OPTIMAL INPUT IN MATERIAL PREPARATION

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Abstract

This paper gives an account of the development of a university level reading textbook for the students of sciences in Iran. The book was prepared on the basis of the comprehension-based approach which suggests that understanding precedes performance and that emphasis on content rather than form facilitates language acquisition. The comprehension-based approach itself is based on the input theory, and it is claimed that the book under discussion has the characteristics of "optimal input" which is such a crucial requirement for the input theory. It is further claimed that the experiment reported offers a number of lessons for material preparation which would enhance second language acquisition.

Introduction

It is widely accepted that emphasis of the receptive skills of listening and reading will enhance the learning of a second language, (Gary 1977; Davies 1980). Research has also shown that emphasis on the content and not the form of language facilitates language acquisition (Swaffer & Stephens 1981). The acceptance of these points of views has led to the adoption of the comprehension-based approach to second language teaching. This approach is based on the assumption that given enough amount of comprehensible input, learners will acquire language. The essence of the comprehension-based approach is that understanding precedes performance, and that the teaching of grammar will not necessarily lead to second language acquisition (Gary & Gary 1981; Winitz 1981). The comprehension-based approach to language teaching is based on Krashen's input theory, which claims that in language learning, meaning is primary and structure is secondary. That is, given the input- - what is read or heard, structure are acquired automatically. The crucial requirement of implementing this theory in teaching is the provision of optimal input which, theoretically leads to language learning (Krashen 1982).

According to Krashen (1982), the optimal opportunities for learning a second language are provided in any textbook which has the following characteristics:1) comprehensibility, an indispensible feature of "optimal input". If the input is understood by learners, language learning will take place.2) The second characteristic is that the text should be of relevance and interest to learners.3) The material should not be arranged according to grammatical structures since it is the content and not the form of the message which enhances language acquisition. In authentic, "real life" communication one does not pay attention to the form of the message; rather it is the information itself which is the focus of communication.4) The last characteristic of optimal input is that the material should be provided in sufficient quantity. All of these

characteristics are present in what is called "Authentic Resource Materials", or "ARMS" (Phillips & Shettlesworth 1978). Therefore the application of the comprehension-based approach to ESP is especially suitable for allowing the use of ARMS in materials development.

The comprehension-based approach is also in line with the idea of regarding learner and learning strategies as the focal point of ESP. Widdowson (1981) and Hutchinson & Waters (1987) have suggested that in order to get better results from our practices in ESP, we must have an understanding of learners and the learning strategies they use. These advocates of the "Learning Centered Approach" have suggested that linguistic content should not be selected on the basis of the fact that they represent what learners will have to deal with, rather than they should be of the type that would activate the learning strategies of learners. It is noteworthy that text-centered ESP practices "often correspond" to learner-strategy centered proposals (Widdowson 1981:99). Learners are assumed to perform better in the task of learning English (i.e., optimal activation of the learning strategies will take place) if the manner of presentation of language is in accord with learners' cognitive styles. Generally speaking, according to this approach two types of learners have been identified: a) "serialists", (Pask & Scott 1972:218) or "converges", (Hudson 1967:50) who prefer "precision and rational control" (Widdowson 1981:101) and are inclined towards exact sciences, and b) "holists" or "diverges" who, on the other hand, prefer "wider networks of association... imaginative excursion and incline towards the arts and the social sciences" (Widdowson 1981:101). Widdowson further argues that it is quite possible that different academic disciplines themselves could be characterized by different cognitive styles. Furthermore, because learners have already demonstrated their preference by selecting a particular field of study, in principle it is possible to design and develop materials which would correspond to learners' cognitive learning strategies. Therefore, in the case of science students, for example, one would have to adopt mainly serialist or convergent type procedures of presentation.

The materials development project:

Background information

After the 1979 Revolution in Iran, the results of a formal survey instrument during fact gathering and needs assessment stages revealed that priority was given to English as the main foreign language of instruction at universities and institutions of higher education.(1) This was an indication of the fact that English was regarded as the "world's foremost lingua franca" (Fixhman 1971; Mackay & Mountford 1978:6); it also reflected the educational tradition of the prominence of English in the near past and, by implication, the availability of educational resources for the instruction of English in comparison to other modern European languages. More importantly, the results of the survey mandated a more selective approach to the teaching of ESP to Iranian students. For example, the results suggested that reading, writing, and oral communicative skills should be emphasized in that order. In view of the limited class time available to students and educators, the priority accorded to the reading skill was not far-fetched.

