Influence Of Purpose For Reading On Second Language Reading: Reading Procedural Texts In ESL

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This paper reports an empirical investigation of the influence of purpose for reading on performance in reading in English as a second language for academic purposes. In a partial replication of a study conducted with native speakers of English (Mills, Diehl, Birkmire & Mou, 1995), high intermediate and advanced level university students of ESL read an academic procedural text for one of two purposes: (a) to perform the task described by the text (read-to-do), or (b) to recall the text (read-to-recall). Both groups of students performed both tasks after reading. Based upon the results of Mills, et al., it was predicted that students would perform best on the task which conforms to their purpose for reading; that is, the read-to-do participants were expected to outperform the read-to-recall participants on the do measure, and the read-to-recall participants were expected to outperform the read-to-do participants on the recall measure. In other words, an interaction between the purpose and task was hypothesized. Additional research questions examined were: (1) Is one purpose for reading more facilitative, overall, than the other? (2) Is one reading task overall easier than the other? (3) What are the differences on macro and micro propositional levels of analysis? (4) What are the differences when order of the propositions (macro and micro) is taken into account? Results showed a significant interaction between purpose and task, as well as a significant task effect; there was no effect for purpose. However, the significant interaction and the significant task effect depended upon the way the data were analyzed. There were also qualitative differences due to task. These results and the differences from Mills, et al.'s results for native speakers are discussed. Limitations of the study dictate cautious interpretation of the results, and the need for replication studies.

INTRODUCTION

We are all at least vaguely aware that reading is not a unitary, static process and that, in fact, we read somehow differently — although we may not realize exactly how so — when we are reading different types of materials and when we are reading for different purposes.

Common sense and intuition suggest that one way in which this difference manifests itself is in the rate of reading. It is widely assumed that individuals adjust their reading rate according to both the purpose for reading as well as the difficulty of the material. This adjustment is referred to as flexibility in reading. Yet, a number of early L1 researchers who investigated the degree to which readers to indeed alter their reading rate according to material and purpose found little flexibility in reading rate according to purpose and materials (Boyd, 1966; Herculane, 1961; Hill, 1964; Letson, 1959; McDonald, 1963; Rankin & Hess, 1970; Theopomelia,

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Samuels and Dahl (1975) demonstrated that failure to find flexibility in reading rate could be due to failure to establish an appropriate purpose for reading. In their study of both fourth graders and college students, both groups of readers demonstrated varied reading rates when reading for different purposes (reading to answer a test for detailed question-answering, and a test for general overview question-answering). Others who have shown differences due to purpose for reading include Gibson & Levin, 1975.

Another way readers manifest differences in purpose for reading is perhaps less obvious and less subject to common sense and intuition, but nonetheless has been borne out by empirical research. This is in adjustments to eye-movements, specifically the eye-voice span, or EVS (Just & Carpenter, 1980). The eye-voice span is defined as the distance, or span of words, that the eye is ahead of the voice in oral reading. In an empirical investigation of elementary school and high school (second, fourth, ninth and eleventh grades) L1 readers reading for three different purposes ("normal reading," "careful reading," and "skimming"), Levin and Cohn (1967) found a significant main effect for purpose. The eye-voice span was the shortest for the careful reading, and the longest for skimming, with normal reading in between.

Purpose for reading has been examined in some first language studies which have varied the purpose for reading by informing participants before reading of what information will be tested (e.g. Gagne & Rothkopf, 1975), or by informing readers of the type of test (e.g., multiple choice or essay) they may expect after reading (e.g. d’Ydewalle & Rosselle, 1978). Other research on purpose for reading has compared participants whose purpose for reading was personal interest and who did not expect to be tested on the contents to participants whose purpose for reading was to read in order to be tested on the contents (e.g. Graesser, Higgenbotham, Robertson, & Smith, 1978).

Some studies that have investigated purpose for reading have ultimately been interested in the question of vocabulary learning from context. In these studies, purpose for reading was varied between reading for the specified purpose of learning the unfamiliar vocabulary, and reading for no specified purpose. In such a study with high and low ability sixth grade L1 readers, Stanley and Ginther (1991) found that there were main effects for ability level and for frequency of exposure to the unfamiliar vocabulary, but no effect for purpose. There were also no significant interactions.

