SCHEMA ACTIVATION AND TEXT COMPREHENSION

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Recent research on reading has supported the theoretical view that meaning is not found in texts only, and that reading comprehension results from an interactive process between readers and texts. Readers bring in their knowledge of the world, or the schemata stored in their memory trying to match this knowledge to the new information which comes from the text. Schemata (the plural of schema), are defined by Rumelhart (1980) as "the building blocks of cognition". According to Rumelhart, schemata are of great importance to the processing of any information, they are employed in the process of interpreting linguistic and non-linguistic input, in the process of remembering, of organizing actions and in guiding the flow of processing.

The role of schemata in reading comprehension is referred to as "schema theory", as stated by Carrel and Eisterhold (1983c), a text does not carry meaning by itself, readers have to bring in the relevant schemata from their memory and make sense out of the text. For Anderson and Pearson (1984) someone comprehends a text when he finds a "mental home" for the new information coming from the text, i.e., when he is able to find a place in his schemata to fit the new information. As several reading researchers have pointed out (e.g. Langer 1984, Adams and Collins 1979), this participation of the reader, bringing in his knowledge and

experience when reading a text is of crucial importance in reading comprehension.

Though it is quite clear today that comprehension depends on both texts and readers, it is not clear yet whether difficulties in reading in a foreign language are due to a reading problem or a language problem. Nevertheless, most reading researchers and specialists will agree that, obviously, some linguistic background in the target language is necessary for readers to pick up clues and thus access relevant schemata. However, as pointed out by Carrel and Eisterhold (1983) the problem is that most of the time the failure to access appropriate schemata in order to comprehend written texts is erroneously interpreted as only a language problem.

For example, in the case of reading a text which contains a concept like producing caviar, which is not discussed by the author, a Brazilian and a Soviet may have a different understanding of the same text. The problem is that Brazilians do not have a "producing caviar" schema, at least well incorporated as the Soviets do. For the Soviets, the whole process of producing caviar is well known, i.e. part of their schemata, and it is likely that they will have no problems in making sense of the text, whereas for a Brazilian the same text may seem difficult to understand because of lack of relevant schemata. Therefore, if a reader does not have the appropriate schema or fails to activate it during the process of reading, he may not understand the text or probably will miss the point intended by the writer.

Knowing the language, therefore, is far from being the only important factor in reading comprehension. One may know all the grammar rules, be able to recognize the structure of a sentence, know the words in the sentence and yet not be able to grasp the meaning because of lack of relevant schemata or lack of activation of schemata.

Presenting the subjects with some kind of prereading activity before they read have demonstrated to be an effective way to build or activate schemata and help readers understand written texts better in the native language (Stevens, 1982; Peeck, 1970; Helfeldt and Lalik, 1976; Smith-Burke, 1982; Langer, 1984), and in the second language (Johnson, 1982; Hudson, 1982). A study by Taglieber (1985) obtained good results with prereading activities on the reading comprehension of EFL students.

This study investigates the effects of two prereading activities, namely, **Possible Sentences** (Moore and Arthur, 1981) and a modified version of the **Request Procedure** (Manzo, 1969) on Brazilian EFL students. These activities are intended as activators or developers of prior knowledge and are thus, expected to improve text comprehension. **Possible Sentences** has to do with preteaching vocabulary and

the **Request Procedure** with forecasting the content of a passage by teacher and student questioning before reading.

According to Tierney and Cunningham (1984) prereading activities function as a way to access the reader's prior knowledge and "provide a bridge between his knowledge and the text" (p.610). Tierney and Cunningham divide prereading activities in teacher-centered and student-centered activities, the latter being more positive in the sense that they promote more student-teacher and/or peer interaction, the former is simply a one-way question/answer activity. The objective is to make the students use the strategies independently in the future and it seems that student-centered activities are more likely to develop a more independent behavior from the beginning. The two activities, **Possible Sentences** and **Request Procedure**, examined in this study are both student-centered.

The first activity investigated in this study, **possible sentences**, has to do with preteaching vocabulary. A great number of the research on vocabulary instruction obtained good results in increasing the students' word knowledge but very few of them had positive effects on comprehension. For Mezynski (1983), the negative results obtained by a great part of the studies are due to the following problems:

1) The target words are not essential to the understanding of the passage. The present study tries to take account of this fact by first selecting the main ideas i.e., the ideas which were high in the content structure of the passage and from these main ideas, the target words were extracted.

2) The number of target words chosen to be taught are not enough, the reader is still left with a great number of unknown words. This study tries to teach the most difficult words or at least the ones which are part of the high content structure of the passages.

