

Reading for Science and Technology in a Foreign Language: Students' Evaluation of Formal Instruction on Reading Strategies

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Research has shown that explicit teaching of reading strategies in L2 improves the learners' reading proficiency in that language. This study investigates science students' evaluation of the impact of learning and using five reading strategies in L2 on performing academic tasks required in that language for subject courses. The instruction was carried out through a mandatory English course, and the reading strategies considered were: identifying topic sentences, understanding paragraph cohesion, understanding paragraph development, dealing with unknown words, and locating information in texts quickly. The results indicated that the students considered receiving formal instruction on these strategies to be helpful in performing the academic tasks required in English in their fields of specialisation. At the same time, they found this learning experience interesting and enjoyable.

INTRODUCTION

Reading ability in a foreign or a second language is viewed by researchers in two different ways. The first asserts that reading ability in L2 is determined by the proficiency in that language; that is, the language skills develop from the lower word skill to the higher level cognitive skills (Macnamara 1970; Clark 1979; Cziko 1980, Laufer and Sim 1982). The second emphasises that the higher level cognitive strategies in L1 can be transferred to L2 and work simultaneously with lower level strategies; in other words, cognitive processes will operate smoothly as the language proficiency develops (Goodman 1913; Coady 1919; Cummins 1980; Hudson 1982; Benedetto 1984). This means that since L1 reading proficiency can be enhanced by providing formal instruction on the top level text organisation (Bartlett 1918; Geva 1983; Mosenthal 1984; Reutzel 1985), L2 reading ability can also be facilitated by the same type of instruction. In fact, many studies have demonstrated that reading comprehension in L2 can be improved by explicit teaching of the different reading strategies (Hosenfeld 1984; Carrell 1985; Hamp-Lyons 1985; Lee 1986; Barnett 1988; Diptoadi 1991; Spinelli and Sisken 1992; Swaffar 1992; Zhicheng 1992; Mustafa 1995; and Rusciollelli 1995).

In addition to enhancing the students' reading proficiency, formal instruction in these strategies has been proved to assist in improving their writing ability. For example, Johns (1988) and Rusciollelli (1995) showed how summary writing can

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be facilitated by instruction in certain reading strategies such as selecting and organising main ideas. Also Johnson (1991) found that while writing, the students make use of the reading passages by extracting the concepts presented, following similar patterns of organisation, and developing awareness of writer/reader relationship.

Most of the studies mentioned above have concentrated on certain reading strategies and the measurement of their efficiency through reading comprehension tests, which usually represent the teachers' rather than the learners' evaluation. Although there have been few studies dealing with the students' evaluation of using such strategies, they have been basically concerned with the tasks performed in the L2 classroom. For example Rusciollelli (1995) concentrated on the responses of English speaking university students to using recommended strategies when reading Spanish articles in an L2 course. Other studies like Johns (1988) and Johnson (1991) investigated the students' awareness of using the knowledge gained from reading comprehension in performing writing tasks in L2, but this was still limited to the L2 classroom. To my knowledge there has been no study which deals with university students' evaluation of using the reading strategies they learn in an L2 course in performing academic tasks required in that language for other subject courses.

The purpose of this study is to investigate science students' evaluation of the effect of learning five reading strategies on their reading proficiency in L2. It will concentrate on their perception of how far explicit instruction has helped them in academic tasks requiring English in their fields of specialisation. It will also consider their attitude towards learning and using these strategies in the L2 classroom.

BACKGROUND

This study is a part of a large ESP project conducted at the University of Science and Technology in Jordan in cooperation with the British Council and the Overseas Development Agency. The participants in this project were seven faculty members in the English unit at the university, a resident British English language teaching officer to whom the head of the English unit at that time was the counterpart, and four British consultants in materials writing and teaching methodology.

The project was initiated in 1988 to revise two mandatory English courses designed to help students in coping up with the science courses in their fields of specialisation. The need for the English courses stems from the university educational situation: most textbooks, references and requirements for the science courses are in English, but most students' command of this language is at the intermediate level.