Yet, in another study with the same ultimate interest in vocabulary learning from context, but also investigating the roles of purpose and schemata, Barnes, Ginther and Cochran (1989) found that comprehension ability (good versus poor eighth grade L1 readers) and purpose were significant, but that the effect of schemata was not. However, they caution that the effects must be interpreted in light of a significant three-way interaction.

Still other research (e.g. Forrest & Waller, 1979; Smith, 1967, cited in Baker & Brown, 1984) has pointed out differential effects on high- and low-ability readers of specifying purpose, with high-ability sixth grade L1 readers better able than low-ability readers to adjust their metacognitive strategies to fit the purpose for which they are reading.

Most of this research on purpose for reading has been done with either narrative or simple expository texts. Only recently have procedural texts been examined. Mills, Diehl, Birkmire and Mou (1993, 1995) were the first to examine the influence of purpose for reading with procedural texts. As they observe, procedural text, which guides a reader to perform a task, have been studied very little but have a very important role in our increasingly technological society (Bovair & Kieras, 1991).

Understanding how procedural information is learned from written text — termed in the literature as procedure acquisition (Bovair & Kieras, 1991) — is important because all of us follow procedures from written instructions all the time in our daily lives. We assemble our children’s toys for birthdays and holidays, we follow recipes when we cook, and we read the directions on defrosting and cooking different types of foods in our microwave ovens, we fill out our tax forms and other forms based upon written instructions, and we download and/or install software on our home computers following written procedures. In addition, following procedures is typical of many jobs. For example, Sticht (1977) found that in the U.S. Navy, 75% of the reading on the job was what he called reading to do, where people read in order to carry out some task. In response to the need for greater understanding of how people acquire information to carry out tasks from procedural texts, a body of literature on procedural texts has evolved (e.g. Wright, 1981; Barnard, Wright & Wilcox, 1979; LeFebre & Dixon, 1986; Kammann, 1975; Felker & Rose, 1981).

Kieras and Bovair (Kieras, 1981; Kieras & Bovair, 1984, 1986; Bovair & Kieras, 1991) have claimed that procedural text and the processes of procedure acquisition are different from other kinds of reading. They claim that the reader’s mental model of the text or mental processing of the text is likely to be different from the reader’s mental model or processing when involved, for example, in reading stories. Kieras (1981) has shown that the task readers are required to perform, or their purpose for reading, can affect how they read a text (i.e. reading for comprehension compared to reading to identify a main idea). Based on this research, Kieras and Bovair have suggested that reading in order to be able to execute some procedure is likely to involve different ways of processing, distinct from reading for other purposes.
In their 1995 study, Mills et al. found that of forty-eight native-English speaking college students who read procedural texts for one of two purposes: (a) to perform the task described by the text (read-to-do), or (b) to recall the text (read-to-recall), as predicted, read-to-do participants performed the task better than read-to-recall participants, and read-to-recall participants recalled the text better than read-to-do participants.

In second language reading, very little research has been done on the influence of purpose for reading and none with procedural texts. Yet common sense tells us that the reason someone is reading, whether in their first or in their second language, should influence that reading. But, in second language, exactly how the reading is influenced remains unclear. Furthermore, we know that procedural texts are as important to ESL readers as they are to L1 readers. ESL students in U.S. universities, studying English for academic purposes, also have the need to engage procedural texts (for example, laboratory manuals in the sciences, and academic texts describing how to perform any number of tasks).

The goal of the current study was to explore the effects of purpose for reading in English as a second language, with advanced students reading procedural texts relevant for EAP settings.

**METHOD**

**Experimental Design**

The experimental design, which was a replication of the basic design used in Mills, et al. (1995), was a 2 x 2 factorial design with two different purposes for reading (read-to-do and read-to-recall, a between-participants variable), and two different tasks to be performed by each participant (performing the procedure and recalling the text, a within-participants variable or a repeated measure) as the main factors or main effects, as well as the interaction between the two main factors:

\[
DV = \text{Purpose (between participants)} \times \text{Task (within participants)} \times \text{Purpose} \times \text{Task}
\]

The dependent measure is the number of propositions (procedures, actions, steps) from the original procedural text correctly performed or recalled.