3) The use of literal questions (rote) which can be answered by the use of syntactic clues. In this study, while answering the reading comprehension questions, students did not have access to the text, so this problem might have been avoided.

4) The use of questions which can be answered without reading the text i.e., with the reader's prior knowledge. Although this variable is very difficult to be completely controlled, this study tried to take account of this fact by, first, trying to ask questions which required information contained in the texts and, second, by previously applying the reading comprehension tests to a group of subjects who had not read the texts.

5) There is not enough practice with the target words. In the activity **Possible Sentences** examined by this study,

the definition of the words is given, the words are pronounced, put in context by the students, encountered in the text and, at the end, wrong sentences containing the words are reformulated and new sentences are created.

6) Learners are not actively engaged in the exercise. During the activity **Possible Sentences**, the learners themselves have to select, from the key words presented, the ones they want to use in a sentence which has to be related to the topic of the passage. This way, they are actively involved in the activity.

The present study tried to take account of these aspects when selecting the key words from the texts, when preparing the reading comprehension tests, and when carrying out the activity, hoping that an improvement on comprehension would take place.

The second activity investigated in this study is the **Request Procedure** which has to do with teacher and students taking turns at asking/answering questions before reading a text. Research has shown that prequestions facilitate intentional learning but not incidental learning (Faw and Waller, 1976; Tierney and Cunningham, 1984; Hamilton, 1985; Wong, 1985 and Peeck, 1970).

For Wong (1985), from the active processing perspective, questions which are generated by the students should lead to much higher processing than the ones generated by teachers. She advocates the need for teaching students to activate relevant prior knowledge by asking higher order self-questions. According to Wong, this helps in the processing of information coming from the text.

In general, research on prereading activities has shown that they are beneficial and that they do activate prior knowledge and thus improve text comprehension. Nevertheless, most of the studies, except Taglieber's (1985), which dealt with EFL, were carried out in L1. Some studies were carried out in L2, but in the country where the target language is spoken. There have been very few studies which have investigated the effects of reading strategies on EFL reading. This study is among the few that deal with effects of prereading activities on EFL students' comprehension.

METHOD

SUBJECTS

The subjects were 40 intermediate level EFL students taking a regular English course at Yázigi, a private language institute, in Florianópolis, Santa Catarina, Brazil. There were 17 women and 23 men, their ages ranging from 14 to 40, with a age mean of 22. Most of them belonged to middle class families.

Four groups enrolled in the intermediate level participated in the study. These students were submitted to a language test and a reading proficiency test. Ten subjects from each group were then selected, according to the results obtained in the test.

MATERIALS

Four expository reading passages of intermediate level of difficulty were used in the study:

1) "Clothesline Literature" (THE COURIER, 1986).
2) "Will Deserts Drink Icebergs?" (THE COURIER, 1986).
3) "Time and Tide" (THE COURIER, 1986).
4) "The Caviar Factory" (SCANORAMA, 1986).

The following criteria account for the selection of these specific passages:
(1) the texts contain general interest factual information;

(2) the information in the texts is not something people come across every day;

(3) the passages are not long, between 500 and 750 words;

(4) the passages contain familiar mixed with unfamiliar vocabulary, an important condition for the use of the prereading activity **Possible Sentences.**

INSTRUMENTATION

Two tests, a recall test with 5 open-ended questions, and a recognition test with 10 true or false statements, were given for each text at the end of each activity.

After all the open-ended questions and true/false statements were prepared for each text, they were applied to a group of ten subjects, other than the 40 who participated in the study. The objective of this was to see whether the information demanded by the tests was part of everybody's schemata. The 10 subjects simply took the tests without any treatment and every item which had more than 30% of subject agreement i.e., which was answered correctly by 30% of the subjects, was considered not to be passage dependent and was eliminated from the test.

The five open-ended questions and the ten true or false statements were pilot tested with a group of 4 students who were taking a regular course at the language institute where the main study was carried out and were comparable to the ones in the main study in terms of language and reading ability.

DESIGN AND PROCEDURE

A 4 X 4 latin square design was used, with treatment and passage as the independent variables, each one with four levels. The treatment consisted of the three prereading activities namely, (1) **POSSIBLE SENTENCES**, (2) **REQUEST PROCEDURE**, (3) **POSSIBLE SENTENCES + REQUEST PROCEDURE**, and (4) of the control condition. Even though with this design it would be possible to investigate the effects of the four passages, this was not done. All the four passages were chosen from the same genre, i.e. they are all expository passages and the analysis was concentrated on the treatment only. Two dependent variables were investigated: (1) The scores on the recall test (open-ended questions) and (2) the scores on the recognition test (true or false statements). Each group read all four texts, three of the texts with a different prereading activity and one without any treatment. This way each group functioned as the control once (see Table 1).

