DOCUMENT RESUME

ED 112 678 FL 007 148

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TITLE Aspects of the Writing and Teaching of EST Courses: The Tabriz Materials. ELT Documents (75/2).
INSTITUTION British Council, London (England). English-Teaching Information Centre.
PUB DATE 75
NOTE 11p.; For related documents, see FL 007 149 and FL 007 150
AVAILABLE FROM English Teaching Information Centre, The British Council, 10 Spring Gardens, London SW1A 2BN, England

EDRS PRICE MF-$0.76 HC-$1.58 Plus Postage
DESCRIPTORS *College Language Programs; *Course Content; Course Organization; English (Second Language); *English for Special Purposes; Instructional Materials; Material Development; *Science Instruction; Scientific Concepts; Scientific Literacy; *Teacher Developed Materials; Teaching Methods
IDENTIFIERS *Iran (Tabriz); Tabriz University

ABSTRACT

This article reports on the experience of the Language Centre of Tabriz University in Iran. The Centre is responsible for teaching English in 7 faculties: Engineering, Medicine, Agriculture, Pharmacy, Science, Education, and the School of Nursing. The article first gives the background of the students that are to be taught, followed by an outline of the course design. The first-year courses are divided into general courses meant for all students and specific courses broken down into individual areas of interest. The concentration is on basic features of scientific content. In the second year, only specific courses are offered and concentration is on organization of discourse rather than content. The remainder of the article deals with the problems that arose when the program was implemented. The teachers prepared their own materials and found it difficult to combine advanced content with elementary-level English. The courses were organized to be as lively and motivational as possible by the use of diagrams, tables, graphs and interpretation. Possibilities for classroom activities, especially technical ones, were limited. Drills were found not to be very useful in this situation, but humor, discussion and student participation in general proved very fruitful. (TL)

INTRODUCTION

THE SUBJECT commonly referred to as English for Specific (or Special) Purposes is currently attracting a great deal of attention in many countries, particularly in the field of science and technology. This edition of ELT Documents presents 3 papers which approach this subject from a different perspective. Two of these record valuable field experience: in one case in an overseas situation (Tabriz), and in the other in Britain (Venezuelans at the University of Essex). The paper by Dr J Cleary presents the EST problem from the scientist's point of view and should give teachers of English an insight into what the head of a science department might ask of the English department. Dr Cleary is both a chemist and an educationist. He has had experience of both the British and American education systems, has taught in both L1 and L2 situations, and has been involved in teacher-training, curriculum development and materials design. His paper, 'Science Teaching in a Second Language Situation', should provide insights for all teachers of English who are teaching science students. It is hoped that all 3 articles will assist those engaged in the design or administration of EST courses.

ASPECTS OF THE WRITING AND TEACHING OF EST COURSES: THE TABRIZ MATERIALS
- A Dudley-Evans, C C Shettlesworth and M K Phillips

Background

The Language Centre of Tabriz University is responsible for English teaching in 7 faculties, those of Engineering, Medicine, Agriculture, Pharmacy, Science, Education, and the School of Nursing. Students study English for 6 hours a week in their first year and 3 hours a week in their second. Tabriz University is not an English-medium university, but students, particularly in their third and fourth years, need to be able to consult English textbooks on their own subject and very occasionally need to be able to follow lectures given in English. It is the aim of our courses to enable students to make the fullest use of their textbooks and to follow lectures given in English.

We believe that the criteria according to which the courses have been developed, although they may well have arisen out of rather different problems from those faced in Southeast Asia, none the less should be of interest and relevance in quite different situations.

Our first problem is that there is a very large discrepancy between the students' attainment in the language on entry to the university and the attainment required to use English textbooks in later years. Students have normally studied English for 6 years at secondary school, but because of poor teaching no particular attainment can be assumed on entry. They have often been taught grammatical rules and lists of irregular verbs, and are frequently proficient in reciting these but have difficulty in understanding a simple sentence, written or spoken. Their ability to form sentences in English is particularly weak. Furthermore, their lack of achievement and the poor teaching they have received have often killed all enthusiasm for the subject and has created the belief that they are unable to learn the language.

Another major problem is that the kind of English they have studied at school is largely irrelevant to the English of scientific textbooks in that General English courses tend not to focus on the distinctive features of scientific English.