**Pilot Test of Materials and Procedures**

A pilot test of all materials and procedures was conducted in two sessions in January; the actual experiment was run in April.

**Participants**

Participants in the study were 33 high intermediate and advanced students of English as a second language studying at the highest two levels of an ESL program at a major south-eastern university in the USA. The focus of the upper level courses in the ESL program was on English for Academic Purposes (EAP). Seventeen participants were male, sixteen female. Approximately three-fourths of the participants were permanent residents in the US; seven were international students. More than three-fourths had been in the ESL program for at least one previous term. The national origins, and hence native languages, of the participants varied, with the largest numbers from Vietnam (14), the People's Republic of China (4), Russia (4), and Korea (3), and with one each from Taiwan, Colombia, Puerto Rico, Turkey, Mongolia, Somalia, Cote d'Ivoire, and Nigeria. See Figure 1 for demographic information on the participants.

<table>
<thead>
<tr>
<th>Level</th>
<th>N</th>
<th>Male</th>
<th>Female</th>
<th>Approximate TOEFL</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>17</td>
<td>7</td>
<td>10</td>
<td>460-490</td>
</tr>
<tr>
<td>5</td>
<td>16</td>
<td>10</td>
<td>6</td>
<td>490-525</td>
</tr>
</tbody>
</table>

Age Range: 18-37
Average Age: 23
Visa Status: PR - 26, F1 - 6, RF - 1

Figure 1: Demographic Information on Participants

**Materials**

The procedural text used in the experiment had to meet the following criteria. It had to:

1. be appropriate for adults;
2. be appropriate for an EAP setting;
3. lend itself to the two tasks of both recalling and doing;
4. lend itself to the performance of these two tasks in group as opposed to individual testing, such that students in the group would still be working individually and independently and not be influenced by one another;
5. be a set of procedures the students did not already know, in order to ensure that we were testing their reading comprehension of the procedures and not their prior knowledge or memory of the procedures;
6. be a set of procedures that the students would feel was worthwhile learning about doing and would be interested in learning to do (in other words it had to involve learning a set of procedures they perceived to be valuable to learn) in order to engage student interest and motivation.
Given these criteria, and given the general level of knowledge and expressed interest of students in the ESL EAP program at the intermediate and advanced proficiency levels who would be solicited to participate in the study, it was decided to use a procedural text about word processing on a personal computer. The researcher, with the assistance of two graduate research assistants, devised the experimental text.

Other considerations which went into the construction of the procedural text were that

1. it should be no more than one page, single-spaced;
2. it should contain a fairly small number (less than 10) of macro procedures or macro propositions;
3. each macro procedure should have as part of it a small, manageable number of micro procedures or micro propositions.

For purposes of this study, macro procedures or macro propositions were the main word processing, document formatting, procedures presented in the text. Micro procedures or micro propositions were the sub procedures or sub steps which constituted a macro procedure. Each micro procedure or micro proposition consisted of a main action verb, an instruction to “do” something, perform an act in order to format a document. The procedural text is shown in Figure 2; Figure 3 presents the macro propositions and the micro propositions of the text.

**FORMATTING A TEXT**

Put the cursor at the end of the line that says Your Name and type in your name. To double space the document, put the cursor at the very beginning of the text (before Your Name) and click. To double space the document, put the cursor on the power bar where it says 1.0 and click; when the box comes up, move the cursor to 2.0 and click. To center and bold the title, put the cursor in front of the title, click and highlight the title. Then put the cursor on the power bar where it says Left and click; when the box comes up, move the cursor down to Center and click; then put the cursor on the tool bar where it says Bold and click. To indent the paragraphs, place the cursor at the beginning of the first paragraph. Press the tab key. Repeat for the beginning of the second paragraph. To check the spelling, put the cursor at the beginning of the document (before your name) and click. Click on the tool bar where it says Spell Check. (Click on Skip Always if the spell checker stops on your name.) If a word in the text shows up as misspelled, replace it with the correct spelling by clicking on Replace. When the spell checker is finished, click Yes to close it. To save your formatted document, click on the tool bar where it says Save. To print your document, click on the tool bar where it says Print. Click on Print in the box that opens and print 1 copy.

