can pronounce centimeter and insist that they say centimeter when giving their answers.

-----  
Segment 7 Oral response Exercises 16-19 Time: 3:00

LENGTH 2.2 "Measure" pictures of objects (pencils, nails, needles) where a picture of a ruler is printed alongside a picture of the object to be measured but neither end of object is lined up with zero-point of ruler.

Introduce the first exercise with a story-like situation in which a child is measuring something and gets an answer that is different from everyone else's. Ask if anyone can see what the child is doing wrong. Then ask the children if they can figure out what the real length of the object is.

Again, enforce the use of the word centimeter.

-----  
Segment 8 Physical response Exercise 20, Paper Time: 4:30

MISC 4.1 Fold paper

LENGTH 2.3 Make a ruler by folding a piece of paper and marking 10 places at one centimeter spacing, using a ruler printed on an exercise sheet.

Explain to the children that they are going to learn to make their own ruler. Even if they already have a ruler, they should learn to make a paper ruler.

Ask the children to fold their paper into four lengthwise parts, as shown in the illustration on the exercise page. Give step-by-step instructions and go slowly for this is a difficult task.

After they have folded the paper, they should make marks one centimeter apart, copying from the ruler printed on the exercise sheet.

Exercise Page 2

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1. [ row of cat, dog, goat ]
  2. [ row of car, truck, bicycle ]
  3. [ row of rake, hoe, shovel ]
  4. [ row of pencil, book, ruler ]
  5. [ row of shoe, sock, hat ]
  6. [ cat and chicken, labeled A and B ]
  7. [ spider and fly, labeled A and B ]
  8. [ beetle and centipede, labeled A and B ]
  9. [ worm and cricket, labeled A and B ]
  10. [ mouse and snail, labeled A and B ]
  11. [ ruler alongside an 8 cm pencil ]
  12. [ ruler alongside a 5 cm nail ]
  13. [ ruler alongside a 4 cm hairpin ]
  14. [ ruler alongside a 5 cm needle ]
  15. [ ruler alongside a 4 cm key ]
  16. [ ruler alongside a 3 cm nail; nail lays from 1 to 4 mark ]
  17. [ ruler alongside a 3 cm nail; nail lays between -1 and 2 ]
  18. [ ruler alongside an 8 cm pencil; pencil lays between .5 and 8.5 ]
  19. [ ruler alongside a 5 cm needle; needle lays between 2 and 7 ]
  20. [ Illustration of how to fold paper and mark it to make a paper ruler ]
- 

Notes for artist:

In Exercises 1 and 2, the animals and vehicles should be facing towards the left, as if in a parade.

In Exercise 7, show clearly that the fly has 6 legs and spider 8. In Exercise 8, you don't have to show all the legs but make it obvious that the centipede has more legs than the beetle.

The rulers shown in Exercises 11 to 19 should be a full size 10 cm ruler without subdivisions into mm. The objects shown should also measure exactly 3 (or 4 or 5 or whatever) cm.

In Exercises 16 to 19, the ruler and the object to be measured should be misaligned. In exercise 16, the head of the nail is at the 1 cm and the point is at the 4 cm mark on the ruler. In exercise 17, the head of the nail extends 1 cm beyond the ruler and reaches to the 2 cm mark (the nail is actually 3 cm). Etc.

In Exercise 20, there should be two or three pictures showing how to fold a piece of paper twice to make a paper ruler. The two folds should be parallel (not crossing) so that after an 8"x11" paper is folded it is 2"x11".

## Notes for Teachers' Guide

Materials needed: Exercise Page 2

1 piece of ruled (lined) paper for each child

The ruled paper for each child must be a single sheet (not part of a copybook) since the children will use this paper both for writing answers and later for folding to make a paper ruler.

The children will also need a pencil. Pencils will not be listed as materials; it will be assumed that children always have pencils available.

When the teachers hand out the exercise pages, they should tell the children again that they are not to mark up these papers. Then they should hand out the plain (lined) paper and explain to the children that when they are supposed to write something they will write on the plain paper, not on the exercise page.

When the children are to fold paper and mark it to make a ruler, they should use the plain paper.

While the children are making paper rulers the teacher should help children who are having difficulty. Some children will not finish during the broadcast. The teacher should help these children to finish after the broadcast.

The children should save the paper rulers they have made; they will need them in the next few lessons.

Radio Science

Grade Four

Pilot Lesson Number: S1

Version Number: 3

Date written: 21 Oct. 86

Written by: J. Friend

Materials needed: Exercise Page 1

### Lesson Outline

Segment	Topic
1	INTRO
2	MISC 1.1 Answer orally, yes/no questions.
3	MISC 1.2 Answer orally, multiple-choice questions.
4	MISC 1.3 Answer orally, constructed responses.
5	MISC 3.1 Stretching, bending, raising arms.
6	MISC 3.2 Raising hand to answer questions.
7	MISC 5.2 Answer aloud, multiple-choice exercises on exercise sheets.
	LANG 1.1 first, next, last
8	LANG 1.2 second, third, fourth
9	LANG 2.7 long, longer, longest
	LANG 2.10 tall, taller, tallest
	LENGTH 1.1 Determine which of a pair of objects is longer (taller) by direct comparison.
10	LENGTH 1.2 Decide when direct comparison can be easily used.

Master tape number: 1

Date recorded: 27 October, 1986

Playing time: 23:17

Characters: Announcer  
Mr. Raka, teacher  
Miss Vagi, teacher

Music: Theme song  
Theme music  
Transition to exercise page  
Transition to end exercise page  
Transition to oral exercises  
Transition to physical exercises  
March music (for physical exercises)

Sound effects: None

2/5

[ Segment 1      INTRO

]

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1.                                    THEME SONG (:45)  
   FADE UNDER
  
2.    ANNOUNCER:    The Department of Education brings you  
   Lesson One of Radio Science for Grade Four.
  
3.                                    THEME MUSIC UP (:05) AND OUT
  
4.    MR. RAKA:        Hello, children. Welcome to the first  
   lesson of Radio Science for Grade Four.  
   I am Mr. Raka and I will be one of  
   your science teachers. And here with  
   me is Miss Vagi, who is also a science  
   teacher.
  
5.    MISS VAGI:        Hello, Mr. Raka, and hello to all of you  
   children who are listening. Today will be  
   your first lesson in Radio Science for  
   Grade Four. In these lessons you will  
   learn many new and interesting things  
   about science.
  
6.    MR. RAKA:        For example, you will learn new ways of  
   measuring. Measuring is important in  
   science....

1. MISS VAGI: Measuring is important for everyone,  
isn't it, Mr. Raka?
2. MR. RAKA: You're right, Miss Vagi, measuring is  
important for everyone. I'm glad I  
can measure. I measure to find out  
how tall I am.
3. MISS VAGI: So tell me, how tall are you?
4. MR. RAKA: One hundred ninety centimetres.
5. MISS VAGI: (Astonished) You are tall, aren't you?  
I'm only one hundred sixty centimetres.
6. MR. RAKA: I wonder how many of the children  
know how tall they are.
7. MISS VAGI: Well, if they don't know now, they will  
find out in just a few lessons.
8. MR. RAKA: So, let's get started with today's  
lesson!

1. MISS VAGI: Before we start, I want to talk to the children a minute. (speaking directly to students) Children, we are going to ask some questions for you to answer. You will not need your books or papers or pencils right now, so put everything aside now and listen. Everyone, put your things to one side now.



1. MISS VAGI: That was better. More of you answered that time. Remember, when Mr. Raka asks you a question, all of you answer.

2. MR. RAKA: Here's another: Have you ever seen a chicken?

3. PPR (:03)

4. MR. RAKA: Do chickens have feathers?

5. PPR (:02)

6. MR. RAKA: Yes, chickens have feathers. Do dogs have feathers?

7. PPR (:02)

8. MR. PAKA: No-o-o, dogs don't have feathers. Do pigs have feathers?

9. PPR (:02)

1. MR. RAKA: No, pigs don't have feathers. Dogs don't have feathers. And pigs don't have feathers. But chickens do have feathers... Now let's think about cassowaries. Do cassowaries have feathers?

2. PPR (:02)

3. MR. RAKA: Yes, cassowaries have feathers, just like chickens. That's because chickens and cassowaries are birds. Did you know that?

4. MISS VAGI: (slight pause) That's interesting. Some people don't know that chickens and cassowaries are birds. But they are birds. They have wings and feathers like all birds.

5. MR. RAKA: That's right. Chickens and cassowaries have wings like all birds. They don't fly very well but they do have wings.

[ Segment 3 MISC 1.2 Answer orally, multiple- ]  
[ choice questions. ]

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1. MISS VAGI: Children, here are some more questions about animals. We're going to think about how many legs animals have. Think of a dog. Does a dog have two legs or four legs?
2. PPR (:03)
3. MISS VAGI: Four.
4. MR. RAKA: Wait a minute! I didn't hear everyone answer that. Try it again, Miss Vagi.
5. MISS VAGI: All right. This time, everyone answer: Does a dog have two legs or four legs?
6. PPR (:02)
7. MISS VAGI: Four, four legs. And now think of a...(hesitating) a pig. Does a pig have two legs or four legs?
8. PPR (:02)
9. MISS VAGI: Four. So, a pig has four legs. And a dog has four legs. Now tell me which of these animals has four legs, a cow or a bird?
10. PPR (:02)

1. MISS VAGI: A cow. A cow has four legs. Now, which animal has feathers, a cow or a bird?

2. PPR (:02)

3. MISS VAGI: A bird. Which has wings, a cow or a bird?

4. PPR (:02)

5. MISS VAGI: A bird. A bird has feathers and it has wings. Which of these has wings, a butterfly or a snake?

6. PPR (:03)

7. MISS VAGI: A butterfly. Snakes don't have wings. Do snakes have legs?

8. PPR (:02)

9. MISS VAGI: No, snakes don't have either legs or wings.

[ Segment 4 MISC 1.3 Answer orally, constructed ]  
[ responses. ]

---

1. MISS VAGI: Think again about how many legs animals have. Tell me, how many legs does a chicken have?

2. PPR (:03)

3. MISS VAGI: Two. A chicken has only two legs. And how many wings does a chicken have?

4. PPR (:02)

5. MISS VAGI: Two. A chicken has two wings. So a chicken has two legs and two wings. Everyone tell me, how much is two plus two?

6. PPR (:03)

7. MISS VAGI: Four. That's interesting. That's the same as a dog's legs. Now tell me, how many legs do you have?

8. PPR (:02)

9. MISS VAGI: And how many arms do you have?

10. PPR (:02)

1. MISS VAGI: Hmm... Two legs and two arms...

And how much is two plus two?

2. PPR (:02)

3. MISS VAGI: Four, the same as a dog's legs again!

- 45 -



1. MR. RAKA: All right, again! First, take a deep breath (inhales and exhales). Now stretch your arms up over your head. High! As high you can!.... And relax. Arms down and sit quietly.... Now take another deep breath (inhales and exhales). And stretch, way up high.... Arms down.... Take a deep breath... And stretch.... And arms down.... Take a deep breath... Stretch... Arms down... Stop! Now let's try something different. Sit up straight.... Now bend to one side, as far as you can without hitting your neighbor.... And sit up straight again.... Now bend to the other side.... And sit up straight again.
  
2. MISS VAGI: (Amused) And don't fall out of your seats when you bend over.
  
3. MR. RAKA: Do it again. Bend to one side....  
Straighten up.... Bend to the other side....  
Straighten up.... Bend again....  
And straighten up.... Bend again....  
And straighten up.... Bend again....  
And straighten up.... And stop! Good.
  
4. MUSIC UP (:05) AND OUT

47



1. MISS VAGI: Put your hands down. Now the girls.  
Girls, raise your hand... Just the girls,  
not the boys.

2. PPR (:03)

3. MISS VAGI: All right, hands down. Now the children who  
are wearing red... Look at your clothes to  
see if you are wearing red... Who is wearing  
red?... Raise your hand.

4. PPR (:03)

5. MISS VAGI: Hands down. Now the children who are wearing  
white... Who is wearing white?... Raise  
your hand.

6. PPR (:03)

7. MISS VAGI: Hands down. Now the children who are wearing  
dresses... Who is wearing a dress?... Raise  
your hand.

8. PPR (:03)

9. MISS VAGI: Now the children who are wearing shorts.  
Who is wearing shorts?... Raise your hand.

10. PPR (:03)

11. MISS VAGI: Now the children who are wearing a  
hat. Who is wearing a hat?...  
Raise your hand.

12. PFR (:03)

13. MR. RAKA: I don't think anyone is wearing a hat.

14. MISS VAGI: No, I don't suppose there are many children  
who are wearing hats.

[ Segment 7 MISC 5.2 Answer aloud, multiple-choice ]  
[ exercises on exercise sheets. ]  
[ LANG 1.1 first, next, last ]

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1. MUSICAL BRIDGE TO EXERCISE

PAGE (:05) FADE OUT

2. MR. RAKA: Now it's time to look at your  
exercise pages. Everyone, find Exercise  
Page One.... Look for the page that says  
"Page One" on the top....

3. MISS VAGI: Children, listen and answer: Do you have  
the page that says "Page One" at the  
top?

4. PPR (:03)

5. MISS VAGI: Let me explain about this page.  
Look at the left hand side. There  
are numbers one, and two, and three,  
and so on down that side of the page.  
Those are exercise numbers. Do you  
see the exercise numbers?

6. PPR (:02)

1. MISS VAGI: All right. We are going to start with exercise number one. Everyone look at exercise number one. In exercise number one, there are pictures of three animals. The first animal is a chicken... Look at the next animal, the one after the chicken.... What is it?

2. PPR (:04)

3. MISS VAGI: A cat. Now look at the last animal.... What is it?

4. PPR (:03)

5. MISS VAGI: A pig. The last animal in the row is a pig.

6. MR. RAKA: Now let's move on to exercise number two. Everyone, find exercise number two.... In exercise two, there are pictures of some furniture.

7. MISS VAGI: Oh, that looks just like the furniture in my house!

8. MR. RAKA: And mine, too. Everyone look at the first picture. What is it?

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1. PPR (:04)

2. MR. RAKA: A table. The first picture is a table.  
Look at the next picture in the same  
row.... What is that?

3. PPR (:03)

4. MR. RAKA: A chair. And now look at the last  
picture in this row.... What is it?

5. PPR (:02)

6. MR. RAKA: A stool. In exercise two, the table is  
first, the chair is next, and the stool is  
last.

7. MISS VAGI: Now let's look at exercise three.  
Everyone find exercise three. These  
pictures are of tools. These are tools  
that people use in their gardens or in  
their houses. Look at the first tool.  
What is it?

8. PPR (:05)

9. MISS VAGI: A spade. The first tool is a spade.  
Now look at the next tool. What is it?

1. PPR (:04)

2. MISS VAGI: A hammer. And what is the last tool?

3. PPR (:02)

4. MISS VAGI: A broom, for sweeping leaves!

5. MR. RAKA: Look now at exercise four.... There are pictures of three people, a man, a woman, and a girl. Look at the first picture. What is it?

6. PPR (:03)

7. MR. RAKA: A man. That's a picture of a man. And what is the next picture?

8. PPR (:03)

9. MR. RAKA: A woman. And what is the last picture?

10. PPR (:02)

11. MR. RAKA: A girl.

12. MISS VAGI: Go on to exercise five.  
Here are some more animals. What's first?

1. PPR (:03)

2. MISS VAGI: A bird. And what's next?

3. PPR (:02)

4. MISS VAGI: A dog. And what's last?

5. PPR (:02)

6. MISS VAGI: A cat. (Rhyming) And that's that!



1. MR. RAKA: The shoe. That's it. The second thing in this exercise is a shoe. What's the first thing?
2. PPR (:03)
3. MR. RAKA: The shirt. What's the fourth thing?
4. PPR (:03)
5. MR. RAKA: A hat. And we've finished with this exercise. Now look at exercise seven. These are all things that people can ride in. Look for the third thing in the row, the third thing.... Tell me, what is it?
6. PPR (:02)
7. MR. RAKA: A bus. The third thing in the row is a bus. What's the first thing?
8. PPR (:02)
9. MR. RAKA: A car. And what's the fourth thing?
10. PPR (:03)
11. MR. RAKA: An aeroplane. Let's go on to exercise eight. In this row, find the fourth thing.... Tell me, what is it?

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1. PPR (:02)

2. MR. RAKA: A fork. The fourth thing is a fork.  
And what is the second thing?

3. PPR (:02)

4. MR. RAKA: A cup. What is the third thing?

5. PPR (:02)

6. MR. RAKA: A spoon. Now look at exercise nine. Look  
for the third thing.... What is it?

7. PPR (:02)

8. MR. RAKA: A spoon, another spoon. And what is the  
fourth thing?

9. PPR (:02)

10. MR. RAKA: A knife. Now look at exercise ten.

11. MISS VAGI: Hey! Those look like my things.  
I'd better give this exercise.

12. MR. RAKA: All right!

13. MISS VAGI: Children, in this row look for the third  
thing.... Tell me, what is it?

1. PPR (:02)

2. MISS VAGI: A belt. And it looks just like my belt!  
Now tell me, what is the second thing?

3. PPR (:02)

4. MISS VAGI: A necklace.

[ Segment 9	LANG 2.7 long, longer, longest	]
[	LANG 2.10 tall, taller, tallest	]
[	LENGTH 1.1 Determine which of a pair	]
[	of objects is longer (taller) by	]
[	direct comparison.	]

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1. 