It is also worth mentioning here that students in Iran are very sensitive about the relevance of what they are studying and can be very hostile to what they consider to be 'not useful'.

Another problem is that of the learning strategies students have acquired during their educational experience. We attempt to develop inductive or deductive strategies which are on the one hand consistent with modern theories of the nature of language and on the other are appropriate to the methods of science. Although, for example, rote learning can be capitalised upon, it does result in an obvious conflict with the methods we use. The learning by heart of whole passages is still very much a feature of Iranian education even at the university level.

In examinations the ability to reproduce the lecturers' notes seems to be rewarded rather than the ability to reason, deduce etc. We have often found students unable to see the main points of a reading passage and generalise from the specific to the general. It is not clear to what extent these problems, which are basically cultural in nature, affect their reading in Persian. My reason for mentioning this fact is that I feel it should be recognised that in teaching efficient reading one is doing more than teaching just language, and that one's methods, or at least the approach drawn from Western scientific methods, may well be alien to many non-European students.

Given this background, ie low attainment, low motivation, and the need to capture the students' interest, we have tried to devise courses which are both entertaining and relevant to the students. Because of the low level of English on arrival, we concentrate in the first year very much on the basic features of scientific discourse at the sentence level before concentrating much more specifically in the second year on actual reading. Given the need to capture the students' interest, we have tried to make the courses as lively as possible by the use of diagrams, tables, graphs of interpretation etc. The type of course that includes long reading passages for comprehension, plus one or two short exercises, usually a test of comprehension and vocabulary, of which there are many published examples with which I am sure you are familiar, would not be appropriate in Tabriz, as they involve far too little student participation.

Courses found suitable

Course requirements. These considerations suggested to us that a suitable course would have to meet the following requirements: 1) it would have to commence at a sufficiently low level to accommodate most of the students; 2) it would have to maintain the interest of the students a) by showing itself relevant to their major subject and b) by the types of language-learning activity involved; 3) it would have to provide the students with the language and strategies they need to read scientific texts at the undergraduate level in their major subjects; in this respect, it has been suggested by Jones and Roe[1] that the minimum objectives should be developing the grammatical, conceptual and rhetorical competence of the students.

A further requirement, which has both theoretical and practical justification in the Tabriz situation, is that the courses should not encroach on the specialist subject, although high-level subject-matter is necessary to maintain interest; this entails the problem of combining such a content-level with low-level English.

The first-year materials

Organisation. There is a basic division between the general course, which may be used with all students, and the specific courses, which relate to the specialist subjects. Both general and specific courses consist of 12 units, and the courses are related in that they cover the same conceptual content.

We shall discuss the role of concepts further in the next section..

The general course. Each unit aims to 1) introduce a new area of conceptual content which we refer to as concept; 2) focus on semi-technical English; 3) provide situations which are generally relevant to science; that is, either situations from science with which the students should be more familiar or more general situations which can be exploited for the purpose of practising scientific English, eg describing a bicycle; 4) encourage active participation by the students in using language in these situations.

The specific courses. Each specific unit aims to: 1) develop the concept and the related semi-technical language of the corresponding general unit along with specific language items from the specialist subject which are related to the concept; 2) provide greater emphasis on reading and intensive listening. In any one specific course, the earlier units are concerned with shorter language items, which are built up through the course so that later units present texts approximating to actual discourse. The first part of each specific unit is a link-section which both eases the transition from the general unit to the specific unit by placing the items taught in the general course into the specific-subject context and provides greater flexibility in that the specific courses could be used by themselves where necessary.

Selection and grading. Language items are selected and graded on both structural and conceptual criteria. It is the role of concepts that we should like to examine here.

Properties and shape Location Structure	(Description of appearance)
Measurement 1	(Measurement)
Function and behaviour	(Process)
Actions in sequence	(Process)
Quantity, sufficiency and excess	(Measurement)
Cause and effect	(Process)
Ratio and proportion	(Measurement)
Probability and frequency	
Scientific method	
General revision	

The following arguments are adduced in favour of conceptual grading: 1) it leads to a fairly 'natural' selection of language-items and seems to fit in well with structural grading; 2) it enables language to be used in situations relevant to science - focussing on the concept makes the language more meaningful and brings together naturally related language-items; 3) concepts provide a necessary and stimulating framework for writing-materials; 4) as Jones[2] has pointed out, the conceptual orientation used in the Tabriz materials accords with Harré's analysis, ie an adequate description of a scientific system needs to specify the structure, the properties, and the changes of state of that system.