	TEXTS			
SUBJECTS	1	2	3	4
10	PS	C	PS + RP	RP
10	RP	PS	C	PS + RP
10	PS+RP	RP	PS	C
10	C	PS+RP	RP	PS

TABLE 1 - EXPERIMENTAL DESIGN

PS = Possible Sentences
RP = Request Procedure
C = Control

1 = "Chothesline Literature"
2 = "Will deserts drink icebergs?"
3 = "Time and Tide"
4 = "The Caviar Factory"

In the **Possible Sentences** condition, the experimenter presented the subjects with a card containing key words from the text to be read and asked them to make a guess about the content of the passage just by looking at the key words. Then subjects were asked to choose at least two words from the list and make up sentences they thought would appear in the text. After reading the text to verify whether they had formulated correct sentences, the instructor and the students made appropriate changes in the sentences which were not accurate according to the text and generated new sentences.

In the **Request Procedure** condition the instructor gave the subjects part of the text to be read and asked them to try to come up with questions about the subject which they would like to have answered in the text. Whenever possible, tentative answers were given to the questions by volunteer students, and as the activity developed the instructor inserted her own questions in order to help students ask more questions leading to higher levels of comprehension.

In the condition where the two activities were worked together, the **Request Procedure** was added to the **Possible Sentences** procedure for the same text.

Each of the prereading activities lasted 8 minutes and was carried out immediately before the reading task. Time limits for reading the passages were 10 minutes for "Chothesline literature", 9 minutes for "Will deserts drink icebergs", 10 minutes for "Time and tide" and 13 minutes for "The Caviar factory". When reading the passages without an activity, the subjects had an extra time of 8 minutes to look at the passages.

After reading each text, the subjects took the two reading comprehension tests: the recall test with open-ended questions and the recognition test with true or false statements.

RESULTS

Three results were obtained when computing the data: the scores on the open-ended items, the scores on the true or false statements and the sum of the scores on both the open-ended items and true or false statements.

A one-way ANOVA (analysis of variance) was performed on the data, using the SAS package of statistical programs on IBM'S CPU model 4341 computer, available at UFSC.

THE ANOVA was performed separately for the three results obtained: one for the open-ended items, another for the true/false statements and a third one for the total results which is the sum of the results on both open-ended items and true/false statements.

The three results were subsequently analysed using Tukey's Honestly significant (HSD) test.

Total Results

Results from the ANOVA for treatment main effects show that the null hypothesis, that is, that differences between means would not be significant, is rejected ($F = 10.23$, $df = 3.39$, $p = 0.0001$). Treatment, then, had a statistically significant effect on comprehension.

As shown in table 2 when the subjects read the passages with one of the three prereading conditions they performed better on the tests (PS = 71.08% RP = 69.33% PS + RP = 72.74%) than when they read them without any prereading activity (C= 54.99%).

Table 2 - Percentages of subjects' scores on both open-ended items + True/false statements.

	TREATMENT			
SUBJECTS	PS	RP	PS+RP	C
10	71.00	73.66	68.66	57.00
10	65.00	75.00	75.66	40.00
10	65.33	61.00	67.66	54.66
10	83.00	67.66	79.00	68.33
TOTAL %	71.08	69.33	72.74	54.99

PS = **POSSIBLE SENTENCES**
RP = **REQUEST PROCEDURE**
C = CONTROL

Differences between means were subsequently analysed with Tukey's Honestly Significant Difference (HSD) test at the .05 level of significance. Results obtained from this statistical test confirmed those from the ANOVA --- the prereading activities examined in this study had an effect on reading comprehension and recall.

Tukey's test indicated that all pairwise comparisons between treatment main effects and the control condition were significantly different at p = 05. However, no significant differences were found among the prereading treatments.

Open - ended items

Results from the ANOVA performed on the scores of the open-ended items confirm those of the total results --- differences between means are due to experimental effects and the null hypothesis is rejected ($F = 20.93$, $df = 3.39$, $p = 0.0001$).

Table 3 shows that, as with the total results, subjects scored higher on the open-ended items when the prereading conditions were present (PS = 68.25%, RP = 73.50 % PS + RP = 70.75%, whereas C = 43.00%).