MUSICAL BRIDGE TO  
END EXERCISE PAGE(:05)
  
2. MR. RAKA: Well, those were a lot of questions.  
Put your exercise page down. We'll finish it later. Now we're going to talk about measuring. Let's talk about things you can measure. One thing you can measure is... yourself! You can measure yourself to find out how tall you are. You can find out if you're taller than your best friend. Of course, you don't have to measure to see who is taller. You can just stand side by side and see who is taller.
  
3. MISS VAGI: Just like you and me. We can stand side by side and we'll see that you're much taller than I am.
  
4. MR. RAKA: I am very tall. I'm the tallest one in my family.

1. MISS VAGI: And I'm the shortest one in my family.  
Even my little sister is taller than I am  
and she is only twelve years old. But I  
like being short.
  
2. MR. RAKA: And I like being tall.
  
3. MISS VAGI: But we were talking about measuring.
  
4. MR. RAKA: Oh, yes! If we want to find out which  
person is taller and which person is shorter,  
we don't need to measure. The two  
people can stand side by side and we  
can see who is taller. We can do  
that with other things, too.  
If we want to find out which broom  
is longer, we can hold the brooms  
side by side and see. We don't always  
have to measure things to find out  
which one is longer.

5. MUSICAL BRIDGE TO  
EXERCISE PAGE (:05)  
FADE OUT

1. MISS VAGI: And that reminds me that we have to finish the exercise page. Children, look on your exercise pages again... Look at exercise number eleven.... There's a picture of a man and a woman. Look at them and see which one is taller.... Tell me, which one is taller, the man or the woman?

2. PPR (:04)

3. MISS VAGI: The man. (Chuckles) Just like me and Mr. Raka! Now look at exercise twelve.... There are two tools, a broom and a spade. Tell me, which tool is shorter?

4. PPR (:03)

5. MISS VAGI: The broom. Did I hear someone say "the spade"? The spade isn't shorter. The broom is shorter. I asked which one was shorter. Now look at exercise thirteen. Look at these things to see which is shorter.... Tell me, which is shorter?

6. PPR (:03)

1. MISS VAGI: The spoon. The spoon is shorter than the fork. Now look at the combs in exercise fourteen.... Tell me which is longer, the first comb or the second comb?

2. PPR (:03)

3. MISS VAGI: The second comb is longer. Now for exercise fifteen.... Which snake is shorter, the first one or the second one?

4. PPR (:03)

5. MISS VAGI: The second one. The second snake is shorter.

6. MUSICAL BRIDGE TO  
END EXERCISE PAGE (:05)  
FADE OUT

[ Segment 10      LENGTH 1.2 Decide when direct      ]  
[                              comparison can be easily used.      ]

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1. MR. RAKA:      Now you know the easy way to tell which thing is shorter and which is longer.
  
2. MISS VAGI:      But that only works if you can put the two things side by side.
  
3. MR. RAKA:      That's right. You can't always tell if the two things are far apart. For instance...  
Miss Vagi, you say you are the shortest one in your family. Is anyone in your family tall?
  
4. MISS VAGI:      Oh, yes, my older brother is quite tall. I think he's as tall as you are.
  
5. MR. RAKA:      You think he's as tall as I am? Or a little shorter?
  
6. MISS VAGI:      I don't know, let me look at you again. Oh, I don't know. I think he's a little taller than you are.
  
7. MR. RAKA:      How can we find out for sure? Can he come in here so we could stand side by side, then you can look to see who is taller?

1. MISS VAGI: Sorry! He's gone away and I  
don't know when he'll come back..  
I know! I could write and ask him to  
measure himself and tell us how tall he is.
  
2. MR. RAKA: Children, do you see what I mean?  
Sometimes you have to measure to find  
out if one person is taller than another.
  
3. MISS VAGI: Children, think about this: Siba  
has a cousin who lives far, far away, in  
another province. She wants to find out if she  
is taller than her cousin.... Can  
they stand side by side to see who is taller?
  
4. PPR (:04)
  
5. MISS VAGI: No, they can't stand side by side because  
they live too far apart. They want to find  
out who is taller. Do they need to  
measure?
  
6. PPR (:03)
  
7. MISS VAGI: Yes, they will need to measure and  
write a letter.
  
8. MR. RAKA: That's all we have time for today. We  
have to go. Goodbye, children.

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1. MISS VAGI: Goodbye, everyone. Be sure to listen to  
the next Radio Science Lesson.

2. THEME SONG (:45)  
FADE OUT

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Radio Science

Grade Four

Pilot Lesson Number: S3

Version Number: 4

Date written: 24 Oct. 86

Written by J. Friend

Materials needed: Exercise Page 2

### Lesson Outline

Segment	Topic
1	INTRO
2	LANG 4.5 <u>more, less</u> MISC 2.1 Write letters or numbers on paper in response to oral instructions
3	LANG 1.3 <u>before, after</u>
4	LANG 4.5 <u>more, less</u> MISC 6.1 Copy letters or numbers from exercise sheet
5	LANG 2.3 <u>how</u> (big, little,...) LANG 2.8 <u>length</u> LENGTH 2.1 "Measure" pictures of objects (pencils, nails, needles) where a picture of a ruler is printed alongside a picture of the object to be measured.
6	MISC 3.1 Stretching, bending, raising arms.
7	LENGTH 2.2 "Measure" pictures of objects (pencils, nails, needles) where neither end of object is lined up with zero-point of ruler.
8	MISC 4.1 Fold paper LENGTH 2.3 Make a ruler by folding a piece of paper and marking 10 places at one centimetre spacing, using a ruler printed on an exercise sheet.

Master tape number: 2

Date recorded: 29 October, 1986

Playing time: 27:58

Characters: Announcer  
Mr. Raka, teacher  
Miss Vagi, teacher

Music: Theme song  
Theme music  
Transition to exercise page  
Transition to physical exercises  
March music  
Working music

Sound effects: None

1.                            THEME SONG (:45)  
                              FADE UNDER
  
2. ANNOUNCER:    The Department of Education brings you  
                              Lesson Three of Radio Science for Grade Four.
  
3.                            THEME MUSIC FADE UP (:05) AND OUT
  
4. MISS VAGI:    Hello, children, welcome again to Radio  
                              Science for Grade Four. I'm glad to  
                              be with you again. And we also have Mr.  
                              Raka here today.
  
5. MR. RAKA:    Hello, Miss Vagi. And hello to all the  
                              children who are listening.

ES

1. MISS VAGI: Today you must all have Exercise Page Two. And you must also have a plain piece of paper. The plain paper is for you to write on. You must never write on your exercise page because other children will use it next year. Remember, write only on the plain paper, not on the exercise page. Children, pick up your exercise page and put it to one side... Now, pick up the plain paper and hold it up. Hold up the plain paper so your teacher can see it.
  
2. PPR (:07)
  
3. MISS VAGI: All right, put the plain paper down in front of you. We are going to start with the plain paper today. You will also need your pencil. Get your pencil ready.

[ Segment 2	LANG 4.5 <u>more</u> , <u>less</u>	]
[	MISC 2.1 Write letters or numbers on	]
[	paper in response to oral	]
[	instructions	]

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1. MUSICAL BRIDGE TO EXERCISE PAGE

(:05)

2. MISS VAGI: We're going to start with an easy writing exercise. Start at the top of your paper. Find the first line on your paper. Write the number four, the number four.

3. PPR (:10)

4. MISS VAGI: Now look at the line under the four, under the four.... On that line write the number two, the number two.

5. PPR (:08)

6. MISS VAGI: On the next line write the number three.

7. PPR (:06)

8. MISS VAGI: Put your pencils down and let's look back at the numbers you have written. Look at the first number you wrote. What is it?

9. PPR (:03)

1. MISS VAGI: Don't forget: When we ask questions we want all of you to answer in a loud voice. I don't think all of you answered that question so let's try again.... Tell me, what is the first number you wrote?
  
2. PPR (:03)
  
3. MISS VAGI: Four. Four is the correct answer. Now look at the next number. What is it?
  
4. PPR (:02)
  
5. MISS VAGI: Two. And what's the last number?
  
6. PPR (:02)
  
7. MISS VAGI: Three. All right, let's try something a bit harder. First you have to think a bit. Tell me this: Which is more, five or six?
  
8. PPR (:05)

1. MISS VAGI: Six. Six is more than five. So now I want you to write six. Pick up your pencils. Find the next line on your paper. On that line, write six.

2. PPR (:06)

3. MISS VAGI: Now find the next line. For this exercise, I want you just to think about which number is more and write it on your paper.... Write which is more, three or seven. Write your answer.

4. PPR (:10)

5. MISS VAGI: Tell me, what answer did you write?

6. PPR (:04)

7. MISS VAGI: Seven. Seven is the correct answer because seven is more than three. Now try this one: A pig has four legs but a chicken has only two. Write which is more, four or two.

8. PPR (:08)

9. MISS VAGI: What did you write?

1. PPR (:03)

2. MISS VAGI: Four. Four is the correct answer  
because four legs is more than two legs.  
Let's do one more exercise. Spiders have  
eight legs. Frogs have four legs.  
Write which is more, eight or four.

3. PPR (:08)

4. MISS VAGI: What did you write?

5. PPR (:02)

6. MISS VAGI: Eight. Spiders have more legs than  
frogs. And that's enough of that. Put  
your paper and pencil aside for now.  
We'll use them again later.

7. PPR (:05)



1. MR. RAKA: The cat. The cat comes before the dog.  
Now look at exercise two. Look at the  
truck. Tell me, what comes after the  
truck?

2. PPR (:02)

3. MR. RAKA: A bicycle. What comes before the  
truck?

4. PPR (:02)

5. MR. RAKA: A car. Now let's do exercise three,  
where the tools are. Look at the  
picture of the hoe. What comes after  
the hoe?

6. PPR (:02)

7. MR. RAKA: A spade. There's a spade after the  
hoe. And what comes before the hoe?

8. PPR (:02)

9. MR. RAKA: A broom. Now exercise four. Look at the  
picture of the book.  
What comes before the book?

10. PPR (:03)

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1. MR. RAKA: A pencil. There's a pencil before the book in this row. And what comes after the book?

2. PPR (:03)

3. MR. RAKA: A ruler. Now for exercise five. Look at the sock. What comes before the sock?

4. PPR (:02)

5. MR. RAKA: A shoe. And what comes after the sock?

6. PPR (:02)

7. MR. RAKA: A hat. And that's that.

[ Segment 4	LANG 4.5 <u>more</u> , <u>less</u>	]
[	MISC 6.1 Copy letters or numbers from	]
[	exercise sheet	]

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1. MISS VAGI: Now we're going to do something a bit different. You're going to use both the exercise page and your own paper and pencil. Get your paper and pencil ready to write the answers.

2. PPR (:10)

3. MISS VAGI: Find the next line on your paper. On that line write the number six for exercise six.

4. PPR (:08)

5. MISS VAGI: Now look at your exercise page. Look at exercise six. There are pictures of two animals with letters written under them. Look at the two animals and decide which has more legs.... Tell me, is it the cat or the chicken?

6. PPR (:02)

7. MISS VAGI: The cat. The cat has more legs. Look at the letter under the cat. What letter is it?

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1. PPR (:02)

2. MISS VAGI: A. It's the letter A. So A is the correct answer to this exercise. On your paper, beside the number 6, write the letter A....

3. PPR (:06)

4. MISS VAGI: Did you write the letter A on your paper?

5. PPR (:02)

6. MISS VAGI: Did you write it beside the number six?

7. PPR (:02)

8. MISS VAGI: All right. You wrote A as the answer to exercise six. Let's go on to exercise seven. First, write seven on your paper.

9. PPR (:05)

1. MISS VAGI: Now look at exercise seven and see which animal has the most legs.... What's the letter under that animal?
2. PPR (:02)
3. MISS VAGI: A. The answer is A again. So, for exercise seven, write the letter A.
4. PPR (:04)
5. MISS VAGI: Let's go on to exercise eight. Write eight on your paper.
6. PPR (:04)
7. MISS VAGI: Then decide which animal has more legs and write the letter on your paper.
8. PPR (:04)
9. MISS VAGI: What answer did you write for exercise eight?
10. PPR (:02)
11. MISS VAGI: B. B is the correct answer.  
Do exercise nine by yourselves.  
Find the animal with more legs and write your answer.

1. PPR (:06)

2. MISS VAGI: What answer did you write for exercise nine?

3. PPR (:02)

4. MISS VAGI: B. B is the correct answer because the worm doesn't have any legs at all. Do exercise ten by yourself.

5. PPR (:06)

6. MISS VAGI: What answer did you get?

7. PPR (:02)

8. MISS VAGI: A is correct. The mouse has four legs and the snail doesn't have any. So the mouse has more. And that's enough of that. Put your papers and pencils aside for now. We'll use them again later.

[ Segment 5      MISC 3.1 Stretching, bending, raising arms ]

---

1.                                    MUSICAL BRIDGE TO PHYSICAL  
   EXERCISES (:05)
  
2.    MR. RAKA:      The children have been working very  
   hard. They need a little break now.
  
3.    MISS VAGI:      You're right.
  
4.    MR. RAKA:      Let's do some stretches and bends, like  
   last time.
  
5.                                    LIVELY MUSIC UP (:03) AND UNDER
  
6.    MR. RAKA:      (Vigorously) And there's our music so we  
   can go! Children, sit up straight....  
   Take a deep breath (inhales and exhales  
   noisily).... Now raise your hands...  
   Raise your hands up over  
   your head, as high as you can....  
   Stre-e-etch.... Relax. Put your hands  
   down.... Take a deep breath (inhales and  
   exhales). Now hands up!....  
   Stretch!.... Higher!.... Arms down.  
   Relax. Take a deep breath. Breathe  
   (inhales and exhales).  
   Hands up again. Up high!.... Now down,  
   and relax.

1. MISS VAGI: Let's do some bending exercises, too.
  
2. MR. RAKA: Right! Everybody! Sit up straight....  
Now bend to one side.... Bend....
  
3. MISS VAGI: (Interrupts quickly) But don't fall  
over!
  
4. MR. RAKA: Sit straight....Now bend to the other  
side.... Straight.... And bend....  
And straight.... And bend.... And  
straight.... And bend.... And  
straight! Very good! Very good!  
That's a good exercise to relax you when  
you've been working hard. And here's  
another exercise for your  
neck. Sit up straight and tip your head  
back so you can look at the ceiling....  
Tip your head wa-a-a-ay back and look at  
the ceiling.... Now tip your head  
forward so you can see the floor....  
Tip back, look at the ceiling.... Tip  
forward, look at the floor.... Once  
more: Tip back and look at the  
ceiling.... Tip forward and look at the  
floor.... And that's all!
  
5. MUSIC FADE UP (:05) AND OUT

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1. MISS VAGI: Those are good exercises. Sometimes when I read or write for a long time, I get tired. So I do some stretching exercises. I feel much better after I do stretching exercises.

[ Segment 6	LANG 2.3 <u>how</u> (big, little,...)	]
[	LANG 2.8 <u>length</u>	]
[	LENGTH 2.1 "Measure" pictures of	]
[	objects (pencils, nails, needles)	]
[	where a picture of a ruler is	]
[	printed alongside a picture of the	]
[	object to be measured.	]

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1. MUSICAL BRIDGE TO EXERCISE PAGE  
(:05)
  
2. MR. RAKA: Now we're going to do  
some more with the exercise page.
  
3. MISS VAGI: But you don't need your paper and  
pencil; we will not write any  
more.
  
4. MR. RAKA: That's right. Just leave your  
paper and pencil aside. We'll use just  
the exercise page now. Look at the  
exercise page. This exercise  
page is divided into two parts.  
You've already done all of the  
exercises in the first part so we're  
ready to start the second part, the  
part with all the pictures of rulers.  
Find exercise eleven.... exercise  
eleven is at the top of the page, in the  
second part.
  
5. PPR (:06)

1. MR. RAKA: In this exercise, there's a picture of someone measuring a pencil. Look closely at the ruler. This is a centimetre ruler. It measures things in centimetres. Centimetre. That's a hard word to say. Everyone, say centimetre.

2. PPR (:04)

3. MR. RAKA: Centimetre. That's an important word. Look at the ruler and pencil now to see how many centimetres long the pencil is.

4. PPR (:04)

5. MR. RAKA: Tell me, how long is the pencil?

6. PPR (:04)

7. MR. RAKA: Eight centimetres. You can see that the pencil is eight centimetres long because one end of the pencil is lined up with the mark that says eight. That means eight centimetres. Remember, you must always say "centimetres" when you use a centimetre ruler.... Now look at exercise twelve.... Look to see how many centimetres long the nail is.... How long is the nail?

