

The book cover features a red background with a photograph of laboratory glassware. On the left is a tall, clear glass graduated cylinder. To its right is a round-bottom flask with a black stopper and a glass tube inserted into it. The text is overlaid on the image in white and black. The main title is in large, bold, black letters. The volume and book type information is in white, and the authors' names are in white at the bottom right.

**English as
a Foreign
Language
for
Science
Students**

Volume 1

Teachers'
Book

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& H Ross

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ENGLISH AS A
FOREIGN LANGUAGE
for science students

VOLUME ONE

Teachers' Book



HEINEMANN
LONDON

Introduction

ALL over the world teachers, in particular teachers of languages, have found again and again that every lesson is an experiment. The results of the encounter between learner and teacher are seldom predictable. As his acquaintance with his students grows, the teacher tries to adapt his approach to teaching to accord with the students' capacities on the one hand and to suit their particular needs and aims on the other. He must be clearly aware of their aims in learning a foreign language in order to make his class achieve a sense of purpose. The design of any complete language course must depend, therefore, upon the probable aims of the learners.

In recent years there has been a growing awareness that everyone, whether child or adult, should have the opportunity to learn how to communicate in one or two languages in addition to his native tongue. He should be able to communicate not only in everyday language but also in the special field of his particular interest, be it cultural, political or scientific. The rapid development of technology has been an additional stimulus for many learners to acquire scientific and technical information in English. Chemists, physicists, geologists, doctors and engineers find that many of the books and journals on their subjects are written in English. They have to read them in order to keep abreast of their subject. Not only do they need to read scientific journals written in English and understand their content but they may also be called upon to attend international meetings where papers will be read and discussions carried on in English. They may come over to England or America, or any English-speaking country, to study in technical colleges or universities. Some students may have as their aim the passing of an examination in English; some may wish to take the General Certificate of Education in order to continue their higher education in an English-speaking country.

Many learners of English as a foreign language are becoming more and more interested in acquiring the ability to write good grammatical English in any subject which interests them; to write scientific reports on their research work, articles, and abstracts; and to exchange letters with foreign colleagues. Furthermore, the rapid development of oral communications throughout the world—by radio, records, films, television (sometimes relayed by satellite) accounts for the greater urgency in the teaching and learning of spoken and written scientific and technical English.

ENGLISH AS A SPOKEN LANGUAGE

The structures of a language are first learned by a native child imitating sounds; the foreign learner of English should therefore also begin with spoken language and imitate the sounds. It is in this way that the basic structures and vocabulary will be firmly established. This natural process is accelerated by modern teaching methods and by the greater maturity and motivation of the students.

EAR — EYE — MIND

This English course has been worked out from the premise that the structures of English are basic to all specialized fields and that scientific and technical English differs from everyday English only in the frequency of use of certain structures and in vocabulary. The course consists of an introductory stage during which the work should be carried out mostly orally, the teacher following the text from the textbook while the students have their books closed. Throughout the course, as a rule, the teacher attacks first 'the ear', then 'the eye' and finally 'the mind'. Exercises in comprehension are planned to develop the learners' ability to listen to and understand spoken language aurally. Learning by looking involves the use of pictures, illustrations, wall pictures, diagrams, newspaper cuttings, slides, films, film-strips, charts, even dramatic acting by the teacher. The student listens and tries to understand what he hears by associating the sound with the idea presented in the picture he sees.

A completely successful lesson at this stage depends, therefore, upon having in the classroom the objects mentioned in the book: either the actual objects or a representation of them. The exercises and drills must then be actively associated with the objects or their representations in the classroom. Things like a book, desk, test-tube, etc. are easy either to bring to the classroom, or to draw or roughly sketch in outline. Teachers will understand that the success of this kind of approach depends upon the availability and constant use of such elementary visual aids. They will make learning more enjoyable and therefore more effective and the teacher himself soon appreciates the help of these techniques in the teaching of the elements of the English language.

When the pictures become more complex or difficult for the learner—and the teacher—to draw, full use of the illustrations in the textbooks should be made by using 'paper stencils'; these are sheets of paper to cover the printed text, with holes cut out to reveal the illustrations only. Captions and text are thus covered by the stencil.

FRAMEWORK OF THE COURSE

The teaching material is not divided into conventional lesson periods. At the beginning of the course explanation and comment are reduced to a minimum. The aim of each section of material is to give the student practice in the simplest structures, preferably orally. The student acquires the patterns of the language by repetition.

From p. 2 to p. 43 the material is heavily illustrated and the grammatical summaries, e.g. **Word Order in Sentences** (p. 8) are minimal. The teacher will first present new material orally, saying it himself and/or using the tape recordings. The students will then repeat the sentences or groups of sentences, in chorus and individually, with correction by the teacher as often as he finds it is necessary.