Conceptual grading has been the subject of vigorous debate in Tabriz. We should now like to point out some of the objections which have been raised: 1) What kind of validity do concepts have? We can claim that they provide a useful but perhaps artificial framework for writing and teaching a course. They may be useful pegs on which the students can hang their English.

A stronger claim would be that they have some psychological validity and that by exploiting them we are aiding a natural learning process, though cultural factors may be relevant here.

Alternatively, we could argue that they have some scientific validity and are therefore highly relevant to the way in which a scientist goes about his job; these points await futher research into: a) the reading process; b) the relationship between scientific activities and the language to describe them.

2) Even if the 3 claims above are true, are we justified in using this 'Western' approach to science for foreign students? We think we are, but, more specifically: a) do we run the danger of teaching science? b) do we run the danger of teaching particular modes of thinking? 3) Are we not assuming that the conceptual structure built up by the course will facilitate the students' interpretation of discourse? Jones[2] challenges this assumption.

More generally, we can say that our experience of the course is that it does interest the students and allow for stimulating teaching. It is possible to write fairly weighty reading passages in the later specific units, using almost exclusively language-items taught in the course, although cohesion and rhetorical organisation (to be discussed in the next section of the paper) are clearly lacking.

It is also necessary to raise certain other points which have aroused discussion in Tabriz: Is it in fact possible to write units which cater for general science? To what extent have we provided the students with strategies for reading? Is there a danger that we are undermining the students' autonomy and not providing enough self-teaching material? How far have we distorted discourse in rendering it suitable for teaching purposes? These are problems with which we have been critically confronted in Tabriz and which any EST course-designer will have to face.

We should like to point out to the clear need for further operational research in: a) discourse analysis; b) the reading process; c) what students bring to the class; d) the value of different classroom activities.

The second year materials

Organisation. The second-year materials are much less developed than those of the first. They consist of specific units only and have been subjected to considerable criticism: at the present time the framework of the course is being rethought. We shall describe the original units and then suggest ways in which we hope to improve them.

The original units. We see the second-year course as complementing the first-year course by teaching the organisation of discourse as opposed to the conceptual content. Each unit attempted to: 1) introduce a new rhetorical act; 2) practise grammatical and lexical items associated with that act and the ways in which they signal it; 3) illustrate the relation of rhetorical acts together with aspects of textual and logical cohesion by various exercises and by reference to actual discourse. It was hoped to give greater continuity to the course by allowing one subject-topic to extend over more than one unit.

Selection and grading. One proposed selection and ordering of rhetorical acts was:

Definition Classification Description Instruction Consolidation 1-4	concerned mainly with factual information
Problem-solving Hypothesis Experimental procedure Consolidation 1-8 Induction and generalisation Deduction and conclusion Consolidation 1-11	concerned mainly with 'hypothetical' or 'experimental' information

In practice, it proved difficult to select and grade language-items on this basis and there was a tendency to pick the more obvious items and neglect those whose relations to rhetorical acts were more obscure and complex. An obvious example for DEFINITION is 'A is defined as B'; a less obvious example, which may be easily overlooked in course construction, is the equative use of be, eg 'A is B'.

For this type of organisation, we can say that: 1) it did highlight areas of reading difficulty which we feel to be of central importance; 2) it did stimulate and provide a framework for the writing of a higher-level reading course. On the other hand: 1) there was a danger of overemphasising the rhetorical act for its own sake and neglecting its role in organising discourse; 2) there was the problem of relating structural items to rhetorical acts already mentioned; 3) because the units were already heavily loaded with rhetorical and structural items, there was a danger of neglecting other important aspects of discourse such as textual and logical cohesion; 4) because of the greater focus on reading, the productive participation of the students characteristic of the first-year course was not always maintained. This may be inherent in reading courses, as the use of actual discourse involves high vocabulary loads, and this can imply a more passive role for the student. We feel that the problems of teaching vocabulary at this level are far from being solved.

Possible improvements. 1) The course might be divided into 2 sections. The initial section would focus on the individual rhetorical act and associated structural items. The later section would exploit the relations between rhetorical acts and, in so doing, introduce and practise other types of cohesion and argument. This would have the advantage of reducing the load on individual units. 2) The units in the initial section could be made more productive by requiring the students to perform acts of DEFINITION, CLASSIFICATION etc.