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1. PPR (:04)

2. MR. RAKA: Five centimetres. All right. Now look at exercise thirteen. How long is the hairpin?

3. PPR (:04)

4. MR. RAKA: Four centimetres. Did everyone remember to say centimetres?.... Look at exercise fourteen. How long is the needle?

5. PPR (:04)

6. MR. RAKA: Five centimetres. And now exercise fifteen. How long is the key?

7. PPR (:04)

8. MR. RAKA: Four centimetres.

[ Segment 7	LENGTH 2.2 "Measure" pictures of	]
[	objects (pencils, nails, needles)	]
[	where a picture of a ruler is	]
[	printed alongside a picture of the	]
[	object to be measured but neither	]
[	end of object is lined up with	]
[	zero-point of ruler.	]

---

1. MR. RAKA: Now go on to exercise sixteen...
- There is a story about this picture. One day a little boy named Eri was trying to measure a nail. This is a picture of the way Eri measured the nail. See how Eri measured the nail... Eri said it was four centimetres long. Children, see if Eri was right.... Everyone look closely at the picture of how Eri measured the nail.... Tell me, is the nail four centimetres long?

2. PPR (:02)

3. MR. RAKA: No. The nail is not four centimetres long. Eri made a mistake when he measured the nail. It's true that the point of the nail is at the four centimetre mark. But look at the other end of the nail! It's not lined up with the end of the ruler.... Does everyone see what Eri did wrong?

4. PPR (:04)

1. MR. RAKA: So the nail isn't really four centimetres. Can you guess how long the nail really is?
  
2. PPR (:04)
  
3. MR. RAKA: Well, let's look at how someone else measured the nail. Look at exercise seventeen.... This is how Siba measured the nail. Siba said the nail is two centimetres long. Do you think Siba is right?
  
4. PPR (:02)
  
5. MR. RAKA: No, Siba is not right. She did not put the end of the nail beside the end of the ruler. Maybe we'll never know how long that nail is. Some people say it's four centimetres and some say it's three centimetres and some say it's two centimetres. What do you think?
  
6. PPR (:04)

- 
1. MR. RAKA: I guess that the nail is about three centimetres long. Go on now to exercise eighteen. This is the way Eri measured his pencil. He said the pencil is more than eight centimetres long. Is he right?
2. PPR (:02)
3. MR. RAKA: No, Eri didn't put the pencil beside the ruler right. How long do you think the pencil is?
4. PPR (:04)
5. MR. RAKA: I think the pencil is eight centimetres long. Now look at exercise nineteen. Siba did this and she said the needle is seven centimetres long. Is she right?
6. PPR (:02)
7. MR. RAKA: No. Poor Siba! Look closely to see if you can figure out how long the needle really is.
8. PPR (:04)
9. MR. RAKA: How long is it?
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1. PPR (:04)
2. MR. RAKA: The needle is about five centimetres long.
3. MISS VAGI: I think the children know a lot about measuring with a ruler.

[ Segment 8	MISC 4.1 Fold paper	]
[	LENGTH 2.3 Make a ruler by folding a	]
[	piece of paper and marking 10	]
[	places at one centimetre spacing,	]
[	using a ruler printed on an	]
[	exercise sheet.	]

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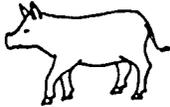
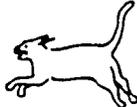
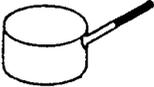
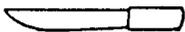
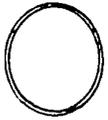
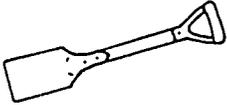
1. MISS VAGI: Children, in the next few lessons, you will use a ruler to measure things like pencils and nails. For those activities, you will need a ruler of your own. We're going to teach you how to make a ruler. Some of you already have rulers but we want you to learn how to make your own ruler.
2. MR. RAKA: What will the children use to make rulers, Miss Vagi?
3. MISS VAGI: They will use paper. They will make rulers of paper. Children, you will now make a ruler out of paper. I will explain how to do it and then Mr. Raka will help you. First, look at your exercise page, at exercise number twenty... Exercise twenty shows how to fold paper to make a ruler. See the first picture, the picture marked A?.... Picture A shows what a piece of paper looks like before it's folded. Now look at the second picture, picture B.

1. MISS VAGI: Picture B shows you how to fold paper once. Now look at picture C. Picture C shows how to fold the paper a second time. You're going to fold paper just like it shows in those pictures.
2. MR. RAKA: All right, now we'll follow those instructions step by step. Children, get your piece of paper, the one you wrote your answers on. We're going to use that paper to make a ruler.... Hold your paper so it looks like picture A.
3. PPR (:06)
4. MR. RAKA: Now look at picture B. Everyone, fold your paper now, just like picture B. I'll wait so you can fold your paper like picture B.
5. PPR (:10)
6. MR. RAKA: Now you have your paper folded once. You're going to have to fold it again. Look at picture C.... Picture C shows how to fold your paper a second time. Everyone, fold your paper again, just like picture C.

1. PPR (:10)
2. MR. RAKA: Now you have a ruler.
3. MISS VAGI: But it doesn't have any marks on it like a ruler!
4. MR. RAKA: That's right. It still doesn't have marks on it. So that's the next step. Children, see the ruler at the bottom of the exercise page?.... You're going to mark your ruler just like that one. Line your paper ruler up with the picture of the ruler. Be sure you get the end of your ruler lined up with the end of the ruler in the picture.... Now see where the number one mark is on the picture. Take your pencil and make a mark on your ruler in the same place...
5. PPR (:04)
6. MR. RAKA: Write a one beside that mark.
7. PPR (:10)
8. MR. RAKA: Now find the number two mark in the picture.... Make a mark on your ruler in the same place... and write a two beside that mark.

1. PPR (:08)
  
2. MR. RAKA: Now find the number three mark in the picture, and make a mark on your ruler... Write three beside that mark.
  
3. PPR (:06)
  
4. MR. RAKA: Now go ahead and do the rest. Make marks at all the other numbers. I'll wait while you do that.
  
5. WORKING MUSIC (:30)
  
6. MISS VAGI: That's all we have time for today. If you haven't finished your ruler, do the rest later. And everyone be sure to save your ruler. We'll use it in the next lesson.
  
7. MR. RAKA: Goodbye, now. Don't forget to listen to the next Radio Science lesson.
  
8. MISS VAGI: Goodbye, children, goodbye for now.
  
9. THEME SONG FADE UP (:45)  
AND OUT

94

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Teachers' Guide  
Radio Science Pilot Lessons  
Grade Four

October 1986

## Introduction

Read the teacher's guide for each lesson the day before the lesson is given.

Do not stop the tape while it is playing.

Do not repeat the instructions given by the radio teachers.

Do not talk while the radio lesson is on. To show children what to do, use hand signals and facial expressions instead of words.

Do not interrupt the radio lesson to explain things to the children. (If they don't understand, tell us so we can change the instruction for the children next year.)

Do not translate the instructions given by the radio teachers. (Make notes of the words children don't understand so you can teach them later.)

Help the children learn to listen to the instructions of the radio teachers. Teach the children that they must answer when the radio teachers ask a question. Teach the children that they must do what the radio teachers tell them to do.

To help the children, you should show them how to do what the radio teachers say. You should answer aloud to show the children how to answer aloud. You should do the physical exercises to show the children how to do them. (After the children learn to listen and follow the instructions by themselves, you don't have to show them any more.)

## LESSON 1

### YOU WILL NEED

Exercise Page 1 for each child

### DO THIS BEFORE THE RADIO LESSON

1. Explain to the children that they will listen to a radio lesson about science. Tell them to listen carefully and to do what the radio teachers say. Tell them to answer loudly when the radio teacher asks them a question.
2. Hold up Exercise Page 1 to show to the children. Tell them they will use this exercise page during the radio lesson. The radio teachers will tell them what to do.
3. Hand out Exercise Page 1, one to each child. Allow the children a few minutes to look at the page.
4. Tell the children to put the exercise pages aside because they will not need them during the first part of the radio lesson. The radio teachers will tell them when they need the exercise pages.
5. Tell the children to sit up straight and listen.
6. Start the cassette tape of Lesson 1.

### DO THIS DURING THE RADIO LESSON

1. Stand at the front of the classroom so the children can see you.
2. Be sure the children are quiet and listening.
3. The children must answer aloud.
4. During the physical exercises, do the exercises yourself to show the children what to do. All the children should do them.
5. When the children working with the exercise page, walk around the classroom and help children who need special help.

### DO THIS AFTER THE RADIO LESSON

Collect the exercise pages.

### AT THE END OF THIS LESSON THE CHILDREN SHOULD

1. Know how to listen to the radio teachers.
2. Do what the radio teachers tell them to do.

## LESSON 2

YOU WILL NEED A piece of string about one meter long for each pair of children. (The Radio Science Project will supply the string for you.)

### DO THIS

1. Tell the children to work with partners. Tell each child who his partner will be.
2. If any children have rulers, tell them to put their rulers away. Today, we are going to "measure" without rulers.
3. Ask the children to find out which partner has the longest pencil. The partner with the longest pencil should hold it up.
3. Ask the children how they know which pencil is longer. They will probably say that they held them side by side to see which was longer.
4. Ask the children to decide which partner is taller. The taller partner should raise his or her hand. Ask them how they know which partner is taller.
5. Ask the children to decide which partner has the longest thumb. The partner with the longest thumb should hold up his hand. Ask them how they know which thumb is longer. Tell them it is hard to decide about thumbs sometimes.
6. Ask the children to decide which partner is bigger around the waist. Ask them how they know whose waist is largest. Explain that it is sometimes very hard to decide whose waist is largest. Ask them how they would find out for sure whose waist is largest. If someone suggests using a belt or a rope or a piece of string to compare, tell them that is an excellent suggestion. If no one suggests using a belt or rope or string, you can suggest it yourself.
7. Hand out the string, one piece to each pair of children.
8. Ask the children to find out for sure whose waist is largest. Give them plenty of time to use the string to compare their waists. Help children who need help.
9. Ask the children to find out whose arm is biggest around. Allow plenty of time for them to do this.
10. Ask the children to find out whose head is biggest around. Allow enough time to do this.

## SPECIAL NOTES FOR THE TEACHER

There are two ways to find out if one thing is longer than another without measuring:

1. Compare the two things directly. For example, hold two pencils side by side to see which is longest. Or have two children stand back to back to see which is tallest.
2. Compare the two things to a third thing. The third thing might be a piece of string or a stick or just your arm. For instance, you can use a piece of string to find out which child has the largest waist. Or you can use a stick to see which of two desks is taller.

### AT THE END OF THIS ACTIVITY THE CHILDREN SHOULD

1. Understand that it is all right to compare two things directly or indirectly (with a piece of string). You do not always have to use a ruler to answer questions about length.
2. Know how to use a piece of string to compare the sizes of heads, waists, etc.



Outline for Teacher Training  
for Radio Science Pilot Lessons

1. Greet head of school. Meet the two teachers involved in the pilot lessons (one third grade teacher and one fourth grade teacher). Make a note of the names of the teachers.
2. Explain that the Radio Science Project is preparing radio lessons to teach science for Grade Four. The lessons we will be trialing are for the first week of Grade Four. Explain that we want to try the lessons also in Grade Three because it is so near the end of the school year that children in Grade Three are more similar to beginning Grade Four students.
3. Explain that these radio lessons are not like other educational radio programs. In these lessons, there are teachers who will give direct instructions to the children. The children are supposed to participate very actively. They are supposed to answer aloud, they are supposed to do exercises from the exercise pages prepared by the Radio Science project, they are supposed to do written work on paper, and so on.
4. Show the Radio Math or Kenya film (or classroom excerpts).
5. Give the teachers a copy of Exercise Page 1 and explain that these are pages from a science exercise book that the Radio Science Project is preparing for children.
6. Tell the teachers we will now listen to a part of the children's first lesson. One of the Radio Science people (David?) will take the role of teacher. The other Radio Science people and the teachers will pretend they are students to see how the lesson goes.
7. Play three or four minutes of the tape. Get the "students" to participate, using non-verbal cues if possible.
8. Explain to the teachers that their main role during the first radio lesson will be to get the children to listen to the instructions from the radio teachers and to do what the radio teachers say. Explain that is important that the children listen carefully. Therefore, the teachers should not talk. Explain the kinds of non-verbal cues that the teachers can use to get the children to participate (hold finger to lips to indicate silence, use gestures to indicate children are supposed to answer aloud, cup hand behind ear to indicate that children are supposed to answer more loudly, place hand on shoulder on child who is talking or otherwise disturbing others, etc.).

Explain that there will be two people from the Radio Science Project observing in each classroom during the lesson. We want to observe how the children react to the lesson. We are not here to judge the teacher's ability, just to watch the children. We will try to be as unobtrusive as possible, so we would prefer to stand quietly in the back of the room for most of the lesson. We do not want chairs brought in for us. We will not interfere with what the teacher does. However, if there is any trouble with the

cassette or the cassette player, we will help if the teacher wants us to.

9. Hand out the teachers' guides and explain how they are organized. Tell them they can read the introduction later. Right now they should look at the guide for Lesson 1. Read through this guide with them. Point out how it is organized (materials needed, what to do before the radio lessons, etc.)

10. The second lesson is to be given by the teacher, without any radio lesson. The teacher should simply follow the instructions in the teachers' guide. Look at the teachers' guide for Lesson 2 and read it with the teachers, explaining wherever necessary.

11. The third lesson is another radio lesson. Read the guide with the teachers so they see what to do.

12. Explain to the teachers that we want to give the children a short test both before and after they take these three lessons. The teachers will need to give the tests because the children may not understand the English spoken by members of the Radio Science staff. These tests are not to grade their students or to judge the teachers or the school. They are to collect information that will help us improve the radio lessons before they are used by more children next year.

13. Hand out samples of the children's test papers and read a few instructions (for the first three or four items) so the teachers can see how the test will go.

14. Hand out the test instructions and explain to the teachers how these are organized (general rules on the first page, then the instructions they will read to the children, then copies of the children's test pages). Read through enough of this so the teachers understand what they are supposed to do.

Be sure the teachers understand that they are not to help the children during the test but that they are to help the children during the lessons.

Explain that one member of the Radio Science staff will be in the classroom during the test to help the teacher. This person can help the children to find the right place on their test papers, help see that all children have sharp pencils, monitor to see that children do not talk to one another or look at one another's papers. The person who is helping will do whatever the teacher says; the teacher is in charge of giving the test.

15. Give each of the teachers a copy of the Pilot Lesson Data Form and ask them to fill it out. If there is time, they should do it right now. The names of the children should be printed so we can read them. The names of the children should be listed in the order in which they are in the rollbook. If the rollbook has numbers, use the same numbers in the form. If a child has withdrawn from school, the space can be left blank with a note that the child has withdrawn. If the teachers know the ages in years and months, they should enter the age that way; if they only know the age in years, that is all right. If they do not know the age, ask them to guess and write it with a question mark. If they

also know the birthdate, they should enter that.

16. Thank the teachers. Tell them at what time you will come tomorrow. Assure them that you will bring everything necessary.

17. Leave the teachers' guides with the teachers but collect all other material (test pages and instructions, cassette player and tapes, children's exercise pages, etc.)

OBSERVATION SHEET

Radio Science  
Pilot Lesson Number: S1

Fourth Grade  
Version Number: 2

Date: \_\_\_\_\_

School: \_\_\_\_\_

Number of Students: \_\_\_\_\_

Observer: \_\_\_\_\_

Teacher: \_\_\_\_\_

-----  
Remarks about the school setting: classroom, chairs, desks, tables,  
blackboard, outside noise level,  
etc.

Seg. Code	Cue	Guide Comments for Observations
1	INTRO Theme song	Did they put away their materials as asked?
2	MISC 1.1	How many students were responding?
3	MISC 1.2	Check pause length.
4	MISC 1.3 "One of the things scientists study is animals." yes/no questions	
5	MISC 3.1 March music "It's time for our stretching exercises."	How many participated? Did they enjoy it?
6	MISC 3.2 hand raising "Everyone, raise your hand."	How did this exercise work? Did they all raise their hands on everything?
7	MISC 5.2 LANG 1.1 ex. 1-5 "Now it's time to look at your exercise pages."	How did the exercise page work here? What troubles did they have using it?

10/1

- 8      LANG 1.2      "Let's do                      How did they manage the change in  
ex. 6-10      something a bit                      exercise type here? Troubles?  
                    different with  
                    exercise six."
- 9      LANG 2.7      "Well, that was                      Was their interest maintained?  
LANG 2.10      a lot of                              How did the exercise page work  
LENGTH 1.1      questions.                              here?  
measuring      Put your exercise  
long, tall      page down."
- 10      LENGTH 1.2      "Now you know                      Was their interest held?  
measuring      the easy way to  
no direct      tell which thing  
comparison      is shorter and  
                    which is longer."