The students then move on naturally to the oral exercises on p. 3 and begin to learn the commands: **Look at . . .** and **Say**. The pace of the proceedings must, of course, be judged by the teacher. He will aim to press on but will come

back time and again to the same oral exercises and many more of his own devising, to revise and hammer home the simple basic structures of the English language.

In the first 43 pages the new structures, new vocabulary, exercises and grammatical summaries merge into one another while the bare essentials of English are being absorbed by the students. From p. 44 onwards the pattern of the course settles down. Having learnt the bare minimum of the language, it is now possible to consider a simple passage of consecutive prose, either in the form of a descriptive passage or of a dialogue called **Words in Action**. On p. 44, the teacher first goes over the new vocabulary listed above the illustration, using the picture to demonstrate the meaning of the words but if possible without translating. A vocabulary list with phonetic transcription has also been given on p. 53 *before* the reading passage entitled **A Laboratory Bench**. From this point onwards the teacher must decide for himself whether to continue to prepare the new vocabulary orally in this way before attempting the reading passages. As the students improve, it may not be necessary, but bearing in mind that English is not a phonic language, careful preparation may not come amiss. From p. 126 onwards vocabulary and phrases are listed after the reading passage so that the student can readily learn them by heart for homework at this more advanced stage.

Throughout the course sections will be found which begin: **Say, Repeat aloud, Read aloud**. These give practice in saying and remembering phrases, idioms, and structures. They are probably more important than vocabulary lists, for they contain the important patterns of the language rather than the isolated word.

The idea that learning a language is mainly a matter of learning the words or the grammar has been condemned for many years. In practice it has been shown that knowing what a word means is only a small part of the problem. One also has to know how words are used in a sentence, or at least in a phrase or expression. The vocabulary and expressions, therefore, are presented not as isolated words but as integral parts of sentences and structures in the text on which it is based. So are the exercises. The dictionary meaning of

the words gives the student, especially at the initial stage of learning, only the basic meanings of the thing itself; to the proper use of a dictionary we shall return later. Be it noted that the vocabulary has been carefully chosen.

SCIENTIFIC AND TECHNICAL TERMINOLOGY

Scientific and technical language can sometimes be incomprehensible except to the specialist. Some non-scientifically minded teachers of languages may therefore be afraid of attempting to use a course entitled *English for Science Students*. There is, however, no need to worry if one remembers that the basic structures of English remain the same, whatever the purpose of the writing; in scientific English, though, some structures (e.g. the passive voice) are used more frequently than others.

Scientific and technical terminology—i.e. the vocabulary of science, may be divided into (a) highly specialized terms which very often are new terms coined by inventors, which find their way into scientific encyclopaedias, e.g. radar, laser, quantum, atomic strata, and so forth; this kind of term is mostly invented by specialists in the given branch and very often becomes international; (b) a large group of scientific terms which describe one particular phenomenon or species, or process, or material usually having a very precise and narrowing meaning; these terms, are, for the most part, of Latin or Greek origin, and are therefore quite likely to become international; (c) another group of terms which may be called 'semi-scientific', words which are used both in everyday language and in the sciences, for example: energy, machine, motor, temperature, agent, reaction, laboratory, analysis, pill, tube, compass, hammer, etc.

These 'semi-scientific' words have been used extensively in this book in the descriptive passages and in the corresponding dialogues, 'Words in Action'; they have been carefully worked out to make the students familiar with them, aware of their existence and of their usage both in everyday English and in the sciences. Some are contained in 'The General Service List', as for example: factory, explode, experiment, horizontal, height, electricity, (electric)

bell, grease, nail, mill, mine, liquid, inch, telegraph, temperature, rust, rock. The 'semi-scientific' words often present the greatest problems because one is not always aware of the semantic shift.

It must be pointed out that this course does not aim at teaching science in general or any special branch of science. It is concerned, firstly, with the fundamentals of the language system and, secondly, with simplified scientific texts. The way in which the course is used must necessarily differ from teacher to teacher and from classroom situation to situation.

The teachers' handbook is designed to help teachers who are interested in employing some of the new methods of language teaching. No attempt is made to give an exhaustive account of methods and suggestions. The aim of the authors is rather to present a possible guide to using the books in an effective way in the classroom. There can be no absolutely perfect method of teaching but there are acceptable and unacceptable patterns of English. Even in the key to the exercises alternative versions are given where possible.

The choice of specific teaching techniques depends on many factors:

- (a) the number of students in the class,
- (b) the hours per week of class sessions,
- (c) the age and interests of the learners,
- (d) the types of examinations to be taken,
- (e) the kinds of teaching aids available.