We shall welcome your views on the points raised concerning our materials.

Problems of writing and teaching the Tabriz EST courses

Relation of the problems. Having discussed the form of the courses developed in Tabriz and the considerations which led us to adopt the solutions which we have just outlined, it will be both useful and necessary to point out the special problems which arose when we attempted to put our programme into practice. From the theoretical problems of course design, then, we now turn to the practical constraints which must themselves inform our approach to course design. These practical constraints make themselves felt throughout the implementation of a course such as we have described, but particularly in its genesis and application: there are, besides the theoretical problems, practical difficulties both in writing EST courses and teaching them.

A short digression as to how the actual writing of our materials is carried out might be of relevance here. Nearly all teachers are arts graduates with little or no specialist knowledge of science. Ideally, all teachers should be in almost constant contact with scientific colleagues; but in Tabriz, where very few of the science lecturers speak English well, this has proved difficult. It is one of the tasks of the Head of English Department to gather information about what students are studying and what areas of the subject should be used in the English course. It has often been difficult to get this information.

Clearly it would be very difficult for teachers to prepare and teach materials for a wide range of subjects; consequently the timetables are devised so that teachers teach English for 2 or 3 related subjects, eg Mathematics and Physics, Medicine and Pharmacy. Teachers write and teach in pairs, or sometimes in groups of 3 or 4. As teachers are preparing and teaching materials for a narrow range of subjects, they are able to specialise in these subjects and become familiar with the language and nature of the subject. Teachers normally teach the materials they prepare.

The difficulties involved in writing courses like ours - on the one hand - and in teaching them - on the other - are interrelated in that the problems which arise in writing the course limit what can be done in the classroom, and similarly what can be done in the classroom determines to a large extent the nature of the writing. In addition, we are limited by the way in which we can present the material to the students. In general, for example, it is not feasible to make use of scientific equipment. In this respect, however, we are particularly fortunate in Tabriz in that, as we have said, the same teachers are involved both in the writing and in the teaching for any one subject. The necessary feedback from classroom practice to materials' preparation is thus automatic. A less obvious advantage, however, is operative in the other direction. In some ways units can be less explicit than is normally the case, since it is the writer who will be teaching them; and, indeed, there is a sense in which the writing of a unit is a form of lesson preparation.

The problem of writing. These advantages do not mean that writing the courses has been a straightforward matter. As I hope to have shown, their content and form differ greatly from that of the majority of English courses written for general purposes. This entails at least 2 related problems in their development. It is the case that one can find a certain amount of teacher-resistance to the very concept of an EST course - and a consequent unwillingness to undertake the necessary materials' preparation. This, in fact, has not been a particular problem in Tabriz, possibly owing to the novelty value of the project, but it is a potential difficulty, especially when most language-teachers, like ours, have an arts education background. They often have an inaccurate idea of the values and techniques of science and a resistance to adapting to those supposed values. It is always worth while in this context to bear in mind what scientific inquiry and, say, literature have in common rather than to emphasise the differences, which are in any case fairly evident. Once the notion of science as a cut-and-dried cumulative activity is disposed of in favour of a view which takes into account the exploratory function of much scientific activity, the parallel with artistic activity can be seen; Widdowson[4] has suggested that this is also true at the stylistic level. It is important, therefore, that teacher-writers should be aware of these philosophical bases to their tasks as a bridge between their own experience and the new approaches demanded by ESP courses.

The second difficulty - which may well underlie the first - is the question of lack of appropriate knowledge on the part of the teacher. Not having a training in science, he is likely even with the best of intentions to approach the task of designing EST materials with some trepidation. This problem has had a determining effect on our approach. In addition, the inevitable constraints of

time and manpower preclude any radical self-education programmes and limit the possibility of extensive research into the nature of scientific English, which could give a firm basis for course-construction.

To a certain extent we are fortunate that our courses can be designed at a fairly low level of linguistic and conceptual difficulty in order to meet the remedial needs of our students. Nevertheless the problem of non-scientists attempting to write a course in scientific English at a content-level high enough to maintain student interest still remains. Our solution has been to lay down clear frameworks for both our courses - as described above, conceptual for the first-year course and rhetorical for the second-year course - which guide writers in the selection and grading of materials. When preparing a new unit, writers will scan as many relevant textbooks as possible, bearing in mind the framework of the course and using it as a criterion for the choice of material to be incorporated. This has proved an effective procedure and at the same time enables writers slowly to build up a fund of experience of scientific writing which benefits their approach to subsequent writing tasks.