COLLECT CASSETTE PLAYERS AND TAPES

OBSERVATION SHEET

Radio Science  
Pilot Lesson Number: S2

Fourth Grade  
Version Number: 2

Date: \_\_\_\_\_

School: \_\_\_\_\_

Number of Students: \_\_\_\_\_

Observer: \_\_\_\_\_

Teacher: \_\_\_\_\_

-----  
Remarks about the school setting: classroom, chairs, desks, tables,  
blackboard, outside noise level,  
etc.

Activity	Cue	Guide Comments for Observations
1	largest pencil tallest partner longest thumb	Did students follow instructions? How many participated
2	measure desks	How many suggested answers here?
3	use "on your leg" measures	Did they follow instructions?
4	string measure problems	How did they solve the problems? How many participated?

Comments about the teacher: preparedness, delivery, discipline,  
effectiveness, etc.

OBSERVATION SHEET

Radio Science  
Pilot Lesson Number: S3

Fourth Grade  
Version Number: 2

Date: \_\_\_\_\_

School: \_\_\_\_\_

Number of Students: \_\_\_\_\_

Observer: \_\_\_\_\_

Teacher: \_\_\_\_\_

-----  
Remarks about the school setting: classroom, chairs, desks, tables,  
blackboard, outside noise level,  
etc.

Seg. Code	Cue	Guide Comments for Observations
1 INTRO	Theme song	Was there confusion with the paper?
2 LANG 4.5 MISC 2.1 blank paper	"We're going to start with an easy writing exercise. Write the number four."	How did these exercises work? Troubles? How many wrote the correct number at the beginning?
3 LANG 1.3 ex. 1-5	"For the next exercise, you'll need your exercise page."	How did these exercises work? Check pauses.
4 LANG 4.5 MISC 6.1 ex. 6-10	"You're going to use both the exercise page and your own paper and pencil." a bit different."	How did this part work?
5 MISC 3.1	March music	How many participated? Was it

- |   |  |  |   |
|---|--|--|---|
|   | physical<br>exercise                                     | "Let's do some<br>stretches and<br>bends."                             | enjoyable?  |
| 6 | LANG 2.3<br>LANG 2.8<br>LENGTH 2.1<br>ruler<br>exercises | "Now we're going<br>to do some more<br>with the exercise<br>page."     | How many found exercise eleven?<br>How many gave correct answers? |
| 7 | LENGTH 2.2<br>ex. 16-19                                  | "Now let's go on<br>to exercise<br>sixteen..."                         | Was their interest held?  |
| 8 | MISC 4.1<br>LENGTH 2.3<br>paper<br>folding               | "Students, in<br>the next few<br>lessons. You<br>will use a<br>ruler." | Were the instructions understood?<br>How did this part work?      |

Other General Comments: teacher, exercise page, etc.

COLLECT THE CHILDREN'S RULERS, CASSETTE PLAYERS AND TAPES.



-----  
 1: [ Segment 1 INTRO ]

Number of words: 191 Length of pauses: 53 Total time: 2 min. 14 sec.  
 Actual running time: 1 min. 32 sec.  
 -----

2: [ Segment 2 LANG 4.5 more, less

Number of words: 366 Length of pauses: 94 Total time: 4 min. 10 sec.  
 Actual running time: 4 min. 23 sec.  
 -----

3: [ Segment 3 LANG 1.3 before, after ]

Number of words: 254 Length of pauses: 37 Total time: 2 min. 25 sec.  
 Actual running time: 3 min. 3 sec.  
 -----

4: [ Segment 4 LANG 4.5 more, less

Number of words: 342 Length of pauses: 72 Total time: 3 min. 38 sec.  
 Actual running time: 3 min. 23 sec.  
 -----

5: [ Segment 5 MISC 3.1 Stretching, bending, raising

Number of words: 252 Length of pauses: 38 Total time: 2 min. 26 sec.  
 Actual running time: 2 min. 44 sec.  
 -----

6: [ Segment 6 LANG 2.3 how (big, little,...)

Number of words: 317 Length of pauses: 44 Total time: 2 min. 59 sec.  
 Actual running time: 3 min. 17 sec.  
 -----

7: [ Segment 7 LENGTH 2.2 "Measure" pictures of objects

Number of words: 381 Length of pauses: 36 Total time: 3 min. 19 sec.  
 Actual running time: 3 min. 17 sec.  
 -----

8: [ Segment 8 MISC 4.1 Fold paper

Number of words: 536 Length of pauses: 139 Total time: 6 min. 8 sec.  
 Actual running time: 5 min. 44 sec.  
 -----

-----  
 SUMMARY

Number of words: 2639 Length of pauses: 513 Total time: 27 min. 24 sec.  
 Actual running time: 27 min. 23 sec.  
 -----

Description of Pre/Posttest  
for Radio Science Pilot Lessons

Oral Instruction

Worksheet

- |   |   |
|---|---|
| 1. Circle the second animal in this row.  | ( row of animals facing left:<br>pig, chicken, dog, cat )   |
| 2. Circle the kitten that comes after the mother cat.   | ( line facing left of: kitten,<br>kitten, cat, kitten )   |
| 3. Which door is the widest? Circle the widest door?  | ( 3 doors, one tall and wide,<br>one medium height and wider,<br>one shorter and narrower)        |
| 4. Circle the car that comes before the bus.  | ( line of four vehicles facing<br>left: bicycle, car, bus, car )                                  |
| 5. A man measured the length of his finger. Which answer did he get? Read the sentences and circle the one that is correct. | The finger is 8 meters long.<br>The finger is 8 inches long.<br>The finger is 8 centimeters long. |
| 6. Circle the fourth fruit in this row.   | ( row of banana, mango, orange,<br>kiwi fruit)  |
| 7. Draw a line one centimeter long.   |   |
| 8. Write the abbreviation for the word centimeter.  | <hr/>   |

9. The short nail shown here is two centimeters long. How long is the longer nail? ( 2 cm nail ) 2 centimeters  
( 4 cm nail ) \_\_\_\_\_

10. Circle the correct sentence. A scientist cleans your teeth. Some scientists study animals. You should scientist your teeth every day.

11. Which is longer? One centimeter  
One meter

12. Circle the last person in this row. ( row of people facing left: girl, boy, man, woman )

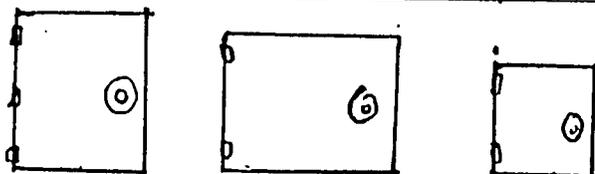
13. Mary measured a pencil like this this. How long is the pencil? ( 8 cm pencil beside 10 cm ruler, line for answer underneath )

14. How many centimeters are there in one meter? \_\_\_\_\_

15. George measured a nail like this. How long is the nail? ( 10 cm ruler beside nail. The nail goes from the 1 cm mark to the 5 cm mark. Line for answer underneath.)

16. Which is longer? 50 centimeters  
2 meters  
5 centimeters

Note: In the right column, in the description of the worksheet, words enclosed in parentheses are a description of a picture. Words not enclosed in parenthese are to be printed as is on the worksheet.

1	← pig ← chicken ← dog ← cat
2	← kitten ← kitten ← mother cat ← kitten
3	
4	← bicycle ← car ← bus ← car
5	The finger is 8 meters long. The finger is 8 inches long. The finger is 8 centimeters long.
6	banana mango orange kiwi fruit
7	
8	_____

9

 2 Centimeters

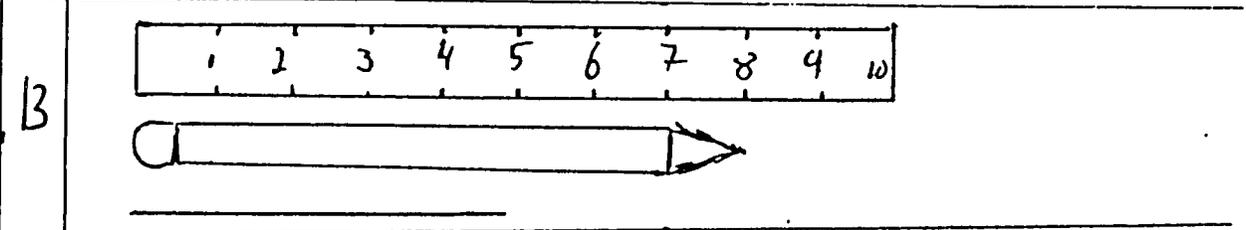
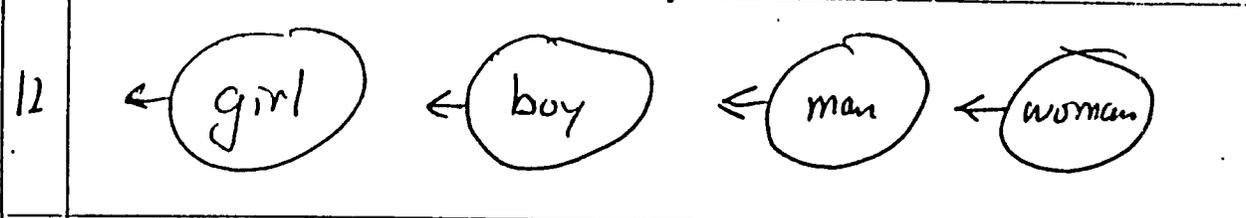


10

A scientist cleans your teeth.  
Some scientists study animals.  
You should scientist your teeth every day.  
every day.

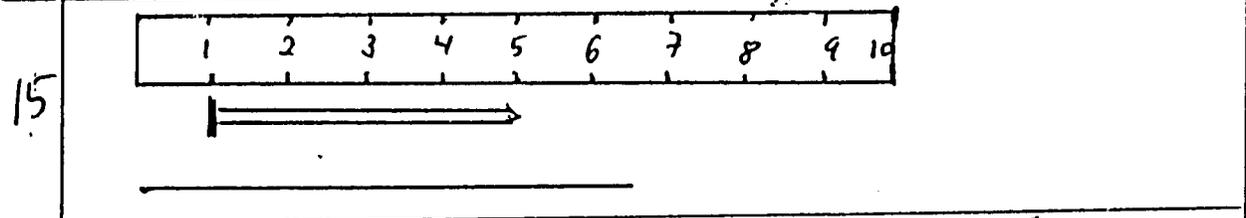
11

One centimeter  
One meter



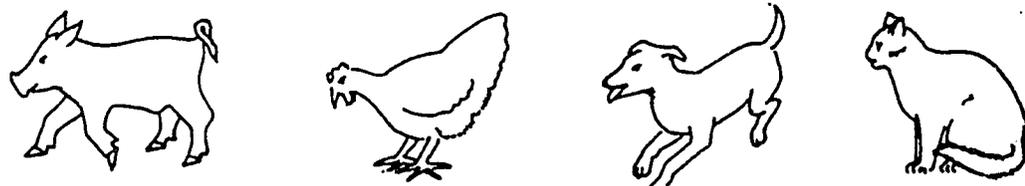
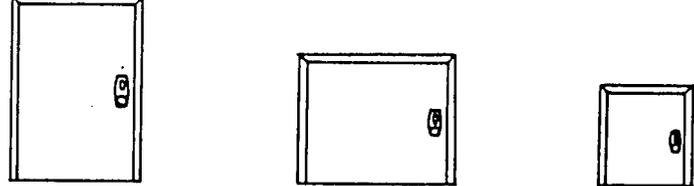
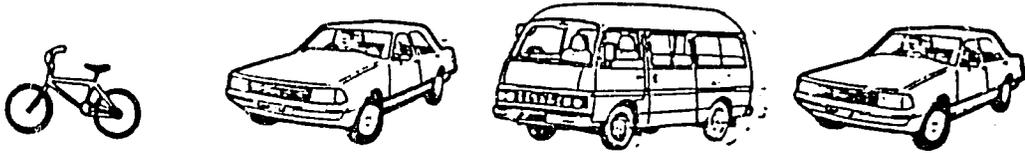
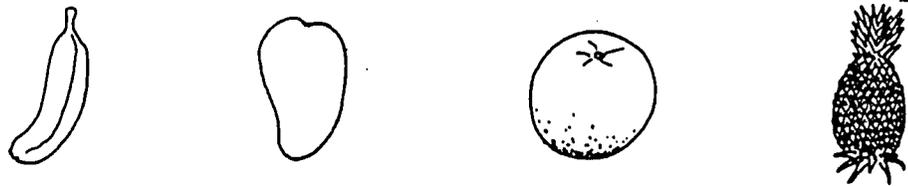
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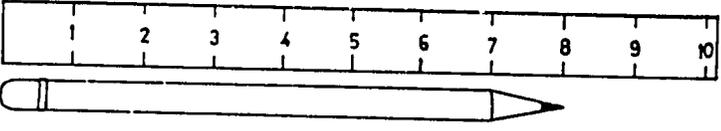
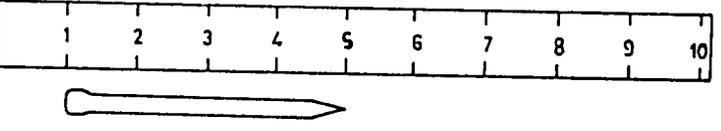
\_\_\_\_\_



16

50 centimeters  
2 meters  
5 centimeters

1	
2	
3	
4	
5	<p>The finger is 8 metres long.</p> <p>The finger is 8 inches long.</p> <p>The finger is 8 centimetres long.</p>
6	
7	
8	<hr/>

9	
10	<p>A scientist cleans your teeth.</p> <p>Some scientists study animals.</p> <p>You should scientist your teeth every day.</p>
11	<p>One centimetre</p> <p>One metre</p>
12	
13	 <hr/>
14	<hr/>
15	 <hr/>
16	<p>50 centimetres</p> <p>2 metres</p> <p>5 centimetres</p>

Instructions for Giving Test  
for Radio Science Pilot Lessons

October 1986

## How to Give a Test

Do not allow the children to talk to one another or to look at one another's papers.

Read the instructions clearly and loudly. (The instructions start on the next page.)

If the children don't understand, you may read the instruction again.

DO NOT TRANSLATE TO ANOTHER LANGUAGE.

The test must be given in English.

DO NOT REWORD THE INSTRUCTIONS.

Read them exactly as they are written.

If the children ask questions, explain to them that you cannot help. All you can do is read the instructions again.

If the children cannot do the exercise, that is all right. They can just leave the space blank if they do not know the answer. Reassure the children that it is all right if they do not do all of the problems.

Oral Instructions to be Used in  
Administering Pre/Posttest for  
Radio Science Pilot Lessons

I am going to give you a short test now. Some of the questions will be very easy for you. A few questions will be hard but don't worry if you can't answer them. This test is really for older students so I don't expect you to get them all right. If there is a question you can't answer, don't worry about it; just try to guess the answer and then go on to the other questions.

This is a test so you will all have to work quietly. Do not talk during the test. Do your own work and don't look at anyone else's paper.

The test will work like this: For every problem, I will tell you what to do. So you must listen carefully and do what I say. Sometimes I will ask you to write words or numbers. For other problems I will ask you to draw a circle around the right answer.

Do you all have pencils?

MAKE SURE EVERY CHILD HAS A PENCIL  
BEFORE PROCEEDING

Put your pencils down and don't start writing until I tell you to. Here are the papers you will write your answers on.

HAND OUT TEST PAPERS

There are two pages to this test. We will start with the first page. That's the page that says "page one." Do you all see where it says "page one"?

BE SURE THE CHILDREN ARE WORKING  
ON PAGE ONE

At the top of the page it says "name" and there is a line for you to write your name. Take your pencils and everyone, write your name now.

WAIT UNTIL THE CHILDREN FINISH

Now we'll do problem number one. Everyone, find problem number one. Look at the animals in the pictures. Do you see the pig? And the chicken? And the other animals? Here's what I want you to do: Find the second animal in this row and circle it... Find the second animal and draw a circle around it.

WAIT UNTIL THE CHILDREN FINISH

Now let's go on to problem number two. Everyone, find problem number two. This problem has a picture of a mother cat and her kittens. Do this: Find the kitten that comes after the mother cat and circle it... Draw a circle around the kitten that comes after the mother cat.

WAIT UNTIL THE CHILDREN FINISH

Now we'll do problem three, problem three. There are three doors in this picture. Here's what you are supposed to do: Find the widest door and circle it, the widest door.

WAIT UNTIL THE CHILDREN FINISH

Now let's go on to problem number four, problem four. See the picture of the bicycle and the car and the other things? Find the car that comes after the bus and circle it, the car that comes after the bus.

WAIT UNTIL THE CHILDREN FINISH

Now problem number five, problem five. There is a little story that goes with this problem. One day there was a man who wanted to find out how long his finger was. So he measured his finger. And he wrote down how long his finger was. Read these sentences and find the one that he wrote. When you find the correct sentence, circle it.

WAIT UNTIL THE CHILDREN FINISH

Now let's do problem six. This problem has a picture of some fruit. Find the fourth fruit and circle it, the fourth fruit.