Table 3 - Percentages of subjects' scores on open-ended items.

	TREATMENT			
SUBJECTS	PS	RP	PS+RP	C
10	77.00	83.00	66.00	27.00
10	59.00	87.00	69.00	32.00
10	60.00	45.00	71.00	48.00
10	77.00	79.00	77.00	65.00
TOTAL %	68.25	73.50	70.75	43.00

PS = Possible Sentences
PR = Request Procedure
C = Control

Again, as it happened with the total results, Tukey's test for the open-ended items indicated that the difference between the treatment main effects and the control condition were statistically significant but again, no difference was found among the prereading treatments.

True - false statements

Unlike the findings presented above for the total results and the open-ended items, the ANOVA indicated that for the true/false statements the null hypothesis cannot be rejected (F = 2.65, df = 3.39, p = 0.0520). Tukey's test also indicated no differences between treatments and the control condition nor between treatments. According to the results yielded by this test, therefore, there was no significant difference due to the prereading activities. Even though not significantly different, the percentages show a slight difference in favor of the prereading treatments (see table 4).

Table 4 - Percentages of subjects' scores on the true / false statements

	TREATMENT			
SUBJECTS	Ps	RP	PS+RP	C
10	68.00	69.00	70.00	72.00
10	68.00	69.00	79.00	44.00
10	68.00	69.00	66.00	58.00
10	86.00	62.00	80.00	70.00
TOTAL %	72.50	67.25	73.75	61.00

DISCUSSION

The results presented above show that all three prereading activities examined in this study improved the subjects' comprehension of the four passages when measured by means of open-ended questions but not by true/false statements.

One possible explanation for the no effect of the treatments on the true/false statement scores is that subjects could be guessing and still have 50 % of a chance to get the item right. Another point is that the only thing the subjects had to do was to recognize the sentence as correct or incorrect, i.e., the sentence was already there in front of them, whereas to answer a question they had to make an effort and retrieve the information from memory.

Both the negative results for the true/false statements and the positive results for the open-ended questions are consistent with the findings of Slater, Graves and Piche (1985). In a study about the effects of teaching text structure, they also found no improvement of subjects' performance on a recognition test. However, there was a significant effect of treatment on subjects' performance when comprehension was measured by means of recall protocols. On the other hand, Taglieber (1985) found the opposite in a study about the effects of prereading activities. She found that the prereading treatments had an effect on the recognition test (multiple-choice items) but not on the recall test (open-ended) items.

All these inconsistent findings lead us to reflect about a crucial point in reading comprehension, i.e. testing. The fact is that we still don't know exactly what we are testing. Therefore, a lot more research in this area is needed before final conclusions can be drawn in the field of reading comprehension.

The positive results for the possible sentences conditions may be for the following reasons: first, the activation of schemata prior to the subjects' reading of the passage may have influenced the way they approached the texts. While formulating sentences about the passage to be read, subjects were predicting the content of the passage and thus activating or building prior knowledge. This might have led to improvement on comprehension and recall.

Second, during the **Possible Sentences** activity the subjects were actively involved while formulating their sentences using the key vocabulary selected from the text. They had to stop and think which two words to use in what context related to the topic, i.e., they had to try to interrelate all the words presented and construct a framework for the text. According to Faw and Waller (1976); Mezynski (1983), and Sthal and Fairbanks (1986), the subjects' involvement and participation during the learning

situation leads to a deeper processing of information, which in this case might have influenced the subjects' comprehension and recall of the texts.

Third, the key words chosen from the passages were, most of the time, high in the hierarchy of the content structure of the passages. When preparing the materials, to select the key words from the passages, the experimenter extracted the main ideas first and from them the key words. According to Wixson (1984) (in Stahl and Fairbanks 1986), the eliciting of words which are high in the content structure of a passage affects the processing of information which is lower in the structure.

Fourth, motivation may have played a role. It may be that subjects were curious to read the text and find out whether their sentences were correct. This positive attitude towards reading the passage might have influenced the processing of information and led the subjects to better comprehend and recall the information from the passage.

Finally, the **Possible Sentences** activity might have served the function of the "Conceptual bridge" between the new and the known (Tierney and Cunnigham, 1984) and as a "cognitive organizer" (Ausubel and Fitzgerald, 1961). There might have been the consolidation of the new to the known. The evaluation of the previously formulated sentences and the generation of new sentences after the subjects read the passages might also have taken to deeper processing. This might have led subjects to rely on their prior knowledge when they were correct, leaving the sentences the way they had previously formulated. It might also have led them to add new information, generating new sentences, and to reject and refine wrong information modifying prior knowledge, by reformulating the wrong sentences.