(Total word count: 268)

Figure 2: Procedural Text

![Image](https://example.com/image.png)
PROCEDURES
Prior to the testing sessions, a questionnaire was conducted in all of the sections of the intermediate, high intermediate and advanced reading classes in the ESL program (levels 3, 4, and 5). Figure 4 shows the questionnaire that was used.

<table>
<thead>
<tr>
<th>Name ________________________________</th>
<th>Instructors ____________________________</th>
</tr>
</thead>
</table>

Computer Knowledge Survey
If you have never used a computer please check here and Stop ____
If you have never used a word processor please check here and Stop ____
If you have used a computer and a word processor please rate your experience as follows:

<table>
<thead>
<tr>
<th>Experience</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Experience</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Using a Word Processing Program</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>2. Using the Word Perfect™ Program</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>3. Using the Microsoft Word™ Program</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>4. Spell Checking a Document</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>5. Double Spacing a Document</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>6. Selecting or Highlighting Text</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>7. Centering Text</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>8. Printing a Document</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>9. Saving a Document to a Disk</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

Figure 4: Computer Survey Instrument

This questionnaire inquired about the previous computer and word processing experience of the students. Because the procedural text was designed for students who knew something about word processing but who were not experts, we invited those students who answered in the mid-range of the 5-point Likert scale (i.e., 2, 3, or 4) on question number one, about their word processing experience, to participate in the study.

The students selected by this process were then invited to attend what they understood would be two instructional sessions designed to teach them about word processing in WordPerfect 7.0. The first instructional session on word processing gave all students the same baseline of information about WordPerfect 7.0 - our attempt to further reduce the variability in their prior knowledge about WordPerfect 7.0. At the beginning of this session, students were told that we were going to help them learn some things about personal computers and word processing that would help them not only in their ESL classes, but also in their university classes, when they had to write term papers and reports. They were told that in two days we would not be able to make experts out of them, but that we would give them a good foundation upon which to build through the rest of the quarter. (There was additional instruction available to them through the rest of the quarter.) Students were also told that we were going to use different ways of teaching them about personal computers and word processing - that some of the ways would be oral and some of it would be in writing; some of it would be lectures, some would be show and tell, some of it would be hands-on with them doing things. Furthermore, they were told that the first session would be mostly oral instruction, and that the second session which they were to come back for in two days would be mostly in written form, with them reading. We also told them that based on the results of the computer survey, we knew that they already knew some things about personal computers and word processing, but that what they knew and how well they knew it varied. Our instruction, they were told, was designed to bring them all to about the same level of knowledge and ability with word processing.

The first session was conducted in a computer laboratory on the campus by one of the graduate research assistants, with the researcher and the other research assistant in attendance. Baseline procedures which were presented in that session included an overview of the parts of a personal computer (the CPU, the hard drive, the disk drive, the monitor, the keyboard, the mouse, a diskette), pointing and clicking with the mouse, some basics of Word Perfect including items and icons on the title bar, the menu bar, the toolbar and the power bar, drop down menus and dialog boxes, the scroll bar, and selecting blocks of existing text with the mouse. Specific word processing procedures related to editing or formatting an existing document included: italicizing, changing fonts and font sizes, and changing margins. Care was taken to avoid the specific procedures included in the experimental procedural text.

Students returned in small groups of 5-10 for the second session two days later. The second session was also held in a computer laboratory, but a larger one than the first session in order to accommodate the variety of tasks the students would be performing and the video equipment we used to tape their performance.

During the first part of the second session, students sat at tables in an area some distance away from, but in full view of, the computers and video cameras situated behind and focused on each computer. Students were told that the video cameras
were there because we were interested in the effectiveness of our different ways of providing the word processing instruction. They were also told that the cameras were focussed on the computer screen, not on them - which was obviously true, and that they wouldn't be seen in the video-tapes - again true.