WAIT UNTIL THE CHILDREN FINISH

Now we'll do problem seven. There is no picture here. There is just a space for you to draw. I want you to draw a line that is one centimetre long. You will have to guess how long a centimetre is. Draw a line that is about one centimetre long.

WAIT UNTIL THE CHILDREN FINISH

Now problem eight. There is no picture here either. But there is a line. That line is for you to write on. On the line, write the short form of the word "centimetre," the short form of "centimetre."

WAIT UNTIL THE CHILDREN FINISH

We've finished one page of the test. If you couldn't do all of the problems, don't worry. I don't expect you to do all of them right. But there will be some easy questions in the next problems so try to do them.

Now turn to page two of the test.

WAIT UNTIL THE CHILDREN HAVE  
TURNED TO PAGE TWO

The first problem on this page is problem number nine. Does everyone see where problem nine is?

In this problem, there is a picture of two nails. The nail on the top is short. It is two centimetres long. Do you see where it says "two centimetres"?

The nail on the bottom is long. You want to guess how long the nail is. Guess how long the nail is and write your answer on the line beside the nail. On the line, write how long the nail is.

WAIT UNTIL THE CHILDREN FINISH

Now go on to problem ten. There are some sentences written here. Read the sentences and decide which one is correct. Then circle the correct sentence. Go ahead. Read and circle the correct sentence.

WAIT UNTIL THE CHILDREN FINISH

Now problem eleven. Here it says "one centimetre" and "one metre." Think which is longer, one centimetre or one metre, and circle the right answer.

WAIT UNTIL THE CHILDREN FINISH

Now problem twelve. There are some people in this picture. Circle the last person in the picture, the last person.

WAIT UNTIL THE CHILDREN FINISH

Now problem thirteen. There is a little story about this problem. There was a little girl named Mary who wanted to know how long her pencil was. So she measured the pencil, like it shows in the picture. Look to see how long the pencil is. On the line below the pencil write how long the pencil is.

WAIT UNTIL THE CHILDREN FINISH

Now for problem fourteen. There is no picture here, just a line for you to write your answer. On the line, write the answer to this question. How many centimetres are there in a metre? Write your answer.

WAIT UNTIL THE CHILDREN FINISH

Now problem fifteen. See the ruler and the nail? A little boy named George was just learning how to measure. He measured the nail like this. George didn't know how to measure very well, so he may not have done it right. You look at the ruler and the nail and decide how long the nail is. Write your answer on the line under the nail.

WAIT UNTIL THE CHILDREN FINISH

Now the last problem, problem sixteen. Read these and decide which is longer. Circle the one that is longest.

WAIT UNTIL THE CHILDREN FINISH

That's all the test. You all worked very hard. I'm sure you did very well. Everyone, give me your test papers.

COLLECT THE CHILDREN'S PAPER  
CHECKING TO SEE THAT THEY HAVE  
WRITTEN THEIR NAMES ON PAGE ONE

RADIO SCIENCE PROJECT  
PILOT LESSONS DATA FORM

School: \_\_\_\_\_

Date: \_\_\_\_\_

Grade: \_\_\_\_\_

Number of students: \_\_\_\_\_

Teacher: \_\_\_\_\_

List all students enrolled in your class:

Student's name	Sex (form)	Age	Repeating the grade (yes or no)
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1.

2.

3.

4.

5.

6.

7.

8.

9.

10.

11.

12.

13.

14.

15.

16.

17.

18.

19.

102

List all students enrolled in your class:

Student's name	Sex (form)	Age	Repeating the grade (yes or no)
20.			
21.			
22.			
23.			
24.			
25.			
26.			
27.			
28.			
29.			
30.			
31.			
32.			
33.			
34.			
35.			
36.			
37.			
38.			
39.			
40.			

1/26

Summary of Observations  
Radio Science Pilot Lesson S1, Version 2

Date:	30 Oct. 86	30 Oct. 86
School:	Sogeri	Sogeri
Class:	Grade 3	Grade 4 (slow)
Teacher:	??	Mr. Taumuia
Observers:	Kerrison, Hill	Chaytor, Friend
Number of children:	??	28

The lesson, which was on cassette tapes, was given simultaneously in the two classrooms; the Grade 3 classroom has all of the school's third graders while the Grade 4 classroom has only about half the fourth graders (the slower half). The lessons were conducted by two substitute teachers --the children's regular teachers were absent and the classes have been taken over by two men who ordinarily teach Grade 6. We left the office at about 9:20 AM and arrived at the school at 10:10. There is paved road all the way which is in excellent condition, although somewhat mountainous in places and with a couple one-way bridges. We arrived during morning recess and were served tea and cookies in a gazebo that is used by the teachers for their tea breaks.

Sogeri is a very pleasant and fairly well-to-do community at a high enough elevation to relieve the heat. It is surrounded by scenic mountains. The rainy season started in Sogeri in the last month so everything is quite green in comparison with Port Moresby.

The elementary school has about 350 children in Grades 1 to 6. Grades 2, 4, and 6 have two sections each, while Grades 1, 3, and 5 have only a single section. Apparently the children are divided by ability when there is more than one section per grade. (We were told later by the headmaster that the Grade 4 class chosen to participate was the "slow" section, a wise choice from our point of view.) One of the teachers asserted that most of the parents are educated, and it is obvious from the condition of the children's clothes and from the size and condition of houses in the neighborhood that these children are not the "poorest of the poor." (This information was also given to us by people in the Evaluation Unit of the Department of Education and the Evaluation and Research Unit of the university; apparently this community school is substantially above average.)

The school has a small library which we did not see. The playground is very large and covered with grass. There are a number of flower gardens around the several school buildings and the buildings themselves are attractively decorated, apparently by the children. We were told there is a school garden but did not see it. We were told it is not in good condition because of a plague of insect pests.

The children appeared to be reasonably well-nourished and were certainly active enough during their recess period. They were not in uniform but we were told that they are required to wear uniforms on Mondays, Wednesdays, and Fridays. The parents

must buy these uniforms, which cost 6 Kina (about \$6.50) for boys and 6.50 Kina (about \$7.00) for girls. We were not told what happened if the parents could not pay.

Classes started at about 10:35. In Grade 4, the headmaster moved the children to the front of the room, putting them three or four in seats that are designed for two. Apparently it is fairly common practice here with educational radio programs to move the children to the front of the room near the radio. This may possibly be because of the poor signal, poor receivers, or run-down batteries. The radio in Grade 4 was left at the front of the room; in Grade 3, the radio was positioned in the center of the room and the children were told to turn to face it. We agreed that we did not like the procedures used in either classroom. Children should not be instructed to look at the radio since they will have other materials in their hands to look at. And children should remain in their own seats so they have enough room to do the activities required in the Radio Science lessons. If the reception is poor, it may be a good idea to put the radio near the center of the room, but the children should not be instructed to look at it. The headmaster and one other teacher remained in the Grade 4 classroom to observe the lesson.

The classrooms are quite well furnished. The rooms are furnished with fairly standardized double desks with attached benches large enough for two children. There were enough places for all the children. The aisles are quite wide, allowing the children to stand (if we want to do standing exercises). The blackboards were sizeable and in fairly good condition. We did not get a chance to inspect textbooks and other educational materials.

The children were very well behaved and shy to the point of embarrassment. Although they were curious about us, they tended to look at us sideways rather than staring. They may have been on their good behavior because of the presence of such strange looking visitors. Their behavior was quite repressed and their oral responses during the radio lesson were very soft. One hopes they will loosen up and be a bit more boisterous after a few lessons.

The teachers explained that the children would listen to a new kind of radio science lesson. The children were told to listen carefully and to do what the radio teachers told them. In Grade 4, the teacher used an example of the kind of questions they would be asked by the radio teacher ("Are you all Grade Four children?" "Yes, we are.") The exercise pages were passed out. In Grade 3, the teacher explained the exercise pages fairly carefully to the children, pointing out the exercise numbers and some of the pictures. The teachers told the children to put aside the exercise pages for now (which they all did), and wait until the radio teachers told them what to do with the pages. All in all, the teachers did very well in introducing the lesson; we can only hope that all of our teachers will do as well. The Grade 3 teacher also made sure the children all had pencils (although pencils are not used in this lesson). Both teachers took about 10 minutes for this preparatory activity. The taped lesson started at about 10:45. The Grade 3 teacher had some trouble finding the "play" button and the volume adjustment (one of the observers

helped him). In the future, teacher training for classes that will use cassettes should include instruction in the mechanics of the cassette recorders and the teachers should be allowed to practice for a few minutes in case they need additional help.

Segment 1, Introduction: There was some amusement expressed when Miss Vagi, one of the radio teachers, was introduced since the headmaster of the school is also named Vagi. When the children were asked to put their papers aside, they made an attempt to do so although it was difficult in the Grade 4 since the children had so little desk space (with four children sitting at a desk built for two). They did, however, leave their papers on the desk and did not seem to be distracted by them while they were doing the initial oral exercises. When Mr. Raka, the second radio teacher, said that he is 190 cm tall, the Grade 4 teacher showed with his hand how tall 190 cm is.

Segments 2-4, Oral answers: When the children were told to "sit up straight and get ready to answer aloud," there was a visible shifting as children who were already sitting straight tried to sit even straighter (evidence that they were listening and understanding). To the first question, "Have you ever seen a dog?", most answered but very quietly and hesitantly. With the repetition of the question, the response strengthened. We expected a response of "yes" to this question but most of the children answered "yes, we have." Later in the segment, to the question "How many legs does a dog have?", the children answered "four legs" instead of just "four." This happened more in Grade 4 than in Grade 3. It may be due to training from their English lessons. We will have to consider whether we want to reinforce these long answers or train the children to give shorter, more conversational answers.

Throughout the segment, but especially to the questions, "Have you ever seen a chicken?" and "Does a chicken have feathers?", the responses seemed to be quite hesitant. In conversation with the teacher later, we learned that most of the educational radio programs use a sound signal to indicate when children are supposed to speak. It may be that the children were waiting for some kind of a signal. (This kind of sound cuing is a device frequently used by inexperienced script writers to compensate for their inability to write natural dialogue in the interactive style.) I think the children understood the questions and knew how to answer but they wanted to answer in chorus so they were looking around at their neighbors to try to judge when everyone was ready. For some of the exercises, the Grade 4 teacher helped a little by giving them "conducting signals" to tell them when to answer. We need to devise some way of telling the children to answer immediately, not to wait for a special signal.

The question "Do pigs have feathers?" was the first question for which the correct answer is no. Several children fell into the trap of simply saying yes to all questions. The reinforcement message seemed to clear up the problem, however, so no change in the script is indicated.

It seemed that the pauses for response were a bit short.

This is due to two factors:

- o The children sometimes hesitated a second or two, waiting for a cue to answer.
- o The children sometimes gave longer answers than we expected.

It would seem advisable to lengthen the pauses a little until we have time to train the children to speak up faster and to give shorter answers (if that is what we decide to do).

There were no responses at all to the question "Which has four legs, a bird or a cow?" This may have been because this was the first question of this type.

There were few responses to the question "Do cassowaries have feathers?" We think the children do not know the English word "cassowary." They may know what a cassowary is but not know the English word.

Segment 5, Physical exercises: Some children giggled and some smiled when the music started. There was 100% participation for the instructions to breath deeply and to raise and lower their arms. The teachers modeled this behavior but it appeared that the children also understood the oral instructions when they included the phrases "over your head" or "up high". The word "stretch", meaning to raise your hands up over your head, was misunderstood by almost all children (and perhaps the teachers). That seems to have been an infelicitous choice of words.

The instruction not to stand up in your seats was quite unnecessary; these children are too reserved to do that. In the second part of the physical exercises (bending from side to side), almost no one understood the instructions.

The timing throughout the physical exercises was excellent. This timing must be done in the studio, not in the script, so it is to the credit of the producer and the actors that this was so well done.

The children enjoyed the physical exercises but we will need to tighten up the instruction for these activities if they are to be included regularly in the lessons. It is difficult enough to write such instructions for native speakers of the language and may be nearly impossible for these children. One thing we might consider doing is illustrating the actions on the exercise page to teach the children what the words mean before the exercise starts.

Segment 6, Hand raising: When the children were asked to raise their hands if they wanted more stretching and bending exercises in another lesson, a large majority responded. It appears that they are accustomed to responding in this manner.

In the next exercise, to the command "raise your hand," the children responded by raising both hands (as they had been doing in the previous physical exercise). The phrase "just one hand" was so beautifully timed it seemed that the radio could see the children.

To the request that boys raise their hands and then that girls raise their hands, the response was 100%.

The requests to raise hands if you were wearing red elicited much less response; there were few children wearing red and they appeared not to want to be singled out.

When the radio asked who was wearing a dress, there was no response. It may be that the children use some other word, such as "frock," or it may be that there was no one wearing a dress (the girls I saw seemed to be wearing skirts and blouses).

A later request for all those wearing shorts to raise their hands elicited a perfect response.

To the question about who is wearing a hat, no one raised their hand --the correct response.

The concern that the children might indiscriminately raise their hands to all questions is now laid to rest. However, if we use these questions in the future, we should try to use questions that will apply to at least half of the children, at least until they get over being so shy.

The timing in this segment was good.

Segment 7, Introduction to exercise page using "first", "next", and "last", Exercise 1 to 5: (The exercise numbers here refer to the numbers used on the exercise page.) The children all understood the instructions to pick up their exercise pages. About 3/4 of them answered the questions "Do you have page one?" and "Do you see the exercise numbers?". (All of them did have page one and they had no trouble later in finding the exercise numbers. They just didn't all answer aloud.)

All in all, this segment went extremely well. The children had no difficulty in finding their way around the exercise page and seemingly had good understanding of the words "first", "next", and "last."

There were some minor problems with the drawings and with the objects chosen as illustrations:

Exercise 1: The drawing of a cat was not recognizable to some.

Exercise 2: The children either did not know what a stool is or did not have the English word for it. It may be that the stool depicted on the exercise page is not similar to stools found in the country.

Exercise 3: No problems.

Exercise 4: Some of the children used the word "lady" instead of "woman".

Exercise 5: No particular problems but the drawings could be improved.

Throughout this segment the timing was good.

Segment 8, Exercises 6-10, using "first", "second", "third", and "fourth": The children seemed quite attentive and had little difficulty with the exercise page except in the first exercise. In the first exercise, Exercise 6, the script first mentioned all of the things by name, going through them from left to right. Then the children were asked to say which is second, first, and

fourth. The reason for going through all the objects in order first was so that the children would hear the names of all the objects in the picture. This is to help be sure that the children will answer with the words we have used in the reinforcement messages. (It turned out in several later places that some of the children did not use the words we expected so such kind of preparation is indeed advisable.) However, some children became confused because they thought they were through with this Exercise 6 after all of the objects had been named once. When asked to find the second thing, they were looking at Exercise 7. To prevent this kind of problem, the exercise should have used only objects we were sure the children could name and started right away with the mixed order questions. For the rest of the exercises, there was good, but not hearty, participation. The children had no difficulty with the exercise page nor with the form of the question but did seem shy and hesitant to answer (possibly still waiting for a more definite cue).

In Exercise 7, some of the children said "plane" instead of "aeroplane."

The chatty introduction to Exercise 10 was not well received and should be cut.

The timing was good throughout the segment.

Segment 9, Discussion of judging taller and shorter, Exercises 11 to 15: The initial dialogue between Mr. Raka and Miss Vagi about standing side by side to see who is taller seemed to bore the children. It is not clear that they got anything out of these two pages of script. Later, when they went back to the exercise page, the interest increased. The responses to Exercise 11 were good (and no one called the woman a "lady"). There were fewer responses to Exercise 12; it is not clear why. Exercises 13, 14, and 15 went well. The timing was good, the children seemed to understand the form of the instructions, and the only problem is that the children pause unduly before giving a response, and then respond very quietly and shyly.

The art work needs to be improved. The stress in this segment is on comparing the lengths of things by holding them side by side so the objects should all be shown side by side rather than arranged in the random order they now appear.

Segment 10, Discussion of direct comparison versus measurement: This segment was a dud. There was too much talk with not enough action. The children didn't seem to get the idea. Some were listening and trying to understand but others didn't seem to be interested. Although a few children murmured an answer to the one question that was addressed to them ("Can they stand side by side?"), they answered incorrectly.

In another place, there was a question from one radio teacher to the other. Several children answered this. We will have to take great care to be sure that the children understand which questions they are supposed to answer.

Other comments: We were all pleasantly surprised that the lesson went so well. The children were interested and participated as

well as could expected for a first lesson. This is probably the best first lesson to be produced by any of the interactive radio projects. This is not to say that it is a really good lesson; one segment was a complete loss (Segment 10) and several others (notably Segment 9) need to be revised substantially.

In general, the level of instructions and the kind of exercises seemed to be quite appropriate for the level of development of the children.

We now know that we will have to take considerably more care with the language we use in the lessons. Although it appeared that the syntax was simple enough to be understood by the children, we used a number of words that were foreign to them (cassowary, stool, stretch, bend). A tight control on vocabulary will be needed. An organized system of collecting baseline data on the children's vocabulary would help considerably.