The project involved several stages including needs analysis of the students and the subject professors, revising the existing English courses, writing materials for

the new version of the courses, training the English teachers to use these materials in the classroom, and finally evaluating the materials and the courses in question.

This study will deal with two stages of the project; the needs analysis and the evaluation of the new materials. In particular, it will concentrate only on the needs analysis of the subject professors and the materials evaluation by the students. The needs analysis of the students and the materials evaluation by the English teachers will not be discussed in detail because of the limited scope of the study.

DATA AND METHODOLOGY

The data for this study were collected and analysed by all the faculty members in the English unit, and the resident British English language teaching officer. It was achieved in two stages, needs analysis and materials evaluation. The needs analysis was conducted in 1989 and was based on data collected from the subject professors in the different faculties, and the students who were taking the two English courses at the time.

The professors' data were collected through structured interviews with 50 professors from six faculties at the university: Engineering, Medicine, Nursing, Pharmacy, Dentistry and Science. The professors were asked about the length and the level of the reading assignments given to the students, and the type of written instruction provided. They were also asked about their opinion of the comprehension level achieved by their students and the problems they face in English. Finally they were asked to suggest ways to improve the students' reading proficiency in English. Similar questions were asked about the other skills: writing, listening and speaking. At the end, they were asked to rank the four skills in terms of their relative importance for the students' academic work in their fields of specialisation.

As for the students' data, they were collected through a cloze test administered to 500 students; 150 were taking the first course and 350 taking the second. The aim of the test was to get an idea about the students' level in English and to compare the levels of the two courses.

The materials evaluation involved the new materials written according to the results of the needs analysis, and was conducted between 1992-1993. This was achieved in two stages: the first involved detailed evaluation forms of each unit administered to 1500 students who were taking the English courses at the time and seven English teachers. The second involved overall evaluation forms administered to these students, and structured interviews with a sample of 15 students conducted by an ESP consultant. Also, there were classroom observations and structured interviews with the teachers conducted by the ESP consultant.

The detailed evaluation forms required rating the texts on a three-level scale in terms of difficulty, acceptability and enjoyment; the tasks on a two-level scale in terms of difficulty and enjoyment; and clarity on a three-level scale in terms of layout, printing and rubrics. There were also questions about the suitability of the time allocated for the various class activities, the extent to which the objectives were realised, the problems faced in using the texts and the tasks, and suggestions for possible solutions. At the end, there was an open-ended question for comments and suggestions.

As for the overall evaluation forms, they involved rating each of the following on a three-level scale: the extent to which the English courses prepared the students to deal with their subject courses, the extent to which they found the texts and the activities interesting, and the extent to which they found the methodology interesting. There was also a question about the reading and writing strategies they found most useful in performing the academic tasks required for their subject courses. Finally, there was an open-ended question for comments and suggestions.

The consultant's interviews with the students involved asking them questions about the relationship between the reading and writing strategies given in the English courses and the required academic tasks for their subject courses. They were also asked about the extent to which they found the materials and the methodology interesting.

The consultant's evaluation through class visits involved taking notes on several aspects of the actual practice in the classroom including methods used to introduce the new materials, managing class activities including pair work and group work within the time allocated for each, achieving each lesson's objectives, dealing with homework, students performance in various tasks, and their reactions to the materials and the activities. These notes and comments were discussed afterwards with each teacher stressing points of strength and indicating points of weakness for future modification and improvement.