The problem of linguistic content is, however, only one aspect of the difficulties involved in devising EST courses. This linguistic content must be presented in a pedagogically valid form: here the constraints imposed by the possibilities of classroom activities are relevant. From the problems of writing our courses, then, we shall now turn to a consideration of some of the problems we have encountered in the teaching of our courses and the implications these have for the pedagogic aspect of course design.

The problem of teaching. As with the writing of the courses, the very fact that they differ radically from the well-known 'general English' format entails a considerable amount of adaptation on the teacher's part in his approach to exploiting materials in the classroom. We have had to rethink old teaching techniques and devise new ones. The well-tried lesson formula that most of our teachers have assimilated only too well in their training, developed, as it was, for the teaching of general English to schoolchildren, is, not surprisingly, inappropriate when teaching scientific English to undergraduates. The classical technique of presentation to establish meaning, development consisting of massive practice, often in the form of intensive drilling to fix the pattern, followed by a recapitulation to extend the student's control over the new learning item, is not suited to the special demands made by our course.

There are several reasons for this. Firstly, as I have indicated, there is the question of objective, which is limited in a way in which general English courses are not. Then there is the special nature of the language we are teaching, which often makes it unsuitable for exploitation by any of the standard teaching methods. Another factor is the characteristics of our students: whilst they may not have a good command of English, they have specialised in science. This necessarily has implications for our teaching methods; indeed it is precisely this factor which we are exploiting by giving the students an EST course. We shall describe how this influences classroom activity below.

This is not to say that we use none of the traditional language-teaching techniques, but rather that we give them a different emphasis. Take, for example, the technique of drilling, which in conventional language-teaching wisdom has a crucial part to play. Certainly there are occasions when it is necessary to fix a pattern in the student's mind by some form of controlled repetition - in order, for example, to distinguish 2 semantically related by syntactically distinct structures, as with the pair: 'It has a length of n cms' - 'It is n cms long'. We have found in general, however, that drilling can be only of limited usefulness; in many cases the types of structure dictated by the framework of the course do not lend themselves to this form of practice. Similarly, it is often difficult to find easily substitutable

lexical items. For example, take a drill to practise a common structure, say that exemplified by the sentence 'Nitric oxide decomposes to form nitrogen and oxygen.' In length it is probably already at the limits of the learner's short-term memory-span. Now substitute 'tri phenyl methane' - phenyl azo tri phenyl methane'. Memory constraints are compounded by phonological and possibly semantic difficulties. If, however, we want to design meaningful drills, this is precisely the sort of result we would obtain. Which brings us to our major objection to the widespread use of drilling, and that is precisely the question of devising a meaningful drill. This, of course, is always a problem, but particularly so in the scientific context, especially when we are emphasising the communicative function of language. Drilling, then, is largely restricted to a subordinate role in our teaching. We use it sporadically; more as a device for checking the student's internalisation of the learning item than as a means of teaching it; for this restricted purpose we prefer rapid question-and-answer drill to formal choral drilling.

We should like now to develop briefly these kinds of consideration by examining the way in which we envisage the relation between productive exercises generally and our objective of reading comprehension. We do not assume that because of our limited aims we are justified in limiting classroom practice to so-called receptive skills. Consequently our courses have a high productive practice in content, exploiting both commonly used techniques such as slot-filling or sentence completion exercises adapted to our purposes and more specialised exercises suggested by the nature of the subject-matter: such as the verbalisation of tabular information, graphs, flow-charts etc. Indeed various forms of written and oral production based on graphically presented information form the largest proportion of our practice material. We were led to adopt this solution basically for 2 reasons. On the one hand we feel that a certain amount of 'overlearning' is necessary: a student who is able to produce the required structure has some guarantee that he will be able to interpret it in discourse. Thus we set up a kind of learning trajectory whereby acceptable achievement is somewhat lower than that actually demanded in classroom practice. On the other hand, we are by no means convinced that it is possible to disassociate the traditional 4 skills. Thus, as a corollary to the points made above, it seems desirable to reinforce reading ability by a variety of approaches. There are, of course, other reasons why such a procedure is desirable: the question of variety for its own sake is one of them, as is familiarisation of the student with the conventions of, for example, formulae or mathematical signs. To illustrate my main point, however, let us admit that inference plays a vital role in the reading skill. Then a written exercise such as slot-filling, which involves a certain degree of inference - inferences, for example, about the grammatical class of the missing word, the likely semantic field from which it is drawn, etc - seem to be extremely relevant. This approach, however, does demand that in his teaching the teacher must be aware of the ultimate purpose of the various exercises and the aim of the course rather than view them merely as devices for practising individual teaching items. A different emphasis is thus often necessary in the classroom; we are frequently more concerned with the reasons underlying students' production than with the production itself.