We realize that the success of this lesson in this school does not adequately foretell what will happen in more deprived classes but we feel that the information we now have for improving the lesson will help make the second version accessible to more children.

The two teachers involved performed exceptionally well. We can only hope we will have many more such teachers. They introduced the lesson very well, served as adequate models for the children's responses (most of the time), and did not interrupt the radio to explain, translate, or amplify.

So far as we can tell, the teachers' guide served quite well. We will know more after we talk to the teachers to get their reactions and suggestions.

The format of the exercise page seems to serve adequately. We will have more information on this with Lesson S3 which uses a somewhat more complex format.

The observation sheet could be improved. More space is needed for comments for each segment. The topic identifiers in Column 2 were not helpful and took up space that could be better used. There was not enough room after the specific questions to write answers to them. A copy of the children's exercise page should be attached so comments can be written directly on it.

The speed of speech seemed all right for these children but it may be too fast for children with less ability in English. We need more information on this question.

The music was very good throughout. Obviously the children enjoyed it.

The pauses generally seemed about right but they should be lengthened in the first four segments and an effort should be made to encourage the children to answer faster (and give shorter answers). We might want to try a verbal game with very simple questions in which the object is to see who can answer first.

The physical exercise segment (#5) should be rewritten to

change the words "stretch" and "bend" to something the children understand. Or one could illustrate these actions on the exercise page before beginning the segment.

J. Friend  
1 Nov 86

Summary of Observations  
Radio Science Pilot Lesson S2, Version 2

Date:	31 Oct 86	31 Oct 86
School:	Sogeri	Sogeri
Class:	Grade 3	Grade 4 (slow)
Teacher:	M. Koloa	Taumuia
Observers:	Kerrison	Chaytor
Number of children:	33	25

This lesson is a teacher-led lesson, using a teachers' guide prepared by the Radio Science Project.

The time taken was about 35 minutes in Grade 3 and 40 minutes in Grade 4 (both started at about 10:35, right after recess). The lesson was planned for 30 minutes so it is a bit long.

In both classes, there were two other teachers who were observing the lesson.

The teachers were well organized and maintained good discipline throughout even though the activities used are somewhat conducive to disorder.

The teachers started by reviewing the concepts and vocabulary ("measure" and "length") introduced by yesterday's radio lesson. In reviewing, one teacher mentioned that we do not have to measure to find out answers to some questions about length. In Grade 4, the teacher introduced the word "pair" as equivalent to "in twos." He then introduced the word "partner" and helped the children to choose their own partners.

In Grade 3, the teacher reviewed vocabulary of comparatives and superlatives but seemed himself not to have mastered these. He used complete sentences and expected complete sentences from the children in response.

The first exercises involved comparing the lengths of pencils, thumbs, etc. The children enjoyed these activities and participated well. In comparing the pencils, one of the teachers reinforced the vocabulary "side by side" after asking the children to explain how they knew which pencil was longer. He also asked the children with the shorter pencil to show their pencil to prove that the pair had really made the right choice of longer pencil. As a further illustration of "side by side", the teacher asked two children to come to the front of the room and stand side by side. He chose two children who are nearly the same height so that the decision as to which is taller was not immediately apparent.

When the problem of comparing waist sizes was broached, the children in Grade 3 had a number of suggestions such as standing one behind the other, but did not come up with the idea of using a rope or string; the teacher finally suggested a belt. The children in Grade 4 suggested a rope but teacher suggested that a belt is better because it has notches that can be used to mark the

precise place.

The activities that involved measuring with string became somewhat chaotic. Not all of the children learned to do this on their own. Some of them observed other children. And in one class, the teacher had to help the children. The children tried to use a midsection of the string, rather than measuring from one end. Also, they would use a pencil or pen to mark their place on the string and then become confused about which mark was which when they used the same string to measure other things.

When asked to measure their arms, the children didn't know which part of their arm was to be measured. The instructions in the teachers' guides should be more explicit on this point. It might also be advisable to illustrate the teachers' guide, showing where these measurements are to be made.

In the activity in which the children compared head sizes, two pairs of children had the same size head. Both of one pair stood up when the teacher asked for the partner with the bigger head to stand. In another pair, both stood up when the teacher asked for the partner with the smaller head to stand.

In Grade 3, the teacher seemed at a loss for how to end the lesson. He seemed to want some kind of summary at the end of the lesson. The teacher finally decided to summarize using the word "compare." In Grade 4, the teacher summarized by asking "How can you find out how long or big something is?" Three methods are possible: guessing, standing side by side, and using string.

In Grade 4, the teachers let the children keep the string for use in later lessons. In Grade 3, the teacher collected the string. The guide should be more clear on this point. In general, the teachers did an excellent job of conducting these activities. We will know more about their reactions to the activities and the guides next week when they are interviewed.

Recommendations: The number of activities needs to be cut down. The guide should be more explicit about what language to review and reinforce. The instructions need to be made more explicit for how to measure your waist using a string and what part of your arm to measure; pictorial illustrations would help. And there should be a summary section.

J. Friend  
4 November 1986

## Summary of Observations

### Radio Science Pilot Lesson S3, Version 2

Date:	3 Nov. 86	3 Nov. 86
School:	Sogeri	Sogeri
Class:	3	4
Teacher:	?	?
Observers:	Kerrison, Hill	Friend, Tilson
Number of children:	36	20

This is the third pilot lesson, the second taped lesson (Lesson 2 was a teacher-led lesson).

In each classroom there were other teachers observing the lesson. We could not object since we were imposing on the school to help pilot test these lessons, and the teacher-observers were fairly unobtrusive. Nevertheless, it has an inhibiting effect on the children, and it is to be hoped that this will not happen too often in future formative evaluation classes.

Both classes started shortly after 10:30 with the teachers reviewing procedures and principles from previous lessons. In Grade 4, the teacher again asked the children to move to the front of the room. He reminded the children to answer aloud and when he handed out the exercise sheets, he told the children not to write on these. He then handed out the plain paper and told them these papers were for writing. About then he realized that it wasn't a good idea to have the children crowded into the first few desks so he sent them to their seats to get pencils and to remain in their own places.

In Grade 3, the radio was again placed in the center of the room. The teacher reminded the children to answer aloud when told to. He explained that they should write when the radio teacher says to. He handed out the two papers and explained which one the children were to write on. We saw no evidence that children were inclined to write on the exercise sheet so this introduction worked quite well. Hill later suggested that "lined paper" and "plain paper" were not the best way to describe this; we should use "writing paper."

In both classes, the cassette recorder was turned on at about 10:40. (The teachers used between 7 and 10 minutes in the introductory remarks and arrangements; it is important to note this since future teachers will need to be told how much time to allow before tuning in to the broadcast lesson.)

Segment 1, Introduction: There seemed to be no confusion about which paper was which; almost all of the children held up their writing paper when asked (the teacher did show them which paper to hold up so it may be they were following the example rather than listening to the instruction). The instruction to "put the paper to one side" may not be the best; in some cases there isn't room

to put it aside and in other cases, the children may not understand the instruction; it would be better to ask them to "put the paper down."

The pause to get their pencils ready was not necessary in these classes as all children already had their pencils (I would not eliminate it, however, for we don't know if other teachers will be as well organized.)

Segment 2, LANG 4.5 more, less; MISC 2.1 Write letters or numbers on paper in response to oral instructions: There was marked difference in the responses of the Grade 3 children and the Grade 4 children to this segment. In Grade 4, all of the children participated in the written work. Although there was again some initial hesitation in giving oral answers, almost all participated. In Grade 3, in contrast, only 1/4 of the children participated in the first exercise; others joined in later, but there was some difficulty, especially with the question "Which is more, 5 or 6?" There was a suggestion that "more" be changed to "bigger" but this seems not to fit the topic since this is a lead-in to questions like "Which is more legs, two or four?" Also, the children answered later questions with the word "more" so their hesitation may simply be because of the change of question form.

Segment 3, LANG 1.3 before, after, Exercises 1-5: In both classes, the response to the first question was very hesitant, but participation improved later. It still seems that the children know the answers but are waiting for a cue to answer. The children had no difficulty with "before" and "after" (meaning in order from left to right) and identified the objects with ease (although there was a bit of hesitation with the spade).

Segment 4, LANG 4.5 more, less, MISC 6.1 Copy letters or numbers from exercise sheet, Exercises 6-10: In these exercises, the children are asked to compare the number of legs on two animals pictured on the worksheet, then write the number of the exercise on their writing paper, and beside that the letter that identifies the correct answer. This is probably the most difficult written response format that would be used in the lessons and the children did very well. Again, there was some initial hesitation, especially with oral responses, but it seems the children understand the task quite well. There was one exercise that didn't have a long enough pause; in Exercise 7, the children had to compare the number of legs on a spider and a fly but the answer is not obvious and there was not enough time to count the legs.

In writing the answers, the answer sheet was supposed to look like this:

6	A
7	A
8	B
9	B
10	A

but some of the children did not put the letter (answer) on the same line with the exercise number. Their answers looked like this:

6 A  
7  
A  
8  
B  
etc.

We collected the papers at the end of the lesson so we can analyze them more carefully. But it appears that the instruction for where to write the letters needs to be written more carefully.

In Exercise 9, the comment "worms don't have legs" seemed to be unnecessary.

Segment 5, Physical Exercises: (Note that Segments 5 and 6 are misordered in the lesson outline on the first page of the script.) The children seemed to enjoy the physical exercises; at least, they smiled when the music started and they all participated. As soon as Mr. Raka said "Let's do some stretches and bends," the children noticeably straightened up. There was 100% participation in stretches, and much better understanding of bends than in Lesson 1 (so the children are learning), but there was some hesitation and less participation in the part about tipping the head forward and back (the teachers had to model this). All in all, it went very well. The timing and the music were excellent.

Segment 6, LANG 2.3 how (big, little,...), LANG 2.8 length, LENGTH 2.1 "Measure" pictures of objects (pencils, nails, needles) where a picture of a ruler is printed alongside a picture of the object to be measured, Exercises 11-15: A few children seemed to be confused about which paper to use at the very beginning of the segment, but this quickly cleared up. Note that these exercises are printed in the second column of the exercise page. This did not cause any of the anticipated difficulty so apparently the instructions were adequate.

At the beginning of the segment, Mr. Raka gives the instruction "Everyone, say centimeters. (pause) Centimeter. That's an important word." A number of the children said "centimeter" during the pause and again after Mr. Raka repeated "centimeter." The repetition should be deleted so the line reads "Centimeter is an important word."

Even with this warning, the children in Grade 3 did not say "centimeters" when answering the questions like "How long is the pencil?" After Exercise 13, Mr. Raka asks "Did everyone remember to say centimeters?" and they answered "yes," a lie. The question did serve its purpose, however, for thereafter they used "centimeter" in their answers. This difficulty did not occur in Grade 4; the children gave a full answer, "eight centimeters," even to the first question. This is probably a reflection of the fact that measurement in centimeters is introduced in math in Grade 4 (so the Grade 4 children should know it, but not the Grade 3's).

Incidentally, Mr. Raka's question "Did everyone remember to say centimeters?" was intended as a rhetorical question but the children in both classes answered it. This difficulty had been anticipated so there was a slight pause after the question and the children's answers did not drown out ensuing lines. But this is clear evidence that the rule about not using rhetorical questions should be followed in the Radio Science scripts.

In Exercise 12, the instruction was "Look at Exercise 12.... Look to see how many centimeters long the nail is.... How long is the nail?" A number of children answered before hearing the question "How long is the nail?" We will need to take more care in cautioning children to think without answering when such questions are posed.

The teacher in Grade 4 was cueing the children as to when to answer so so there is evidence that they still haven't caught on that they are to answer right away.

Segment 7, LENGTH 2.2 "Measure" pictures of objects (pencils, nails, needles) where neither end of object is lined up with zero-point of ruler, Exercises 16-19: Exercise 16 shows a nail beside a ruler with the head at the 1 cm mark and the point at the 4 cm mark. The first question was "Is the nail four centimeters long?" In Grade 4, the children answered yes (which is wrong); in Grade 3, some said yes, some no, and some mumbled. After a bit more explanation about how the nail was misplaced, the Grade 4 children guessed correctly that the nail is 3 cm long.

Exercise 17 is similar except the nail (same nail) is placed 1 cm beyond the end of the ruler so the end is at the 2 cm mark. The Grade 4 children were quite sure this was wrong, and again guessed correctly that the nail is 3 cm long. Some of the Grade 3 children also did this correctly but the participation was far from 100%. It was suggested that order of Exercises 16 and 17 be switched; this might eliminate some of the initial wrong answers, but my impression is that most of the Grade 4's did get the point anyway and that most of the Grade 3's would find the material too difficult regardless of how it is presented.

Exercises 18 and 19 went reasonably well in Grade 4 but seemed to tire the Grade 3 children (probably indicating that the exercises were too hard).

The most instructive finding in this segment is that children at the end of Grade 4 have some experience in measuring while children in Grade 3 have little or no experience. If we want to do anything with measurement in Grade 4, we will need to teach the entire topic from scratch. In Grade 5, we will probably need to include substantial review (at about the level of this lesson). In other words, this segment is more appropriate for Grade 5 than Grade 4 (which is in agreement with the math syllabus).

Segment 8, MISC 4.1 Fold paper, LENGTH 2.3 Make a ruler by folding a piece of paper and marking 10 places at one centimetre spacing, using a ruler printed on an exercise sheet: This segment contains by far the most difficult tasks required by these lessons and the

folding paper part went surprisingly well in the Grade 4 class. The children in that class listened, seemed to understand, and neither lagged nor anticipated the instructions (this was one of the expected difficulties since Miss Vagi explained the task in some detail before the children were supposed to start doing it). Most of the Grade 4's seemed to be follow the instruction without difficulty and folded very carefully; a few looked at their neighbors' work for help, and a few needed help from the teacher. The work did not go so well in Grade 3. Most of the children needed help from the teacher; even one of the teacher/observers pitched in to help. The children tried to hold the paper up while they were folding it instead of putting it down on the desk (the instructions should be written better). The pauses were definitely too short for Grade 3.

In the part that required the children to make marks one cm apart on their folded paper, and to label those marks with numbers 1, 2, 3, etc., the pauses should have been a bit longer. All children were trying very hard, seemed to know what was expected, and did quite well. In Grade 3 there was more difficulty than in Grade 4 but the children there also seemed to understand the task even though they didn't do it very well and were quite rushed because of the short pauses. (The papers were collected after class and a further analysis of these responses will be made.)

Other comments: The first part of the lesson (up to the measurement activities in the second column) went amazingly well. It seems the children have especial difficulty with the language and understood (or rapidly learned) the sense in which we were using the words "before" and "after." None of the children had marked difficulty with the written exercises, even the very difficult formats in Segment 4. The children seemed to enjoy the work with the exercise pages and were able to participate with enthusiasm in the physical exercises. There is still noticeable hesitancy in given oral responses, but not because they don't know the answers. I suspect this could be helped some by providing game-like segments in which the purpose of the game is to answer as fast as possible; because the children seem to prefer large group responses to individual or small group response, this might be a contest between two halves of the class.

The measurement activities separated out the two groups. The Grade 4's did very well but the Grade 3's didn't indicating that the level was more appropriate for Grade 5 than for Grade 4.

Throughout the lesson, the speed of speech and the music were very good. With children who are less competent in the language, we will probably want a slightly slower speed of speech, however. The pauses were generally excellent (except for the few places previously mentioned). There were some places where the actors put the stress on the wrong words in a sentence, but the fault wasn't so serious as to confuse the children, and this problem will be cleared up when more professional actors are chosen for the next version.

J. Friend  
5 December 1986

## Analysis of the Children's Written Work

As a part of Student Lesson 3 (S3), the students were asked to participate in some writing and paper folding activities. The written exercises were done using a blank sheet of lined paper to write on; in some exercises, the children referred to the exercise page from the lesson. Basically the students were asked to observe something in one of the boxes on the exercise page and then respond with a written answer on their lined paper. Later, they also used this same sheet of writing paper to make a centimeter ruler.

In the first section of the written work, the students were simply asked to write down a number that was dictated to them. There were three such problems. They were to begin at the top of the page and write each succeeding number on the next line down. In the third grade class, 100% of the children were able to write the correct numbers and begin at the top of the paper. 97% wrote the numbers one under the other.

In the fourth grade class, again 100% of the children wrote the correct numbers and began at the top of the page (one child wrote the numbers both in words and numerals). 80% of them wrote the numbers one under the other. Most the children did quite neat work and the numbers were well formed by almost all of them.

In the next group of exercises the students were asked to write down which of two numbers was more. In Grade 3, 86% wrote the correct number and in Grade 4, 90%.

In the next group of exercises, the students were asked to write the exercise number on the paper and then the letter of the correct answer from the exercise page next to it. In the third grade class, 50% of the children followed the radio instructions correctly and the rest either put the letter answer on the next line down after the exercise number, or listed all of these problems on one line horizontally. All of them wrote the correct answers.

In the fourth grade class, 80% of the children followed the radio instructions correctly and again, all of them wrote the correct answers.