RESULTS AND DISCUSSION

A. NEEDS ANALYSIS:

For the purpose of this study, the analysis will concentrate on the subject professors' responses to the questions asked about reading and writing, and their relative importance to the learning of science compared to the other skills. The analysis showed that the professors prescribed reading assignments for each course; and these included chapters in textbooks and references, and specialized journal articles, after the second year. In addition, they provided their students with handouts of notes and outlines of selected topics, and written instruction for out of class assignments. The analysis also indicated that the professors usually checked their

students' comprehension either orally or in writing, and they considered it to be of an acceptable standard. Nevertheless, they believed that the students face reading problems in vocabulary, paragraph organisation and grammar, respectively, and that these problems were due to their poor background in the subject area

As for writing, the analysis showed that the writing tasks required by the different faculties can be either in note form or full writing, and included solving problems, completing report forms, writing short laboratory reports, writing full project reports and answering examination questions. It also showed that the professors believed that their students' performance in writing was much lower than what was expected at this level, and that the major area of difficulty was organisation of ideas compared to vocabulary and grammar. Therefore, they suggested that more organised and supervised writing practice should be provided.

The analysis of the professors' responses to the question about the relative importance of the four skills as applied to the learning of science showed that they all considered reading to be the most important skill, but writing the most difficult although it was given the third place in terms of importance. The results are illustrated in Table 1 below:

Place	Reading	Listening	Writing	Speaking
1	6			
2		3	1	2
3		2	4	
4		1	1	4
Points	24	14	12	10

Table 1: Professors' ranking of the four skills in terms of their relative importance as applied to the learning of science

The points allotted to each place in the table above were based on the following scale: 1st place-4points, 2nd place-3points, 3rd place-2points, 4th place-1point. As for the analysis of the students' scores on the cloze test, the results showed that their overall performance was much lower than expected. However, the students taking the second course performed significantly better than those taking the first course. The overall low achievement may be due to either the students' unfamiliarity with this type of test or the insufficient time allocated for it; because despite the clear instruction, many students did not complete the test. As for the significant difference in the performance of the students taking the first course and those taking the second, it could be explained on the grounds that this test was administered in the second semester when most of the first year students were taking the second

course, while the first course was taken mostly by those who failed it in the first semester, or those who postponed taking it because of their low level in English.

Based on the results of needs analysis it was decided that the first English course should concentrate on reading preparing for the second course which should be built around writing. This does not mean that the other skills were ignored; on the contrary, they were integrated in the two courses, listening in the first and speaking in the second.

Because of the limited scope of this study, it will concentrate only on the reading strategies introduced in the first course and how they were integrated in writing instruction. The selection of the reading strategies included in the first course was based on techniques used by efficient readers in their interaction with the text, and which are best developed by using the process approach. This approach, which is called by Hamp-Lyons (1985) the "text-strategic approach", concentrates on the discourse rather than the sentence level, emphasises ideas rather than specific facts and deals with meaning rather than form. Consequently, the reading strategies chosen to be included in the first course were: identifying topic sentences, understanding paragraph cohesion, understanding paragraph development, dealing with unknown words and finding information in a text quickly.

a. Identifying topic sentences: this concept was introduced as an aid to understanding through the recognition of topic sentences, their position in the paragraph and their function. The tasks built around this concept emphasised the role of topic sentences as a basis for a set of notes or a summary. The following activity from our materials concentrates on identifying the topic by using the topic sentence.

Read the following paragraph carefully. Underline the topic sentence. Indicate the topic in one word or a phrase.

Much research has been carried out in recent years into sleep and we know much more about it. We know, for example, a great deal about the mechanics of sleep. We are beginning to know about the biochemical changes involved. While the psychological basis for sleep remains a matter of conjecture, we do nevertheless, have considerable evidence on how much sleep people obtain.

Example 1

In the above activity the students were supposed to identify the topic as "research into sleep" based on the topic sentence of the paragraph which is the first sentence. Using this concept proved to be very helpful to students in summary writing. (See Johns (1988).)

b. Understanding paragraph cohesion: here the common ways writers link their ideas were introduced: reference expressions such as pronouns, repetition, change of word form, synonyms and hyponyms; followed by adverbial links such as exemplification, addition, contrast, result and sequence. The activities built around this concept involved identifying these expressions, rearranging jumbled paragraphs, and providing adverbial links for deliberate gaps in paragraphs. What follows is an example of these activities:

Read the following paragraph carefully. Then fill in the gaps with the signal words according to the sense of the passage.