On the basis of the findings of the needs analysis and the subsequent revisions in curricula, ESP is currently offered in three stages in the Iranian universities:1) The first stage, "Basic English For University Students", deals with the basics of English, which is a review of what learners have learned in high school.2) The second stage, (hereafter "ESP1") emphasizes semi-technical" language. At this stage the aim is reading comprehension of authentic general scientific texts, and performing different kinds of comprehension, vocabulary and structure exercises. It is hoped that in ESP1 learners will master the more basic vocabulary of general science and, accordingly will gradually become familiar with original and general introductory texts of science.3) During the third stage ("ESP2") students of different disciplines study texts which are solely related to their own fields. The ultimate behavioral objective of the entire program is to train students who can mainly read the literature of their own specific fields with ease and enjoyment, thus getting the information they need. The justification of this approach (i.e., the Learning Centered Approach), following the theoretical framework outlined above- - the optimal input theory- -is that reading comprehension is regarded as an active thinking process.

A case study

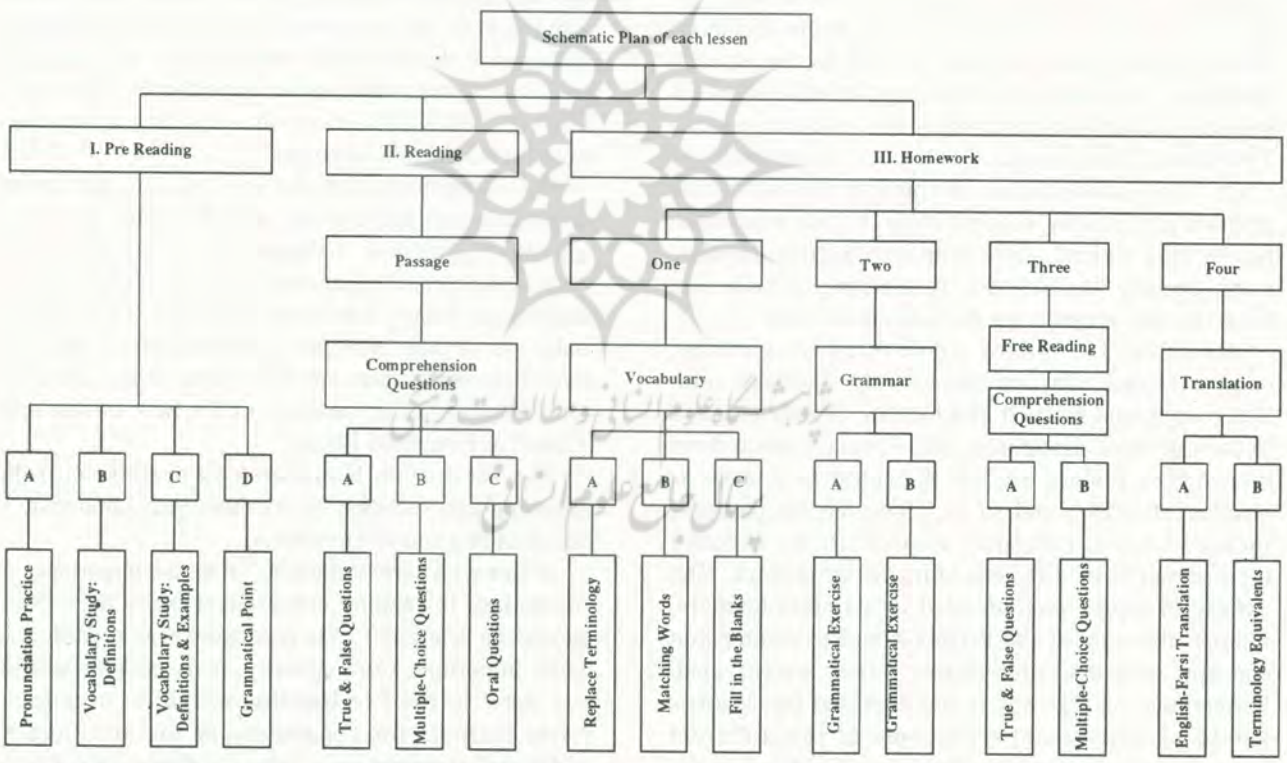
Our ESP textbook, *English For The Students Of Sciences* (hereafter *ESS*), was prepared within this general framework and the theoretical considerations outlined above informed its development. It is meant to be used by the general science students who have successfully passed the first review course mentioned in the three-course program above. *ESS* is a comprehension-based reading textbook which complements rather than duplicates some of the seminal topics of the students' major fields of study, thereby broadening students' academic experience, it is hoped.