The next activity the children did with the paper was to fold it and make it into a ten centimeter ruler copying the picture of the ruler on the exercise page. The folding instructions were given orally and they were also told to look at the folding instructions drawn on the exercise page. Then they were told to line up the end of their paper to the end of the ruler printed on the exercise page and mark the one to ten centimeter marks, writing the numbers beside the marks as they went along.

In the third grade class, all the children got their papers folded into adequate rulers. Most were able to follow the radio instructions exactly although 2 or 3 children made several extra folds. 44% of them were able to complete their rulers

correctly, complete with numbers. Of the remaining 56%, most were at least able to place the ten centimeter marks on their rulers. The most common problem was not aligning the edge of their paper ruler with the edge of ruler printed on the exercise page. All but one child were able to make the marks with proper spacing between them.

In the fourth grade class, 85% of the children completed their rulers correctly with the remaining 15% making errors similar to those made by the third graders. All of the children had the marks aligned correctly.

Generally, the written work was quite well done, with the fourth graders' work being a bit neater and better. Having children use a blank sheet of paper along with an exercise page appeared to work well and could continue to be used. The difficulties experienced by the third grade children in making rulers could be overcome by writing the instructions more carefully, with particular attention to the problems of lining up the end of their ruler with the end of the printed ruler.

Name: *Abenna Nicholas*

4

2

3

6

7

A

8

Fourth Grade Student  
Answers and Form Correct

6 A

7 A

8 B

9 B

10 A

OF MANAU. MANAU

11  
2  
3  
6  
7  
4  
8  
6  
A  
7  
A  
B  
B  
A

Forth Grade Student  
Answers Correct, Error in Form

4  
12  
3  
6  
7  
4  
8  
6

Third Grade Student:  
Answers Correct, Error in Form

A 7 A 8 B B A

Fourth Grade Student  
Correctly Made Ruler

Third Grade Student  
Incorrectly Made Ruler  
Error in not beginning ruler on the edge of the paper.

1 2 3 4 5 6 7 8 9 10

Third Grade Student  
Incorrectly Made Ruler  
Error in format and incomplete.

Discussion of the Data Analyses  
from the Third and Fourth Grade  
Pre and Posttests

Two analyses of the pretest and posttest data were done; both analyses are contained in the appendix. The first analysis is simply a comparison of the number of correct answers on the pretest to the number of correct answers on the posttest to see how much gain there was between the two tests (remember that the same test was used as pretest and posttest). Comments on the analysis are given below.

The second analysis is a more detailed analysis of the responses given, including both correct and incorrect responses; this analysis was done for the pretest only. The report (found in the appendix) includes a description of the test, showing both the oral instruction and the printed item.

Correct Answers by Item

The correct answers were analyzed from both the pretests and posttests for third and fourth grades. In the third grade class, the mean score on the pretest was 43% and on the posttest it was 55% for a difference of 12 percentage points. In the fourth grade class, the mean score on the pretest was 55% and on the posttest it was 69% for a difference of 14 percentage points. No measures of significance between the means were attempted on these scores because it was felt that any differences found could be attributable to an increase in test taking skills as much as to a real learning gain (significant learning gains are not likely to be achieved in just three short lessons).

Interestingly enough, however, when the topics that were not specifically taught were compared with the topics that were taught, it was found that the gain for the topics that were taught was much higher than for the topics that were not taught: There was a gain of 16% in third grade and 20% in fourth grade for the topics that were taught in the lessons; in comparison, the gains were only 8% and 7% in the topics that were not taught. This provides some evidence for believing that learning did take place in the three lessons.

It is interesting to note that the pretest scores for topics that were taught were the same for third and fourth grade (61%). (Overall, as would be expected, the third graders did not do as well as the fourth graders.) The gain for both grades was quite high, although not as high in third grade as in fourth (16% and 20%). The greater gains in fourth grade may be because the fourth graders had already been taught measurement in centimeters and these lessons served more as review than as initial teaching (they were, in fact, intended more as review).

In conclusion, it appears that there was some learning over the three lessons for both classes and that not all of this gain could be attributed simply to gains in test-taking skills.

## Analysis of Responses by Item

In this analysis only the pretests for the third and fourth grades were analyzed as it was felt that no significant data would be forthcoming by comparing the responses on the items between the pretest and posttest. This analysis serves as baseline information for the design of future lessons.

Items having to do with vocabulary and language were numbers 1, 2, 4, 6, 10 and 12. In general, items having to do with ordinal terms such as "second", "last", and "after" proved easy for the children. The exception to this was Item 2 ("Circle the kitten that comes after the mother cat."); in this item, we expected the most common wrong answer to be the kitten that comes before the mother cat, but the most likely error (for third graders) was the mother cat itself. In the wording of the test items the terms of reference for words like "second" and "last" were not explicit; it was never stated that we meant "second when counting from left to right" or "last in order from left to right." Surprisingly, almost all of the children understood the convention that was being used.

Item 10 is worthy of note as in this item the understanding of the word "scientist" was being tested. It proved to be a difficult item for both classes; only one student marked the correct response (in a multiple-choice item with three alternatives). About half of the students felt that "you should scientist your teeth every day."

In the items on linear measurement (3, 5, 7, 8, 9, 11, 13, 14, 15 and 16), neither grade did very well, but the fourth graders did much better than the third graders although not consistently so (as was pointed out, the third graders had not previously studied linear measurement in centimeters whereas the fourth graders had).

There were two items that tested skills involved in using a ruler, Items 13 and 15. The performance for Item 13 (writing the length of a pencil, given a picture of a pencil beside a ruler) is difficult to analyze; in this item, the fourth graders did worse, and their wrong answers appear more random than those of the third graders. In Item 15, in which a nail was shown between the one and five centimeter marks on a ruler, was felt to be 5 cm long by most of the students (58% in third grade and 39% in fourth grade).

There were two items that tested the children's intuitive idea of the length of a centimeter, Items 5 and 7. Item 5, in which the children had to decide if a man's finger is eight meters, inches, or centimeters long, shows a clear difference between the two grades; the third grade responses appeared to be nearly random whereas 64% of the fourth grades answered correctly. Item 7, in which the children are asked to estimate a length of one centimeter, showed that this skill was almost completely absent in both groups.

In Item 8, which asked the children to write "the short form" of the word centimeter, the third grade responses were wildly off the mark and seemingly completely random whereas there is evidence that the fourth grade children have at least heard the word centimeter before (half of the children wrote "cm" and the other half wrote either "centimeter" or "meter").

One item tested the relationship between centimeters and meters, Item 14, which asked "How many centimeters are there in a meter?" Only five students, all in fourth grade, answered correctly. The most common wrong answer in fourth grade was "1 centimeter"; other answers, in both grades, exhibited great creativity (e.g. "39 centimeters").

### Errors in the Test

One of the values of an analysis of incorrect responses is that it can indicate weakness in the test itself. Study of the data revealed four items that were questionable.

In Item 1, the children were asked to "circle the second animal." This animal happens to be a chicken. Since there are many people who do not classify birds as animals, the children may simply have skipped to the next object in line. (This interpretation would account for about 10% of the errors.)

There was an error in the printed stimulus for Item 9; the phrase "two centimeters" should have been written beside the shorter nail. Notwithstanding, there were a surprising number of correct answers (about 40%).

Item 11 may have been ambiguously worded. The children were asked to "circle which is longer" and the printed choices were the phrases "one centimeter" and "one meter"; it may be that some of the children looked for the longer phrase.

Item 16 is similarly ambiguous; the choices were "50 centimeters", "2 meters", and "5 centimeters", so again the children may have looked for the longest phrase.

## Radio Science Pilot Lessons Conclusions

In general, when comparing the Radio Science pilot lessons to the pilot lessons from other projects the comparison comes out quite favorably. The materials were well organized, the quality of the recorded lessons was very good, observations and testing were carried out, and the lessons seemed to work quite well in the two classrooms.

These lessons bring into focus several key issues. One very important issue has to do with language. Since these lessons were used in a school in which the language ability of the students is reported to be significantly better than other schools, the level of language will have to be scaled down and controlled very carefully in the lessons.

Another important issue has to do with the use of writing paper and reusable exercise pages. It would appear that these materials caused no undue difficulty for the students and therefore they could be used as a prototype for the student materials that will evolve as a result of more formative evaluation.

The interactive model appeared to be as effective with PNG students as it has been in other countries with other subject matter. This may indicate which direction the development of the master plan may take for Radio Science.

The high quality of the pilot lesson recordings (even with sub-standard equipment, inexperienced temporary actors, and little time to work) is an indication of the capabilities of the project producer. With permanent actors, an organized production schedule, and better equipment (which the project will soon procure), one should be able to expect consistently high technical quality in the future.

Given the circumstances in which the pilot lesson materials were composed (initial work was done in North Carolina at Friend Dialogues with no baseline data from PNG), their success was surprising and a strong indication that the interactive radio instruction methodology has reached maturity. The segmented structure, high level of student participation, and the method of immediate reinforcement all worked exceeding well.

Besides the value of the pilot lessons in providing a starting point for the fourth grade lessons, the exercise also proved to be a valuable learning experience for the Radio Science field team. Although there was no practice in designing and outlining lessons or in writing scripts and tests, the rest of the production process was done in microcosm and provided practice in details of scheduling tasks, editing, reproducing materials, training teachers, observing classes, and administering tests. Issues that had once been theoretical for the field team assumed a new reality.

Although the pilot lessons proved to be a successful beginning for the project, there were nevertheless a number of deficiencies

uncovered, both in the materials and in the procedures.

Most of the deficiencies in the teaching materials have been mentioned (in the sections on classroom observations, analysis of written work, and analysis of test data). The main findings were:

- o Children at the beginning of fourth grade will not be competent in linear measure. If this subject were to be taught at this level, more complete and careful instruction would need to be planned.
- o Abstract discussions, especially where the conversation was between the two radio teachers without actively involving the classroom children (e.g., Lesson 1, Segment 10), were inappropriate, probably because of the children's language deficiencies, but perhaps because the content was too advanced.
- o Instructions for activities that involve work with physical materials (folding paper, using string for indirect measurement) need to be written with extreme attention to every detail. Although these went well enough in the pilot lessons because of the excellent support given by the classroom teachers, they caused enough difficulty to sound a note of caution for future lessons.
- o In several places, words used were not immediately understood (stool, bend, stretch) although the children gave evidence that they could learn these words readily.
- o The children tend to await some sound cue before responding orally. They also tend to give answers in the form of complete sentences or phrases, rather than the short, conversational answers expected. This combination of tendencies meant that some of the pauses were uncomfortably short.

Besides the errors found in the instructional materials themselves, there were several errors in the procedures used in conducting the pilot studies. First, some preliminary work that could have been done before Friend's visit in October was not done; some of these tasks, like the collection of baseline data, were simply left undone, while other tasks, such as revising the scripts and teachers' guides to make the language culturally appropriate, were done sketchily and hurriedly.

Another procedural error that may cause future difficulties was the selection of an atypical school. Sogeri School is in a community that is too well off and too well educated. More typical classes should have been selected. However, from a training point of view, Sogeri was a good choice. The staff learned more from seeing lessons go reasonably well than they would have had the lessons been tried in substandard classes with (perhaps) disastrous results.

With the exception of the classroom teachers in the two classes, there was no involvement of local people in the pilot testing; all work was done by expatriates, most of whom had been in

the country only a short time.

Another procedural error was that there was no immediate debriefing after most of the school visits. Consequently some of the information collected by individual team members may not have been included in this report. Teachers comments, for instance, were never written up and have not been included.

Pilot testing of three lessons in two classrooms, no matter how successful, is not adequate preparation for beginning a production cycle in a subject matter that has never before been taught by radio. The lessons used should now be revised, extended to a set of about six lessons, and tried out in five or six third-grade classes; these classes should be chosen from schools that are less advantaged than Sogeri School. The revision should include:

- o changing the time allocation to conform to the standards decided for the Radio Science lessons (30 minutes lessons, with 20 minutes of radio broadcast)
- o removal of the segments that teach linear measure, since this topic is not included in the Grade 4 Science Syllabus
- o removal of the segments that teach advanced response formats such as Lesson 3, Segment 4 (these should be put in later lessons, just before they will be needed for teaching some scheduled content)
- o addition of several segments directed at encouraging the children to respond immediately and to give short, conversational answers

Beyond these immediate lessons, the pilot study also provided some cautions for the future:

- o Great care needs to be taken to control both vocabulary and syntax. We strongly urge a systematic method for controlling these language variables.
- o A continuing effort in collecting baseline data will need to be instituted, with especially attention to the children's language.

Correct Answers, by Item  
3rd and 4th Grade Pretest and Posttest  
Radio Science

Item #	Description	Third Grade Percent Correct			Fourth Grade Percent Correct		
		Pre- test	Post- test	Diff.	Pre- test	Post- test	Diff.
* 1	Circle second animal [pig, chicken, dog, cat]	82	100	18	79	100	21
* 2	Circle the kitten that comes after the mother cat [kitten, kitten, mother cat, kitten]	53	94	41	75	92	17
3	Circle the widest door [3 doors (2nd widest)]	74	77	3	96	100	4
* 4	Circle the car that comes after the bus [bicycle, car, bus, car]	92	97	5	93	100	7
5	How long is the man's finger [8 metres, 8 inches, 8 centimetres]	13	63	50	64	67	3
* 6	Circle the fourth fruit [banana, mango, orange, pineapple]	90	97	7	93	100	7
* 7	Draw a line about 1 centimetre long	11	26	15	18	38	20
8	Write short form of word "centimetre"	3	3	0	54	58	4
* 9	Write how long the nail is [4 cm nail (2 cm nail shown for comparison)]	37	34	-3	43	54	11
10	Circle the correct sentence ["You should scientist your teeth every day." "Some scientists study animals." "A scientist cleans your teeth."]	24	31	7	46	50	4
11	Circle which is longer-- 1 centimetre or 1 metre [one centimetre, one metre]	11	11	0	36	29	-7

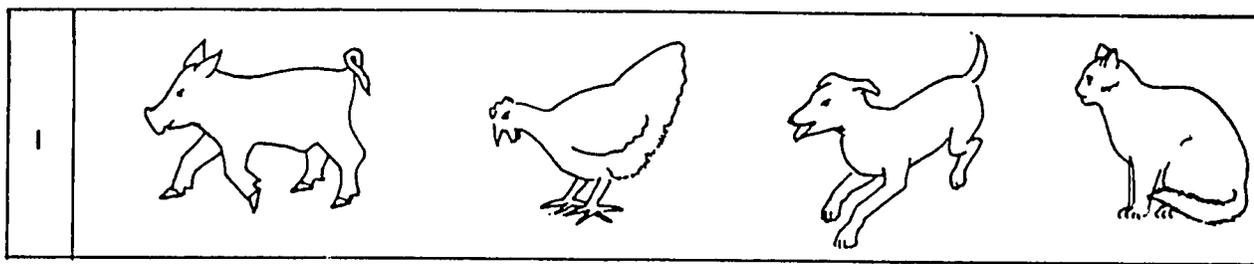
Item #	Description	Third Grade Percent Correct			Fourth Grade Percent Correct		
		Pre- test	Post- test	Diff.	Pre- test	Post- test	Diff.
*12	Circle the last person [4 people in a line]	100	97	-3	93	96	3
*13	Write how long the pencil is [pencil beside ruler]	74	91	17	43	92	49
14	How many centimetres are in a metre	0	0	0	18	46	28
*15	How long is the nail [nail beside ruler]	13	57	44	11	54	43
16	Circle the longest one [50 centimetres, 2 metres, 5 centimetres]	8	3	-5	11	21	10
Means (all items)		43	55	12	55	69	14
Means (topics not specifically taught or not much time dedicated to them; Items with no *)		19	27	8	46	53	7
Means (topics taught in pilot lessons; items marked with *)		61	77	16	61	81	20

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Analysis of Responses, by Item  
3rd and 4th Grade Pretests  
Radio Science Pilot Study

Item number:     1    

Oral Instruction:     Circle the second animal.    



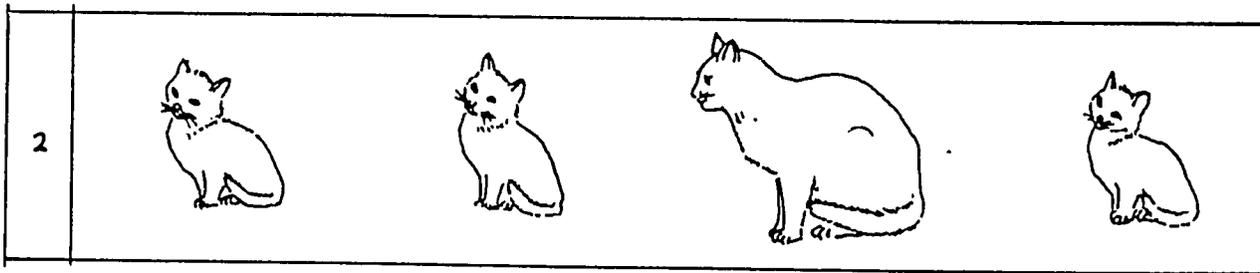
Answers	3rd Grade		4th Grade	
	# Students	%	# Students	%
*Chicken	31	82	22	79
Dog	5	13	1	4
Pig	1	3	0	0
Cat	0	0	5	18
Cat & Dog	1	3	0	0
Totals	38	101**	28	101

\*Note: For all items, the correct answers are marked with \*.