Tape-recordings of the language material contained in the textbooks are available and thus provide the learner with added opportunities of hearing and imitating the spoken language. The most important activity, whatever the learner's age and aims may be, is continuous imitation of the model of the spoken language provided by the teacher and/or the tapes.

The question whether and to what extent to use the student's native language in the classroom and how it should be used must be left to the teacher's discretion. Roughly speaking, in the initial stages if there is something to 'explain' or if the learner is unduly alarmed or disappointed at his lack of comprehension, the learner's native

language or sometimes even a translation may be used. Sometimes an explanation in English would be too involved and too slow. The teacher must use his common sense. But during the ordinary course of a lesson the giving of instructions, requests, greetings, the beginning and ending of a lesson, and other typical classroom situations require nothing but the English language.

At the initial stage of language learning expressions used by the teacher should be very simple and obviously linked with the classroom situation, often supported by gestures, by a smile, or a frown, by the voice inflection of the teacher. There should not be any need to use translation into the student's mother tongue. Of course there should be no grammatical analysis; otherwise the students will miss the chance actively to incorporate English language patterns into their memory store.

Here are some expressions covering the most usual and typical situations at the beginning of the first lessons:

Good morning. What's your name? How do you do?
 Look at this/these picture/s. Listen and repeat after me.
 Touch this object and ask your colleague. . . .
 Answer my question.
 Look at the blackboard . . . Listen to me . . . Come to the
 blackboard, please
 Thank you.

We all know that foreign students are usually very anxious to learn polite phrases and greetings. They try to translate the polite forms of addressing people from their native languages; no wonder, then, that they are seldom correct in form and intonation. Foreign students often add 'please' and 'thank you' indiscriminately to their discourse. They hesitate whether to put 'please' at the end or at the beginning of their sentence. Whether to use 'excuse me' or 'thank you' becomes a grave problem. The best thing is to drill the students into these polite expressions gradually from the very beginning. You will find them introduced throughout the course; they need, however, to be used constantly until their use is automatic.

At an early stage students, especially adults, will ask the

teacher in their own language, 'How do you say such and such in English?' It is not advisable to answer this sort of question fully, as the student may have various reasons for asking it. Such phrases and expressions usually have little to do with the lesson itself and may not interest the whole class. They form a distraction yet they have to be dealt with tactfully. However, whenever a student asks the teacher, 'How do you *pronounce* this word or that expression?' he ought to be given the proper pronunciation, and at the same time be made to repeat it properly.

PRONUNCIATION

Here are a few hints to the teacher on points which call for special attention. Naturally the teacher will adapt them to suit the particular difficulties of his class according to the native tongue of the student. It may help the students' first steps in producing speech sounds accurately if the teacher shows the right function of the speech organs by means of useful charts or diagrams of the lips, teeth, palate, and the lower part of the mouth.

Exercises and pronunciation drill in sounds are a regular feature throughout the books. They are aimed at making students hear the sound, identify the sound, and reproduce the sound.

Intonation and the typical rhythms of English are best learned by constant imitation and practice. Use any gestures or signs you may think useful to show rising and falling intonation. As the whole sound system is best learned by imitation of speech, and as repetition can be very wearying for the teacher, we recommend the use of the tapes which accompany these textbooks as an effective teaching device. If you have a language laboratory at your disposal the master tape is a necessity and your students should make particularly rapid progress.

Students should be taught quite early to distinguish between two main tones, i.e. a rising tone as in general questions and a falling tone, as in simple statements, commands, and questions beginning with a question word. The use of strong and weak forms is also closely connected

with stress and rhythm in English sentences, and therefore attention should be drawn to the use of these forms at the earliest possible stage of teaching. But the teacher should avoid giving his class too much theory and using highly technical terms in this field. He should seize any occasion to draw his students' attention to the correct use of stress and intonation.

As the student of English may have little chance of hearing the language outside the classroom, all sorts of additional available tapes and records of English songs and poems are also recommended, provided they do not disturb the plan of classwork.

The phonic symbols used in these books are those of the IPA and their transcription is a simplified form of those recommended by the International Phonetic Association.

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THE FIRST EXPERIMENT

This teaching-unit introduces actions which are being done *now*. Make the students observe you performing various actions in class and get them to study the illustrations in the textbook representing various phases of these actions. It would be very useful to have ready in advance such requisites as:

- (1) a test-tube,
- (2) a bottle filled with a liquid, labelled either HCl or H₂SO₄,
- (3) a filter paper,
- (4) a funnel,
- (5) a beaker,
- (6) a glass-rod.

If, however, it is impossible to prepare these objects in advance, use textbook illustrations.