Students were told that at this second session they would learn more specifics about word processing procedures, working from the menu bar, the tool bar and the power bar in WordPerfect 7.0. They were reminded that we had told them last time that we would be using different ways of teaching - that last time was mostly oral with them doing lots of listening and some hands-on work. At the second session they were told they would be learning mainly through reading about word processing procedures - they were, after all, there in lieu of their reading class! They were also told that they were not being tested or graded in any way on what they did and that our goal was just for them to learn some word processing skills that could help them.

In order not to overwhelm students with too much information all at one time, we indicated they would receive the word processing instructions in three separate parts. First, they would receive Part I, and when they had finished with it, we would collect it and give them Part II. When they had finished with Part II, we would pick that up and give them Part III.

Students were told that in order to see how successful our written instruction was, it was important to work individually and not to work together or collaborate. If they needed help with anything or had any questions they were to raise their hand and one of us would come to help.

Before returning for the second session, students had been randomly assigned to one of two groups: read-to-recall and read-to-do. To do the grouping we used a stratified random sampling method based upon instructional level (presumed ESL proficiency level), prior word processing experience as reflected in their score of 2, 3, or 4 on the first question on the computer questionnaire, and their gender and national-origin.

The instructions for Part I contained common elements and set the different purposes for reading for the two groups. The common instructions for both groups read as follows: "Today you are going to learn how to put a document in a format acceptable as a university term paper. Learning how to create this format is very important for university students in the USA to know about. You are going to read a short passage which tells you how to do this." Then, for those in the read-to-recall group the instructions continued: "After you have finished reading, you will be asked to WRITE YOUR RECALL (what you remember) of the procedures, in the order in which they are given in the reading passage." For those in the read-to-do group the instructions continued: "After you have finished reading, you will be asked to PERFORM THE PROCEDURES on the computer, in the order in which they are given in the reading passage." The instructions for both groups then continued in common: "You will be asked to do this without referring to the reading passage. So read the short passage with this in mind. You should read the passage twice at your own pace. Read continuously on your own; we will not be able to answer any questions while you are reading."

Part II solicited a recall from both groups of students. The read-to-recall students received the following written instructions: "Now please write your recall (what you remember) of the short passage, recalling (remembering) as many of the procedures as possible, in the order in which they were presented. DO NOT write a summary or an outline; rather, try to remember as much of the passage as you can, as exactly as you can. Please write it in sentences on the attached sheets of paper. You are encouraged to paraphrase the passage if you do not remember the exact words." Read-to-do students received the additional instruction to rationalize why they were being asked to produce a recall: "We are asking you to recall or remember the passage because it will help you organize the ideas from the materials you have just read before you perform the procedures on the computer."

Part III solicited the performance from both groups of students. Instructions for Part III for both groups read: "You are now asked to format the document according to the procedures you read about in the passage. For best results, perform the procedures in the order in which they were presented. Take a good look NOW at the attached sheet as the model of what the final formatted document should look like when you are finished. Do as many of the formatting steps as you can by yourselves, but if you have major problems, you may ask one of us for assistance. After you have read these instructions and after you have looked at the model, and you are ready to begin formatting the document on the computer, RAISE your hand. One of us will come and tell you what to do next." The read-to-recall group received the following additional instruction to rationalize why we were asking them to perform the task: "We would like you to go ahead and perform the task to see if having read to recall (remember) the passage helps you to perform the formatting procedures."

Attached to the Part III instructions was a copy of what the target text would look like after it had been correctly formatted via the word processing procedures in the procedural text. When students raised their hands indicating they were finished with Part III, students were individually escorted to a desktop personal computer. Figure 5a shows the document which appeared on the participants' computer screens, before formatting; Figure 5b shows the model text they were shown in the instructions for Part III - how the document would or should look after they formatted it using the word processing procedures in the procedural text.
News and magazine articles have always been useful in language instruction as a source of authentic reading and up-to-date regional and cultural information. Traditionally, teachers have been limited by the cost and availability of print media sources. However, large numbers of periodicals have now gone online, and many offer some or all of their content to the reader without requiring a subscription fee.