The text comprises 17 comprehensive units. The rationale for the inclusion of 17 units is that each

semester in the Iranian university system lasts for 17 weeks; by implication, then, it is suggested that each unit should be covered in one week. ESP1 usually requires a minimum of two hours per week of classroom interaction of guidance, for completion of the course. Depending on the availability of resources, however, some universities have been able to offer the course with three and even four hours of instruction per week.

Each unit in ESS is made up of three complementary sections: ***I. Pre-Reading, II.Reading and III. Homework;*** (See Fig. 1; also notice that the description of the textbook given hereafter will follow the same order as that of the diagram in Figure 1.) The first and the third sections of ESS are expected to be studied exclusively by learners themselves with the main part of the class period spent on the second section of each unit. However, if students encounter problematic questions regarding sections I and III, they can seek teachers' help and guidance.

Figure 1



The Pre-Reading section is divided into four sub-divisions. The pronunciation practice aims to familiarize students with the pronunciation of the new words of the unit (arranged alphabetically), especially those that appear in the main reading passage. In case students still have pronunciation problems regarding the vocabulary which they were introduced to in high school; this section is also intended to provide them with an extra chance to overcome those problems. The framework for the selection of the words was the vocabulary lists of high school textbooks. General or technical words which were not found in these lists were included in this section.(2)

The technical words of each unit are defined in the section on Vocabulary Study: Definitions. The criteria for selection of technical words was somewhat subjective in that selection was based on the material developers' own intuition of what were considered technical words. Typically, they were words:1) which were indispensible to a particular branch of science and 2) which were defined and or illustrated in the main passage, one of the other reading passages, or even in one of the authentic exemplifying sentences of the unit (i.e., ARMS examples). In most cases on the basis of our knowledge of curricula it was believed that the students would be familiar with the concepts in question.(3) The definitions of the technical vocabulary were taken mainly from the *Oxford Advanced Learner's Dictionary Of Current English* (1982 edition).(4) All words supplied in the pronunciation practice section, except for the technical words, are defined in the section on Vocabulary Study: Definitions and Examples. One example of their usage in ARMS was given (be it the text itself, one of the reference works, or

some other ARMS). The contextualization of vocabulary in ARMS takes place even before the words have been encountered in the reading passages.

The section on Reading comprises ARMS followed by comprehension questions. Verbatim textbook passages- - ARMS,were offered because it was believed that in view of the students' linguistic background and the introductory nature of the reading material, the original discourse of science and technology rather than common language would benefit the comprehension of the English for science and technology by students (Strother & Ulijn 1987).

All the passages in the 17 units are fairly short, ranging from four to eight paragraphs. The subjects of reading passages were selected on the basis of their importance and centrality to different branches of natural sciences, since it is likely that learners may need to interact with members of the other branches of science. For example, the first and the last units in the book are devoted to an introduction to science, the justification for the classification of sciences and the prospects of pure science respectively. Twelve units are devoted to physics, chemistry, biology and mathematics (three units for each: the first an introduction to each discipline, the other two related to the most essential subjects within that discipline). For example, in unit Two after "The Science Of Physics" is introduced, Units Three and Four are devoted to electricity and magnets respectively, because these two are believed to be the most crucial subjects in introductory physics. Consequently, the outcome of learning of each unit leads into and prepares for the next unite's work.

Units 14, 15, and 16 are devoted to: geology, computers and nutrition respectively, each one unit. Space limitation dictated th allocation of only one unit to each of these disciplines, and especially since these branches of science are not as central to science as physics, chemistry and so on. However, the passages included were carefully chosen to be broadly representative of different branches of science. The variety of topics was intended to maintain learners' interest throughout the textbook and to ensure that concepts related to each learner's field are recycled. Furthermore, in this way it was expected that learners would be conversant with some of the different concepts and vocabulary of varying fields of study, which in turn would broaden their knowledge.