Introduce the function of the Continuous Present Tense

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by demonstrating various activities in class and saying at the same time what are you doing. For example, pick up a test-tube and say: 'I'm taking a test-tube. Now I'm pouring the liquid, it is HCl; I'm pouring it into the test-tube.' Do not discuss grammatical terms or forms just now. Go through the series of actions and establish this structure:

Now I'm taking a test-tube.

Now I'm holding it in my left/right hand.

Now I'm pouring the liquid into the test-tube.

Emphasize the word *now* especially at this stage of teaching.

Drill this action with the pronouns, *he/she/they*.

Now change to another drill:

TEACHER: Tom, come to the blackboard, please, and draw a portrait of Miss Ross (or a student's name).

TEACHER: (to class) Look, Tom (or some student or other) is drawing a portrait.

Get the class to repeat in chorus: Tom (or the student's name) is drawing a portrait.

TEACHER: Thank you, Tom. Now go to your place.

TEACHER: Look, Tom (or student's name) is going back to his place.

Vary the commands with individual students and get them to repeat after you, e.g.:

TEACHER: Go to the door.

TEACHER: (class repeating after him) He/she is going to the door.

TEACHER: Hold up a test-tube.

CLASS: He/she is holding up a test-tube.

TEACHER: Pour the liquid from the bottle into the test-tube.

CLASS: He/she is pouring the liquid from the bottle into the test-tube.

TEACHER: Take a bottle in your left hand.

CLASS: He/she is taking a bottle in his/her left hand.

You can if you like introduce other useful commands in addition to those in the textbook, e.g. 'Pick up a bottle.'

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As soon as the students are familiar with commands and responses, practise with other pronouns:

TEACHER: I'm pouring the acid.

CLASS: You're pouring the acid.

TEACHER: I'm opening the window.

CLASS: You are opening the window.

With an intelligent and eager class it would be good to introduce more vocabulary here which would lead to more varied drill. For example you might demonstrate such activities as driving a car, riding a bicycle, playing the violin, playing the piano, typing, reading a book, reading a newspaper, smoking a cigarette, singing, etc., which are easy to act. But be sure to put the new words on the blackboard as you demonstrate them.

TEACHER: (performing the actions of driving a car and saying): Now, I'm driving a car.

CLASS: You're driving a car.

TEACHER: I'm reading a book now.

CLASS: You're reading a book now.

pp. 63-64 Make sure the shortened forms are used from the very beginning. Further drilling may be done from the textbook material with the use of the illustrations on pp. 63 and 64.

64 TEACHER (pointing to the appropriate picture):

What's Barbara doing now?

What's he doing now?

What's Tom doing now? etc.

Now change the series and the commands again:

Look at the blackboard! What are you doing now?

We're looking at the blackboard.

Open your notebooks. What are you doing now?

We are opening our notebooks.

Write your names in your notebooks.

What are you doing now?

We're writing our names in our notebooks.

Try to make the situations as real as possible: that is the art of teaching.

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Practise the question-and-answer series referring to all persons. Use the appropriate pictures and revise the verbs: *to write, to draw, to hold, to look (at), to powder (a nose), to shine, to talk, to copy (from), to leave, to go (back), to sit (down), to stand, to use*. The variety of these verbs will give ample opportunity for drilling the new structure.

If you have not already read **The First Experiment** as a consecutive passage, do so now. Then study the pictures. Then ask these questions, introducing *or*; it will make the students answer with complete sentences, for example:

TEACHER: Is Barbara pouring the acid *or* reading a book?

STUDENTS: She's pouring the acid.

TEACHER: Is Tom drawing a portrait of Miss Ross *or* looking at the window?

STUDENTS: He's drawing a portrait.

TEACHER: Am I playing the violin *or* writing on the blackboard?

STUDENTS: You're writing on the blackboard.

Follow up the presentation of the question-and-answer series with activities performed by you or your students. Give the students orders to do something, ask them and the class what is being done and the replacing of the subject by a pronoun is thus automatically revised.

To revise the prepositions: *of, in, on, between, at, after, with, from, to, into*—do the exercises on p. 66.

It is left to the teacher's discretion whether to teach the Imperative of the first and third persons, or whether to leave it until a later stage.

It is, however, as well to revise the question word *Who* again. The teacher asks individual students questions on this model:

TEACHER: Go to the shelf, David.

Who is going to the shelf?

David is going to the shelf.

TEACHER (again): Who are sitting at the desks?

Make your students answer you:

We are sitting at the desks.

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ENGLISH AS A FOREIGN LANGUAGE

If they hesitate, give them straightaway this hint . . . 'We' . . .
Insist on the students answering in full.