Aluminum is the commonest metal in the earth's crust. 1. – it was only recently that methods were perfected to produce it in large quantities. It is the least dense of all the metals. 2. – it is particularly useful in construction where the factor of weight is crucial. 3. – it is widely used in the manufacture of the body work of the plane and cars. In addition to being light, aluminum is also resistant to deep oxidation. It reacts quite easily with water and oxygen. 4. – as soon as the outer surface has been converted to aluminum oxide, no more oxidation takes place. The thin outer layer of aluminum oxide sticks firmly to the metal. 5. – it is protected from further attack by water or oxygen. 6. – it is particularly suitable for making window frames and doors. It is more expensive than wood, 7. – as it does not need repainting, it may in the end prove to be cheaper.

Example 2

In this activity the students were supposed to write "However or any other adverb expressing contrast" in the first gap and "Therefore or any adverb expressing result" in the second.

c. Understanding paragraph development: here the students were introduced to the different kinds of paragraph structure, and how the information is ordered in each. The types considered were those describing an object or a process, definition, and classification. For each type sample paragraphs were presented and analysed, then the students were asked to analyse paragraphs with a similar structure, and after that to produce each type of organisation based on information provided in note form. For example, after the students were introduced to the development of a classification paragraph by analysing it into sentences illustrating the function of each, they were asked to do the following activity:

Use the notes below to write your own classification paragraph.

The division of the elements

1. *Metals: e.g. gold, silver, copper*
2. *Non-metals: e.g. oxygen, sulfur, silicon*
3. *Inert gases: e.g. argon, helium*

Example 3

Here the students were supposed to include in the paragraph, classification expressions like “are divided into” and exemplification expressions like “such as”.

Using such reading activities has been reported to have helped students in ordering their ideas in writing tasks in the second language (Johnson 1991).

d. Deducing the meaning of unknown words: guessing vocabulary from context as an efficient aid in reading comprehension has been repeatedly emphasised in the literature (Hosenfeld 1977 1984; Clark and Nation 1980; and Rusciollelli 1995). The instruction provided on this strategy in our course concentrated on the relationship between word meaning and the sentence context, and on word analysis as a technique for dealing with unknown lexical items. The activities built around this concept involved using clues from the paragraph, and analysing words into roots, suffixes and prefixes to deduce their meaning. At the same time these activities introduced the students to the most common scientific prefixes and suffixes. The following activity illustrates how this concept was dealt with in our course:

Look carefully at the following paragraph. Work out the meaning of the underlined words and indicate the clue which helped you.

The study of geology can tell you a lot about early history and the creatures who once lived on earth. A prehistoric animal, for example would probably be fossilised if it died in an area where the soil was moist and alkaline, that is lacking acidity. Over millions of years the soil would turn into stone and the creatures or its bones would be fossilised. Skeletons and shells of all sorts of organisms, such as fish and dancers, have been found as fossils.

Example 4

The students were expected to show that the meaning of “prehistoric” as “belonging to early history” can be based on the information “creatures who once lived on earth” or on an analysis of the prefix “pre-” which means “before”, the root “history” and the suffix “-ic” which means “pertaining to” Also they were expected to show that the meaning of the word “fossilised” as “turned into stone” is based on the clue from the text “turn into stone”.

e. Locating information in texts quickly: here skimming and scanning were introduced as methods for extracting main points or specific information from texts quickly. Tasks based on these skills involved practising these modes of reading to find major ideas or certain points in long passages and to locate specific information in dictionaries or timetables in a limited time. For example, in one activity the students are provided with copies of certain pages from a dictionary, then asked to find specific information about certain lexical items as illustrated below.

Look at pages 555-6 of the Oxford Advanced Learners' Dictionary on the next page. Use it to answer the following questions.