Some of the explanations given for the positive results of **Possible Sentences** may also account for the findings of the **Request Procedure**: first, the activity served as a means to activate schemata prior to the subjects reading of the passage. While reading part of the text and then thinking about the questions they would like to have answered concerning that topic, subjects were bringing to bear relevant experiences in relation to the topic and were also forecasting the content of the passage, thus activating or developing prior knowledge.

Second, the subjects were actively involved while trying to pose their own questions about the passage to be read. Therefore, the information was more deeply processed (Faw and Waller, 1976, Mezynski, 1983 and Stahl and Fairbanks, 1986).

Third, as with the **Possible Sentences** activity, here subjects were motivated to read the text and try to find answers for their own questions. Similarly, the subjects'

positive attitude towards reading the passage might have influenced comprehension and recall.

Finally, this activity might have also served as the "Conceptual bridge" between the new and the known (Tierney and Cunningham, 1984) and as a "cognitive organizer" (Ausubel and Fitzgerald, 1961). As with the **Possible Sentences** activity, here also there might have been the consolidation of the new to the known. While setting purposes for reading, it might be that students were bringing in relevant background knowledge about the subject and went to the text with some expectations in mind trying to find answers for those questions which they had formulated. When reading the text and finding answers for their questions students either confirmed or refused their hypotheses, thus integrating the new information with the concepts already existent in their cognitive structure.

The fact that the two activities together did not bring any better results than each of them separately is somewhat surprising.

One possible explanation could be that when working the first activity **Possible Sentences**, the subject's schemata and experience for that specific topic were brought to bear and subjects were ready to read in order to check whether they had formulated correct sentences. Having to stop the reading in order to ask and answer questions might have influenced and changed the natural course of reading and caused students either not to benefit from the second activity or deviate their attention from the first activity and only benefit from the second one.

These findings go against Faw an Waller's (1976) claim about study time. They advocate that study time should be controlled in prose learning experiments because the positive results obtained could be due to extended time in studying the passage and not to a real effect of the treatments. They suggest that the control groups should study the passages for as long as the experimental groups. In the present study this suggestion was taken into account, except for the third treatment PS = RP in which the time spent was a sum of that spent in each activity separately. Even so, subjects did not perform any better receiving these two treatments together than when receiving each of them separately.

Results obtained from this study have shown that Brazilian Intermediate EFL students profit more from written texts when they have relevant passage - related schemata activated by means of the two prereading activities investigated , i.e., **Possible Sentences** and **Request Procedure**, than when they simply read the texts. From these findings we can conclude that, as many reading researchers have already pointed out (Carrell and Eisterhold, 1983; Langer, 1984; Adams and Collins, 1979; and others),

linguistic knowledge alone does not enable a reader to comprehend a passage. Relevant schemata also have to be activated during the process of reading, so that the entire message from the writer can be comprehended. Knowing about these important aspects of the interactive process of reading, reading teachers should then include in their classroom curriculum reading strategies which will help students gradually become more successful and independent readers by bringing the relevant passage - related schemata to the reading task.

Based on the difficulties and limitations encountered throughout the realization of the study, the following recommendations can be made for further research:

1. READING ASSESSMENT - Testing in reading comprehension is a very complicated field which also needs to be further investigated. This was shown by the discrepancy of the results obtained in this study for the two types of tests used, the reading comprehension questions and the true or false statements.

2. LONG - TERM INSTRUCTION - For Wong (1985) it is necessary to teach students how to generate and construct questions either by direct instructions (orally) or by explicit instructions (written), before they are able to generate their own questions appropriately. Therefore, for better results to be obtained with the RP, further studies could make use of a long term instruction.

3. LOWER LEVEL STUDENTS - Another study could investigate the effects of these prereading activities on lower level students to compare with the intermediate group. For Adams, (1982), students with higher proficiency levels are able to use contextual clues to construct meaning from the text without the need of activators or extra help.

4. TEXT DIFFERENCES - This study made use of expository texts, another study could investigate the effects of prereading activities on other types of texts, as Taglieber (1985) did.

5. CONTENT AREA READING - Some studies have examined the effects of PS and PR in content area reading in English as L1, their effectiveness for content area in Portuguese still needs investigation.

6. VOCABULARY KNOWLEDGE - This study only investigated the effects of the activity **Possible Sentences** on improving comprehension. Its effects on increasing vocabulary in a foreign language should also be examined.

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