For example, U.S. Robotics operates a site in Australia, offering access to numerous online newspapers and magazines around the world. The Massachusetts Institute of Technology Foreign Language News and Magazine page offers an extensive list of online newspapers and magazines for some of the more commonly taught languages. Links to other international media are available at World Television Web Links.

Each computer had been previously been turned on and configured to have the diskette in the a-drive and opened, with the document to be formatted showing on the screen. Furthermore, all of the settings on all computers had been standardized (e.g., to show three lines of the tool bar, to display both the icons and their labels on the toolbar, to turn the insert key on, standard font and font size).

Equipment
The following equipment was used in the study: (1) Dell Personal desktop computers with pentium microprocessors, (2) Hewlett Packard Desk Jet 600 series printers, (3) Corel Word Perfect 7.0 software installed on the computers, (4) Verbatim high density double-sided diskettes preformatted for IBM compatible machines, (5) Panasonic video cameras mounted on tripods, and (6) Certron Stereo High Grade T-120 VHS videotapes, recorded in short play mode.

Scoring and Reliability
The number of procedures recalled in the written protocols or performed on the computer by participants were scored in four different ways: micro propositions and macro propositions, both in order and in any order.

1 Micro Propositions - In Order: Each individual micro proposition (which we alternately termed micro procedure or sub step) was awarded one point if it was present and if the macro proposition of which it was a part occurred in the order of the macro propositions in the original text.

2 Micro Propositions - Any Order: Each individual micro proposition was awarded one point if it was present, regardless of its order of occurrence.

3 Macro Propositions - In Order: A macro proposition (which we alternately termed macro procedure or macro step) was awarded one point if it was represented by even one micro proposition and if it occurred in the order as in the original text.

4 Macro Propositions - Any Order: A macro proposition was awarded one point if it was represented by even one micro proposition, regardless of its order of occurrence.

Thus, both the recall data as well as the performance data were scored on exactly the same four scales. The recall protocols were scored by two independent raters. On the 20% of recall protocols on which they overlapped, the interrater reliability of the two raters was $r = .90$ ($r^2 = .81$). The performance data were obtained primarily from the videotapes, with evidence from the diskettes and printouts used as backup. The reason for utilizing the videotape data as the primary data for the 'do' task was that these data showed exactly how the participant performed the procedure. If the participant performed the task in any way other than that indicated by the procedural text, they did not receive credit on the 'do' performance task. (For example, in WordPerfect 7.0, one can save a document by going to the menu bar and clicking on 'file' and, in the pull-down menu which appears, clicking on either 'save' or 'save as'. However, the procedural text stated that the participants were to accomplish this step by going to the toolbar and clicking on 'save'. As previously stated in the procedures subsection, the toolbar had been set up to display both the icon and its text label.) Furthermore, if students had requested help with performing any procedure, this was also noted and the students were not awarded points for any procedure on which they received assistance. The interrater reliability of the videotape scoring by the two independent raters, on the 20% of tapes which they both scored, was $r = .86$ ($r^2 = .74$).
RESEARCH QUESTIONS
The following research questions were posed by the study:

1. Is there an interaction between purpose and task? In other words, will purpose for reading relate to the specific task which conforms to that purpose? And if so, what is the nature of that interaction?

Specifically:
1a. Will the read-to-recall participants recall the text better than the read-to-do participants?
1b. Will the read-to-do participants perform the procedures better than the read-to-recall participants?

2. Is there an overall purpose effect? Of the two purposes for reading in this study, read-to-do and read-to-recall, does reading for one purpose yield higher scores than reading for another purpose?

3. Is there an overall task effect? Of the two tasks included in this study, recalling and performing the procedures, are scores on one task higher than on the other task?

4. Are the answers to the preceding questions different on macro and micro-procedural (propositional) levels of analysis?

5. Are the answers to the first three questions different when order of the (macro and micro) propositions is taken into account?