1. Is “mulch” (a). a verb only? - (b). a noun only? - (c). a noun and a verb? -
2. “Mug” means someone who is stupid. False or True? -
3. How many entries are there for the word “mug”? -
4. There are two words “mucous” and “mucus”. Which one is the adjective? -
5. “Mulct” is a word in common English usage. False or True? -

Example 5

Teaching this strategy as a specific reading style for performing certain tasks has been reported to be very helpful in enhancing the students' reading ability in L2 (Grellet 1981; Rusciollelli 1995).

It should be noted that all of these strategies were recycled more than once, and the activities built around them were presented in gradual difficulty. After each strategy was introduced and practised by the students both separately and in combination with the preceding techniques, all of these strategies were integrated in an instructional form to improve reading skills. This recommended method includes pre-reading activities, skimming and scanning practice, deducing the meaning of unknown words and summarising the main ideas (Phillips 1984; and Rusciollelli 1995).

As mentioned earlier, the reading strategies, especially identifying topic sentences, and understanding paragraph cohesion and development, were extended to the second English course which concentrated on writing long projects. Using explicit instruction on various reading strategies in teaching writing has proved to be very successful not only in summary writing (Johns 1988 and Rusciollelli 1995), but also in extracting and organising ideas (Johnson 1991). In our situation, this was applied to the writing of laboratory reports and in particular the procedure section. Here we emphasised the organisation of process description which includes the use of sequencers as cohesive devices. Using proper cohesive devices was also stressed in writing the conclusion section of the laboratory reports as an essential link between the results and the aim of the experiment. Students were also instructed in paragraph development and paragraph cohesion on writing descriptions of an object. In all of these types of paragraph structure, the importance of the topic sentence to introduce the main idea was always emphasised. As indicated earlier, the writing instruction involved tasks in which the students had first to analyse sample paragraphs, then to write guided paragraphs, and finally to perform tasks similar to those required for subject courses.

B. MATERIAL EVALUATION:

The students' overall evaluation of the material indicated that they thought the English courses, including the reading and writing strategies, clearly benefited their subject courses and their attitude towards learning and using these strategies in the L2 classroom. This is illustrated in the following table:

Question	Not at all %	To some extent %	Very much %
Help in subject course	17	70	13
Interesting material	25	53	22
Interesting methodology	12	31	57

Table 2: The students' evaluation of the materials for the two English course

The figures in the table above show that most students, 70 percent, considered the English courses to be related to their subject courses and to be helpful in dealing with them. The figures also show that most students seemed to enjoy the materials and the way they were presented.

The reason behind the students' reports on the materials as being helpful in dealing with their subject courses, is most probably that these materials were based on the results of the needs analysis which indicated the types of task required from the students in English in their fields of specialisation. The explanation for their considering the materials interesting is probably that they dealt with various basic scientific topics which were partly related to their fields of specialisation and partly

added to their general knowledge. The reason for their enjoying the methodology used in presenting these materials is most probably that it was learning centred rather than teaching centred. This methodology gave each student the chance to participate in the activities through group work and pair work, and consequently, to learn through discussion and reasoning.

The consultant's report showed that the students, even those with a high competence in English, were pleased with the English courses and perceived them as being very valuable to their subject courses. The students indicated that they found the reading strategies to be very helpful in both their reading and writing assignments for their subject courses. It also showed that the students' suggestions for changes were related to the methodology rather than to the materials.