The potential problem of a particular unit (such as physics) being unfamiliar to students other than physics majors, was reduced to a considerable degree; the topics included are so general and introductory in nature that it could be claimed that they are of significance to all branches of science. For example the units on "Basic Arithmetical Operations", "An Introduction To statistics" and "The Computer" (in addition to the first and the last units) are of seminal importance to all science students. In some cases, because of the generality of the subject matter it is difficult to categorize the given topics, such as "Magnets" or "Electricity" (i.e., two or more fields of study may overlap). In this way the danger of loss of motivation on the part of the students was addressed, and hopefully to a considerable extent lessened.

The reading passages are followed by three kinds of comprehension questions: 1) True or False, 2) Multiple Choice and 3) Wh-Questions. The number of items per unit is fairly constant, ranging between a minimum of 15 and a maximum of 26. The exercises can be done in written form or orally in order to provoke discussion about the content of the passage and to activate learners' background knowledge of the topics presented in each of the passages. This is not in contradiction with the belief that reading had been identified in the needs analysis as the most important skill to be emphasized. The fact that the exercises can be checked orally along with teachers' encouragement of oral work in class is a pedagogical device which would satisfy a commonly-held belief regarding what constitutes successful language learning-namely, that learning a language means speaking that language.

The increasingly complex exercises are not limited to reading comprehension, and there are others on vocabulary, grammar, independent reading and so on. What is the common feature of these exercises is that in addition to being "top-down" oriented (i.e., learners make use of their previous knowledge about the topic under discussion) there are many "bottom-up" exercises which demand close analysis of the new information (Carrell & Eisterhold 1983).

The section on Homework is divided into the following four sections: 1) Vocabulary, 2) Grammar, 3) Free-Reading and 4) Translation.

In line with current thinking about the importance of vocabulary in reading comprehension, (Ulijn 1984) increasing learners' lexis repertoire was regarded as being important. Consequently, lexis is dealt with in two steps: a) **the Pre-Reading** activities, in order to prime learners for vocabulary of the unit, and b) **additional exercises** on vocabulary after completion of the reading. The lexis of each unit within a subject (e.g.physics) builds on that of the preceding unit and, consequently, the simpler concepts help learners to understand more difficult ones. The implication of this fact is that learners repeatedly are exposed to different topics presented in the book.

In the Vocabulary section, three types of exercises

are prepared: a) **Replacement drill,** the purpose of which is to increase students' knowledge of the use of words which gradually become more technical and specialized; b) **Matching words** for the completion of which students would be encouraged to use monolingual general English dictionaries, and c) **Fill in the Blanks.** For the purposes of estimation of the performance of students regarding constant tasks throughout the entire course, these kinds of exercises were judged to be more suitable than the variable communicative information-transfer exercises. This is in line with Machay's (1981) observation that quantifiability is closely related to accountability in ESP.

The grammatical point which was exemplified during the Pre-Reading stage is taken up again in part two of the Homework stage. some researchers have investigated the discourse characteristics of English for Science and Technology (Trimble 1978; Ulijn 1984). The findings reveal that in English for Science and Technology texts, some syntactic structures such as the passive, nominalization, participle construction, etc. occur more frequently than they do in common language. Thus, what are known to be the most common, general and frequent grammatical structures of scientific discourse were chosen to be included in this section. These structures were selected from the main reading passage and the same sentence was used as one of the examples in the general introduction of the grammatical point in question. The grammatical descriptions are general and kept to a minimum since the students have covered their general use in common language at high school and during the first course of instruction at university (i.e., the prerequisite course for ESP1). Furthermore, if students still face difficulty, they are encouraged to raise the point in class and seek the teachers' help. The main characteristic of the general and brief introduction of the grammatical point and the subsequent exercises is that they highlight the use of the grammatical point in question in scientific and technical discourse. In other words, the section on grammar aims at driving home the scientific discourse of the grammatical structure, which hopefully students have already internalized from non-scientific sources.