\*\* Rounding error

Item number: 2

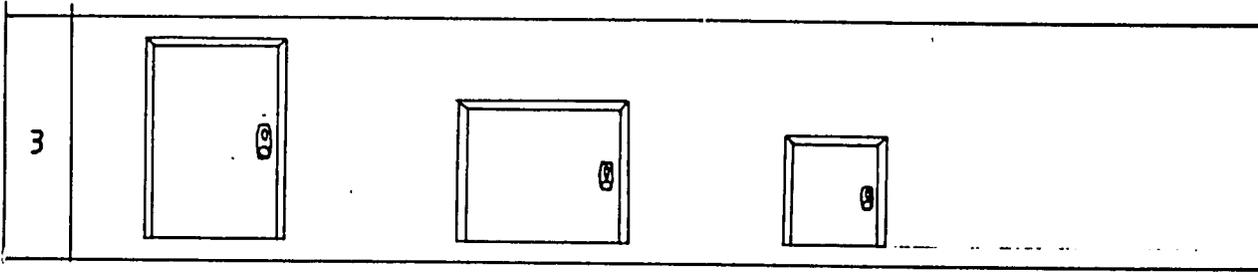
Oral Instruction: Circle the kitten that comes after the mother cat.



Answers	3rd Grade		4th Grade	
	# Students	%	# Students	%
*Third kitten	20	53	21	75
Mother cat	12	32	3	11
Second kitten	3	8	1	4
First kitten	2	5	3	11
No Answer	1	3	0	0
Totals	38	101	28	101

Item number:     3    

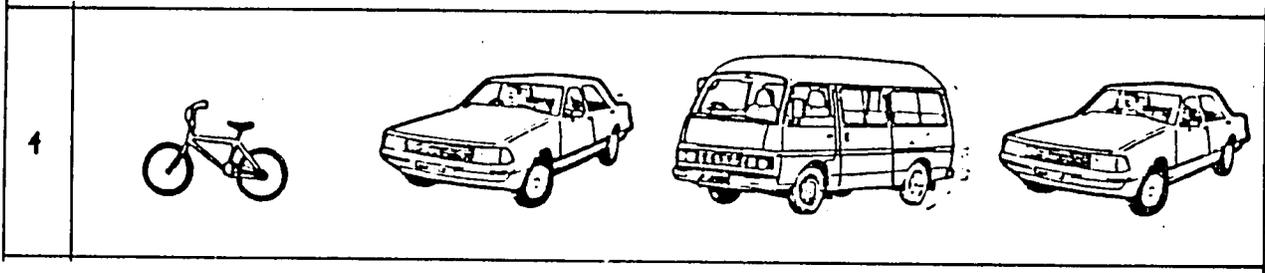
Oral Instruction: Circle the widest door.



Answers	3rd Grade		4th Grade	
	# Students	%	# Students	%
*Second door	28	74	27	96
First door	10	26	0	0
Third door	0	0	1	4
Totals	38	100	28	100

Item number: 4

Oral Instruction: Circle the car that comes after the bus.



Answers	3rd Grade		4th Grade	
	# Students	%	# Students	%
*Second car	35	92	26	93
Bicycle	2	5	0	0
First car	1	3	2	7
Bus	0	0	0	0
Totals	38	100	28	100

Item number: 5

Oral Instruction: How long is the man's finger?

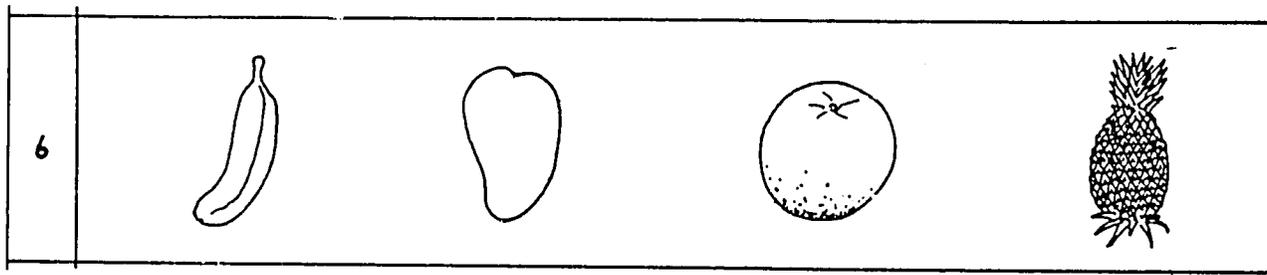
5	The finger is 8 metres long.
	The finger is 8 inches long.
	The finger is 8 centimetres long.

Answers	3rd Grade		4th Grade	
	# Students	%	# Students	%
8 inches	17	45	3	11
8 metres	7	18	7	25
*8 centimetres	5	13	18	64
8 metres & 8 inches	5	13	0	0
8 metres & 8 centimetres	2	5	0	0
8 inches & 8 centimetres	2	5	0	0
Totals	38	99	28	100

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Item number: 6

Oral Instruction: Circle the fourth fruit.



Answers	3rd Grade		4th Grade	
	# Students	%	# Students	%
*Pineapple	34	90	26	93
Banana	2	5	1	4
Orange	1	3	1	4
Mango	0	0	0	0
No response	1	3	0	0
Totals	38	101	28	101

Item number: 7

Oral Instruction: Draw a line that is about 1 centimetre long.

7	
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Answers	3rd Grade		4th Grade	
	# Students	%	# Students	%
16 centimetres	12	32	2	7
6 centimetres	6	16	2	7
7 centimetres	5	13	2	7
*1 centimetre	4	11	5	18
5 centimetres	4	11	4	14
4 centimetres	3	8	2	7
9 centimetres	0	0	2	7
11 centimetres	0	0	2	7
2 centimetres	1	3	3	11
3 centimetres	1	3	2	7
10 centimetres	1	3	0	0
14 centimetres	0	0	0	0
"1 metre"	0	0	1	4
"60 centimetres are long"	0	0	1	4
<b>Totals</b>	<b>38</b>	<b>100</b>	<b>28</b>	<b>100</b>

Item number: 8

Oral Instruction: Write the short form of the word centimetre.

8	<hr style="width: 50%; margin: 0 auto;"/>
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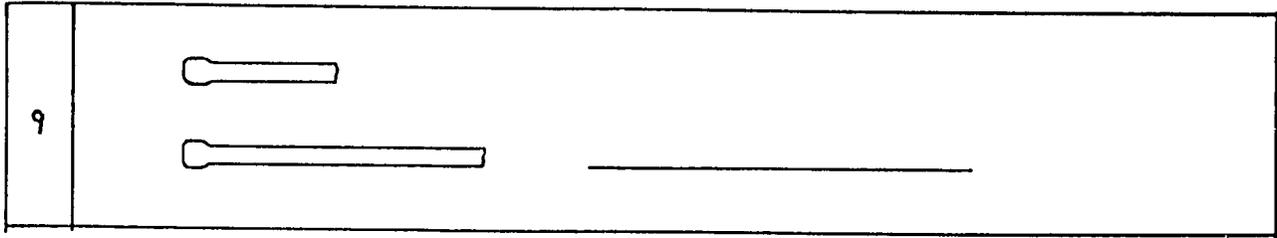
Answers	3rd Grade		4th Grade	
	# Students	%	# Students	%
"Centimetre"	7	18	7	25
"Metre"	6	16	6	21
"Inches"	2	5	0	0
"----" (little line)	2	5	0	0
"sisem mese"	2	5	0	0
No response	2	5	0	0
*"CM"	1	3	15	54
"STM"	1	3	0	0
"Box"	1	3	0	0
"Chair"	1	3	0	0
"Bad"	1	3	0	0
"Sani"	1	3	0	0
"Boys & Girls"	1	3	0	0
"tacng"	1	3	0	0
"KG mile"	1	3	0	0
"cauter then"	1	3	0	0
"6"	1	3	0	0
"20"	1	3	0	0
"staneing"	1	3	0	0
"finger ris"	1	3	0	0

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Answers	3rd Grade		4th Grade	
	# Students	%	# Students	%
"60 m long"	1	3	0	0
"the seter minting"	1	3	0	0
"sovn"	1	3	0	0
Totals	38	105	28	100

Item number: 9

Oral Instruction: Write how long the nail is.



Answers	3rd Grade		4th Grade	
	# Students	%	# Students	%
*4 centimetres	14	37	12	43
3 centimetres	13	34	4	14
6 centimetres	2	5	0	0
9 centimetres	2	5	1	4
1 centimetre	1	3	3	11
2 centimetres	1	3	1	4
2 & 4 centimetres	1	3	0	0
5 centimetres	1	3	5	18
11 centimetres	1	3	0	0
12 centimetres	1	3	0	0
"needle"	1	3	0	0
80 centimetres	0	0	1	4
No response	0	0	1	4
Totals	38	102	28	100

Item number: 10

Oral Instruction: Circle the correct sentence.

10	A scientist cleans your teeth.
	Some scientists study animals.
	You should scientist your teeth every day.

Answers	3rd Grade		4th Grade	
	# Students	%	# Students	%
"You should scientist your teeth every day."	20	53	13	46
*"Some scientists study animals."	9	24	13	46
"A scientist cleans your teeth."	8	21	2	7
"Some scientists study animals. And--A scientist cleans your teeth."	1	3		
<b>Totals</b>	<b>38</b>	<b>101</b>	<b>28</b>	<b>99</b>

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Item number: 11

Oral Instruction: Circle which is longer--one centimetre or one metre.

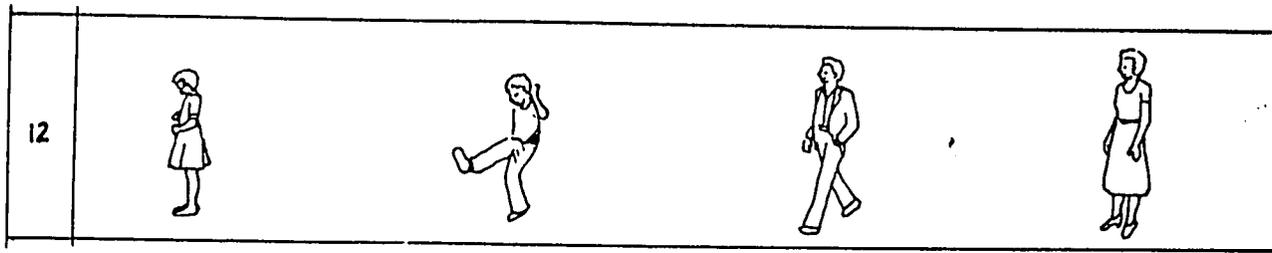
11	One centimetre
	One metre

Answers	3rd Grade		4th Grade	
	# Students	%	# Students	%
one centimetre	33	87	17	61
*one metre	4	11	10	36
one centimetre & one metre	1	3	0	0
No response	0	0	1	4
<hr/>				
Totals	38	101	28	101

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Item number: 12

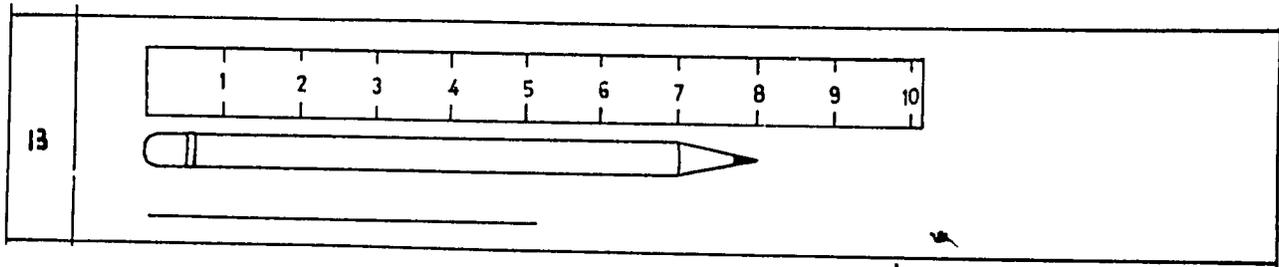
Oral Instruction: Circle the last person.



Answers	3rd Grade		* 4th Grade	
	# Students	%	# Students	%
*Last person	38	100	26	93
First person	0	0	2	7
Second person	0	0	0	0
Third person	0	0	0	0
Totals	38	100	28	100

Item number: 13

Oral Instruction: Write how long the pencil is.



Answers	3rd Grade		4th Grade	
	# Students	%	# Students	%
*8 centimetres	28	74	12	43
7 centimetres	2	5	2	7
"sbe 1 m"	2	5	0	0
1 metre	1	3	2	7
4 centimetres	1	3	0	0
2 centimetres	1	3	2	7
"tall"	1	3	0	0
"voitis"	1	3	0	0
(drawing of pencil)	1	3	0	0
5 centimetres	0	0	1	4
6 centimetres	0	0	2	7
40 centimetres	0	0	1	4
"How long is the pencil"	0	0	1	4
"Are day"	0	0	1	4
"horg long lo int"	0	0	1	4
"How long the pencil is"	0	0	1	4
"8 metre"	0	0	1	4
"8 long"	0	0	1	4
<b>Totals</b>	<b>38</b>	<b>102</b>	<b>28</b>	<b>103</b>

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Item number: 14

Oral Instruction: How many centimetres are there in a metre?

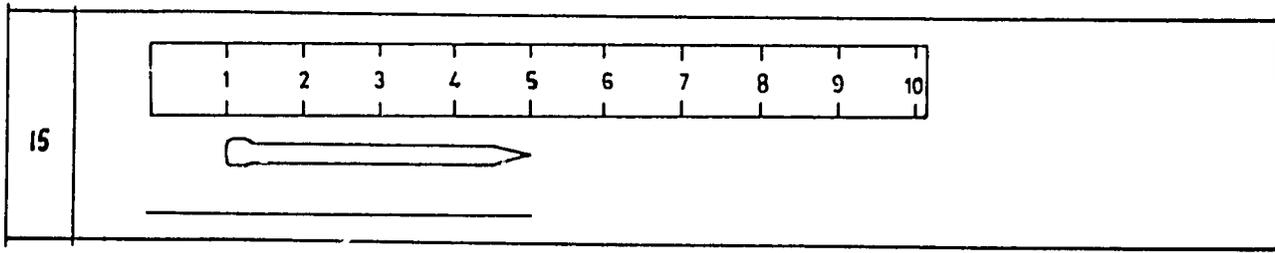
14	
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Answers	3rd Grade		4th Grade	
	# Students	%	# Students	%
1 centimetre	7	18	10	36
10 centimetres	7	18	2	7
5 centimetres	4	11	3	11
9 centimetres	4	11	0	0
6 centimetres	3	8	1	4
3 centimetres	2	5	0	0
7 centimetres	2	5	0	0
8 centimetres	2	5	0	0
"1SH"	2	5	0	0
2 centimetres	1	3	1	4
4 centimetres	1	3	0	0
20 centimetres	1	3	1	4
"easeher"	1	3	0	0
"sine"	1	3	0	0
60 metres	0	0	1	4
24 metres	0	0	1	4
8 metres	0	0	2	7
39 centimetres	0	0	1	4
*100 centimetres	0	0	5	18
<b>Totals</b>	<b>38</b>	<b>102</b>	<b>28</b>	<b>103</b>

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Item number: 15

Oral Instruction: How long is the nail?



Answers	3rd Grade		4th Grade	
	# Students	%	# Students	%
5 centimetres	22	58	11	39
*4 centimetres	5	13	3	11
1 centimetre	1	3	1	4
2 centimetres	1	3	0	0
2 1/2 centimetres	1	3	0	0
10 centimetres	1	3	0	0
"Shore"	1	3	0	0
"needle"	1	3	0	0
(drawing of pencil)	1	3	0	0
"---" (little line)	1	3	0	0
"shogi"	1	3	0	0
"saresf"	1	3	0	0
"foranah"	1	3	0	0
3 centimetres	0	0	1	4
20 centimetres	0	0	1	4
25 centimetres	0	0	1	4
5 metres	0	0	4	14
2 metres	0	0	2	7
"how long is it"	0	0	1	4
"dereane nen"	0	0	1	4

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Answers	3rd Grade		4th Grade	
	# Students	%	# Students	%
4 metres	0	0	1	4
5 long	0	0	1	4
Totals	38	104	28	103

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Item number: 16

Oral Instruction: Circle the one that is longest.

16	50 centimetres
	2 metres
	5 centimetres

Answers	3rd Grade		4th Grade	
	# Students	%	# Students	%
50 centimetres	31	82	24	86
*2 metres	3	8	3	11
5 centimetres	3	8	1	4
50 centimetres & 5 centimetres	1	3	0	0
Totals	38	101	28	101

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