As for the other aspects of material evaluation, the analysis of the detailed forms filled by the students showed that, except in a few instances, most of the texts and tasks used were considered to be of acceptable difficulty and enjoyable, most of the rubrics were clear, and the class time allocated for various activities was usually suitable. For example, the students indicated that they liked identifying the topic sentence and the topic, and guessing the meaning of unknown words from their structure or their context. Their appreciation of the value of these strategies could be due to their immediate application in the reading assignments required for their subject courses. They also seemed to like writing laboratory reports based on the reading strategy of understanding paragraph development. Again this could be because of the immediate application of that strategy in the weekly laboratory reports they had to submit. However, they found understanding paragraph cohesion, including tasks on identifying the links between sentences, providing adverbial links in gaps, and rearranging jumbled paragraphs the most difficult strategy, and consequently, the least enjoyable. This could be due to their high school English courses in which paragraphs were dealt with at the sentence level, and so the adverbial links were mostly considered intrasentential rather than intersentential. Therefore, the students had to learn a new concept and at the same time to modify a well-established previous one.

The analysis of the students' responses also showed that the layout and printing needed to be improved. For example the letter font, especially in materials extracted from dictionaries or timetables, had to be made bigger, and the drawing of some objects which were used in the writing material, had to be improved. The problems indicated in some texts and tasks, clarity and time allocation were taken into consideration in the continuous revision and modification of the materials. However, some tasks, especially cohesion tasks, were not changed, but the instructors agreed to give them more attention by extra class practice and homework.

The analysis of the detailed evaluation forms filled by the English teachers showed that there was a high degree of satisfaction with the materials. However there were suggestions similar to those indicated by the students for changes in some texts and tasks, layout, printing and time allocation.

The consultant's report on the class observations and the discussion with the language teachers indicated that the teachers were very satisfied with the materials, but they needed more training in class methodology. As for their suggestions for future changes, the analysis indicated results similar to those commented on in the students' interviews as far as the materials and the methodology were concerned.

CONCLUSION

This study has shown that formal instruction on reading strategies through the English course was perceived by the students as being helpful in performing academic tasks required in English for their subject courses. This was manifested through the students' reported awareness of the positive impact of applying such strategies in dealing with the reading and writing tasks required in English in their fields of specialisation. It has also shown that explicit teaching of these strategies through proper methodology can lead to a positive attitude towards learning and using them in foreign language classrooms.

Note

An earlier version of this paper was presented at the International Conference on Reading in the University: First, Second and Foreign Languages, which was held in Toulouse, France, September 15-16, 1995.

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BOOK REVIEW

Variables - A Case Of War In The Classroom by Valerie Whinston, ed. (1994). New York: TESOL Series II - Innovative Classroom Techniques (ed. C. Richards, Series Editor).

Charlottesville, Virginia: TESOL, Inc. ISBN 0-939595-4-4, 173 pp.

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"These are English language teachers who feel uncomfortable about presenting the art of the classroom," says Valerie Whinston in the introductory words of the wonderful book. "Contributions to this volume have come up with original and exciting ways to incorporate literature into the language classroom."

This is a challenge, followed by a bold claim: "The proof of the pudding is in the eating," having tried out a number of these activities with low intermediate to advanced general English classes recently as the course of reading the book, the reviewer also got the interesting and fruit-full nature of this book.

The very much of this book. Most of the activities would fit naturally into the normal sequence of language teaching events in ways which we would expect to find in a "theory" activities. Most foreign language teachers are well aware of the many kinds of communicative activity at all levels and in all areas. This book will surely be of help in confirming the place of "literature" within the language teaching, and should take its place alongside other texts such as *World's Language and Language Learning* (1993), *Agency and Dual Language* by Carter and Long (1994), *Reading and Study in the Foreign Language Classroom* (1997), and others, beyond to those who are interested in the background and value of teaching literature, and approach the discipline with a "theoretical" standpoint. This book is indeed a good one, and it is indeed a good one in its very widest sense. The book is, and is intended to be, a collection of practical ideas which the reader can use immediately.

"Literature" may well be a word which conjures up an image of an old-fashioned, dusty, and heavy, and even though it is a word which is used in many contexts, it is not always clear what it means. It is a word which is used in many contexts, and it is not always clear what it means. It is a word which is used in many contexts, and it is not always clear what it means. It is a word which is used in many contexts, and it is not always clear what it means.

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