STATISTICAL ANALYSES
Statistical analyses were carried out using a General Linear Models Procedure in SAS, equivalent to a Two-Way Analysis of Variance, with repeated measures on Task:

\[
\begin{align*}
DV & = \text{Purpose} \times \text{Task} \times \text{Purpose*Task} \\
\text{where} & \\
DV & = \text{Micro Propositions - In Order} \\
& = \text{Micro Propositions - Any Order} \\
& = \text{Macro Propositions - In Order} \\
& = \text{Macro Propositions - Any Order}
\end{align*}
\]

An alpha level of .05 was set as the cut off for statistical significance. Exact probability levels of all inferential statistics are reported.

RESULTS

QUANTITATIVE RESULTS
Descriptive statistics (i.e. means and standard deviations for each of the four different ways of scoring the data are reported in Table 1.)
<table>
<thead>
<tr>
<th>Effect</th>
<th>df</th>
<th>Mean Squares</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Micro Propositions - In Order</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Error</td>
<td>28</td>
<td>8.96</td>
<td></td>
<td></td>
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<tr>
<td>B. Micro Propositions - Any Order</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<td></td>
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<td>D. Micro Propositions - Any Order</td>
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<td>28</td>
<td>3.31</td>
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<td></td>
</tr>
</tbody>
</table>

= p<.05

Table 2: Two-Way ANOVA Procedures with Repeated Measures on Task.

As can be seen from Table 2, for the macro propositions either in order or in any order, neither purpose nor task nor the interaction of purpose with task is statistically significant. Therefore, the macro propositional analyses - both in order and in any order, were dropped from any further post hoc quantitative analyses. Macro propositions were examined further for qualitative differences; the results are presented in the next section.

However, as can also be seen from Table 2, for the micro propositions in any order, there is a significant main effect for task, but no significant main effect for purpose and no significant interaction between purpose and task. The scores on the performance task were significantly higher than the scores on the recall task, regardless of the purpose for reading.

Also, as can be seen from Table 2, for the micro propositions in order, there is a significant interaction between purpose and task, but no significant main effect for either purpose or task. Because of the significant interaction between purpose and task, we performed post hoc pair-wise comparisons of the means to determine the exact nature of the interaction. These results are reported in Table 3.

<table>
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<th>Research Question</th>
<th>Means</th>
<th>F-value</th>
<th>p-value</th>
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<td>1a</td>
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<tr>
<td>1b</td>
<td>10.00</td>
<td>5.62</td>
<td>0.0249*</td>
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</tbody>
</table>

Table 3: Post Hoc Pair-Wise Comparisons, Micro Propositions - In Order

Table 3 shows that the read-to-do participants performed the procedures better than the read-to-recall participants on the performance task, a positive answer to research question 1b. However, the read-to-recall participants did not recall the text better than the read-to-do participants, a negative answer to research question 1a.

Thus, Table 3 shows us that the significant interaction between purpose and task in the micro propositions-in-order data is due to the superior performance of the read-to-do participants on the task conforming to their purpose for reading, namely performing the procedures or "doing"—better than the read-to-recall participants on the same performance task. The read-to-recall participants did not do better on their conforming task (recalling) than the read-to-do participants on the same task.

**Qualitative Results**

In addition to analyzing the data quantitatively, we were interested in qualitative aspects of the data. Two interesting qualitative differences emerged which were
each related to differences in the two tasks. First, there were apparent differences in which macro propositions were performed or recalled in the two tasks. That is, although the total number of macro propositions did not differ by task, purpose or the interaction of purpose and task, the kinds of macro propositions differed by task. Table 4 shows the frequency distributions of the macro propositions by task, reported as the percentage of participants who included the macro proposition in their recalls and in their performance.

<table>
<thead>
<tr>
<th>Name</th>
<th>Dbl. Sp</th>
<th>Ctr</th>
<th>Bold</th>
<th>Ind. 1</th>
<th>Ind. 2</th>
<th>Spell</th>
<th>Save</th>
<th>Print</th>
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</thead>
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<tr>
<td>Recall - In Order</td>
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<td>71</td>
<td>43</td>
<td>43</td>
<td>40</td>
<td>20</td>
<td>57</td>
<td>43</td>
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<tr>
<td>Do - In Order</td>
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<td>15</td>
<td>30</td>
<td>42</td>
<td>21</td>
<td>55</td>
<td>24</td>
<td>70</td>
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<tr>
<td>Recall - In Order</td>
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<td>83</td>
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<td>46</td>
<td>40</td>
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<tr>
<td>Do - In Order</td>
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<td>42</td>
<td>45</td>
<td>42</td>
<td>33</td>
<td>58</td>
<td>24</td>
</tr>
</tbody>
</table>