Nevertheless, given our aim, we do attach importance to the exploitation of the reading passages which every unit contains. It is, however, easier to check reading comprehension than to teach it. We use various techniques, such as true/false questions, elicitation of non-verbal response to the information presented in the form of labelling diagrams, completion of tables or charts; but these are largely testing devices. It is thus the case that the reading passage per se is more a final check of comprehension, a check that what has previously been taught in other ways we have already discussed has been assimilated rather than an additional teaching device. On the other hand, the testing factor does induce student motivation to read. Even this, however, raises its own special problems. There is always the danger that the semantic

content of a passage can be overloaded; this we attempt to avoid by choosing passages which we know to be within the students' conceptual achievement. There is the difficulty of actual classroom technique. One method used successfully is to simulate the situation the student will be in when studying English texts independently. We often give the passage to the student without comment and rely upon follow-up discussion rather than traditional preparation, which runs the risk of inducing attitudes unfavourable to the development of student autonomy. If the teaching of the previous sections of the unit has been effective, this method is viable and successful.

This brings me to what is perhaps our most powerful teaching technique, which is the role played by discussion. By the very fact of using an EST course we are able to relate our English teaching to the students' knowledge and interests. Indeed we consciously draw upon that knowledge as a teaching device. By eliciting relevant scientific knowledge from the students and discussing aspects of the conceptual content of the units, we attempt to exploit the student's knowledge of his subject for language-teaching purposes, to extend the use of English beyond the confines of the course, and to relate our course to the wider scientific context of the student's studies. We feel that the possibility of significant communication, as opposed to the illustrative use of much classroom language, by thus using the course as vehicle for extensive discussion, is very high. At the same time, the skilful teacher will exploit this discussion to reinforce and practise the linguistic items being taught. There is no doubt, however, that this is a highly skilled art: it demands of the teacher a basic knowledge of scientific concepts related to the theme of the unit he is teaching, a flexibility in his approach - which enables him to abandon the prepared material when appropriate - and at the same time an ability to exercise sensitive control of the students, an ability to choose the correct topic and the right moment for extension in this, and the knowledge of the right time to get away from the subject in hand and of the right time to introduce a certain amount of humour. Humour may be a vital component in view of the serious nature of the materials. Such capability is, of course, the hallmark of good teaching in any context, but it becomes doubly important when it goes into the making of a fundamental teaching technique. The desirability and advantages of thus placing language-teaching in the context of an approach to genuine communication are obvious. It would be true to say, none the less, that our teachers require a fairly long period of 'acclimatisation' before they can handle such methods in the field of scientific English with confidence.

As a last point related to teaching methods; we should like to comment on the role of the native language. If the foreign teacher is perhaps at a disadvantage when attempting to handle discussion procedures, he is clearly at a marked advantage in that he knows the native-language equivalents of the terminology we must teach. This implies, of course, that we do not endorse the common proscription of translation. There are several reasons for accepting the use of translation, at least as far as terminology is concerned. In many cases there is a one-to-one correspondence between the English and the native term; this is particularly true of scientific discourse, where terms are often used with precise meanings. No harm is done, for example, by translating for medical students the names of diseases; indeed a lot of time and effort is saved and it could well be that in this case there is no alternative. Because much scientific terminology is used in a precise sense, one often finds that there is no equivalent term to gloss the unknown item or that it is particularly difficult to give an accurate description of the meaning couched in readily accessible language where it is possible to define a term by recourse to 'common core' language, we do so; but if this is not possible, translation can often be an acceptable technique.

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