In order to further enhance the task of language acquisition and to provide students with practice in independent reading, every unit contains an additional reading passage on the same topic as the main reading passage. So, for example, because the reading passage of lesson two is "The Science of Physics", the free reading is "What Sort of Work Does a Physicist do?" The free reading passages are generally shorter and easier to understand than the main reading passage. Comprehension of the free reading passages is checked by True or False and Multiple Choice questions.

The inclusion of Translation and Terminology Equivalence sections, as the fourth part of the Homework section, reflects the recognition of the fact that educational institutions do not exist in a vacuum. It was in the light of this belief that a need was felt for providing textbooks which "can function within the system whose needs they are meant to serve", (Markee 1986:4). The outcome is intended to enable students to read pertinent literature in English and to make use of it in the Iranian context.

Conclusion

English For The Students Of Sciences represents a serious attempt to present an ESP textbook in which the comprehension-based theory is put into practice. *ESS* has undeniable qualities as a reading comprehension book and the experiment reported above offers a number of lessons worthy of consideration.

One of the strong points of the book is that it is learner centered (Widdowson 1981; Hutchinson & Waters 1987). That is, *ESS* is process oriented and attempts to relate to the transitional behavior of learners. According to Widdowson, given the present state of ESP "the best one can do is to prepare materials which directly refer to the characteristic styles of different [learners'] styles" (Widdowson 1981:102). The content and format of ESS both in its inter and intra arrangement of units is perceived by the material developers as being in harmony with students' probable cognitive learning styles (i.e., serialist).

Another strong point of *ESS* is that being a comprehension-based textbook it gives the students the maximum opportunity to develop their skills of reading. It meets all of the characteristics of "optimal input" as suggested by Krashen (1982). It is comprehensive because it appeals to and makes use of students' knowledge of the content areas and it provides students with opportunities to use their previous knowledge. The selection of both the most central topics of the sciences as reading passages and even the grammatical structures to be highlighted, presupposes students' familiarity with those topics and structures. Therefore, it is hoped that the selection will provide stimulus for learning and will engage students' thinking capacities (Hutchinson & Waters 1987).

ESS is of relevance and interest to students because the materials included are ARMS which have been selected from a variety of disciplines in order to provide typical science discourse. ARMS provide beyond the sentence level discourse, the type of discourse learners need to master for their future professional work. The

use of ARMS, hopefully will immediately make learners realize that learning *ESS* will facilitate the transition to their own fields of study. *ESS* provides a sample of authentic material for science students, to the extent that it can also be used as a good collection of original scientific passages.

The book's strong pedagogical focus provides another source of strength. It provides a sufficient quantity of material; each unit has three reading passages and is supplemented and monitored by a variety of exercises. Therefore it maximizes the chances of learning by providing ample opportunities to students (Hutchinson & Waters 1987). Furthermore careful sequencing and structuring of units which follows a meticulously built-in-hierarchy secures a high level of cyclicity in the book.

In conclusion, despite the hope that *ESS* is a step in the right direction, the continual evaluation of the material should be undertaken as is the case with most successful materials. The feedback from the students and especially the formative and submative evaluation of teachers will definitely be very helpful in eliminating any unforeseen drawbacks.

Notes

1. For further information regarding the needs analysis, see the preface to *English For The Students Of Sciences*, (1989).

2. for the pronunciation of vocabulary we used the transcription methods from the most recent edition of *Webster's New Collegiate Dictionary* of 1976 but with the minor omission of the secondary and weak stress marks (and thus only the primary stress marks were given). It was believed that the pronunciation key of *Webster* would be easier for students, because the symbols used are more like the English alphabet, with minor use of diacritics in comparison to the IPA or a variation of it used in other dictionaries. The justification for the omission of stresses other than the primary (which is phonemic and thence must be acquired) was based on our own judgement as experienced English teachers. We felt that we would do better if we spent the precious class time on more seminal problems than the secondary, tertiary and weak suprasegmental features of stress.

3. Our presupposition has been borne out in the course of our relatively short experience of using the text.

4. The language of definitions given in the *Oxford Advanced Learner's Dictionary* was judged to be simpler and more brief than others. In cases when the *Oxford* was judged to be difficult, the following sources were used: *Webster's New Collegiate Dictionary* (1976) and A *Dictionary Of Science*,by Uvarov et al (1973). In a few cases, when the language of none of the above was regarded as being appropriate to the students' linguistic background, definitions given in the glossaries of the source material were used.

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