Table 4: Frequency Distribution of Macro Propositions, Comparison by Task As Percentage of Participants Who Recalled/Performed

Table 4 shows apparent differences between tasks for the macro propositions of double spacing and saving. These macro propositions were recalled (whether scored in order or in any order) far more frequently than they were performed.

A second qualitative difference between the two tasks was related to intrusions - material which was included in either the recalls or the performances which was not in the original procedural text. Due primarily to the differences in the tasks, the kinds of intrusions were markedly different. The most frequent kinds of intrusions in the recalls consisted of gratuitous introductions and/or conclusions. Some participants wrote lengthy introductions and/or conclusions for their recalls. By contrast, the most frequent kind of intrusions in the performance data consisted of what might best be termed intrusions from prior knowledge, and intrusions from trial and error or guessing. Some participants, who may have previously known a way of performing a procedure which differed from the way the procedural text prescribed, may have performed the procedure in that way and not in the way presented in the procedural text. However, if they did so, they received no credit on the quantitative measures. Also, some participants engaged in a kind of trial and error or guessing, trying various possible (and some impossible) ways to perform the procedures.

**DISCUSSION**

The main research question addressed in this study was: “Is there an interaction between purpose for reading and task?” That is, do students perform better on a task which conforms to their purpose for reading? The answer is a qualified yes, depending upon the purpose and the related, conforming task, and the way the task data are analyzed (macro or micro propositions; in order or in any order).

Another question raised in this study was “Is one purpose for reading more facilitative of higher scores than another?” The answer for the two purposes which were investigated in this study is no. We found no difference overall between the two purposes for reading investigated in this study: reading-to-recall and reading-to-do. A third question addressed in the study was “Does one task produce higher scores than another?” The answer is a qualified yes. We found that if micro propositions are counted, without consideration of their order of occurrence, that the performance task produced higher scores than the recall task. However, if the order of micro propositions is considered, the task effect disappears. The task effect that we found for micro propositions in any order may - and probably does - reflect the fact that a procedural text of the type used in this study invites the kind of mental processing that naturally fits with the task of “doing” - regardless of the purpose for reading. (Later in this discussion, when we compare our results for these second language readers to those of Mills, et al., (1995) for L1 college students, the reader will note that they also found this same task effect.)

We further found that the answers to the preceding questions about purpose effects, task effects, and interactions between purpose and task are different depending upon whether the task data are analyzed on a macro or micro level of analysis, and whether one takes the order of the propositions into account. We found that the macro level of analysis is too gross to yield much information at all in quantitative analyses. Only in the qualitative analyses were there differences at the macro level, and these were differences between the two tasks. The micro level of analysis yields a main effect for task or an interaction between purpose and task, depending upon whether order of propositions is considered.

It is instructive to compare our results, with ESL readers, to Mills, et al.'s (1995) results for native English-speaking college students. Mills, et al. found both a significant effect for task as well as a significant interaction between purpose and task. The significant task effect was the same as we found, with participants performing proportionally more correctly on the “Do” measure than on the “Recall” measure. Post hoc analyses of the interaction showed that the latter was due to the read-to-do participants outperforming the read-to-recall participants on the performance task as well as the read-to-recall participants outperforming the read-to-do participants on the recall task. Our interaction results were only in one direction, not both.

One source of the differences between our results and those of Mills, et al. may involve the question of order in the proposition scoring. Mills, et al. indicate that
they scored their propositions on a micro level, and not on a macro level, but do not say explicitly whether they took order of propositions into account in their scoring. Given our results, this would seem to be an important consideration. Moreover, their experimental texts involved procedures with more natural ordering between them than did ours. Furthermore, Mills, et al. point out that their procedural texts did not contain any or many sub procedures, a shortcoming they point out and which they say they plan to address in a future study.

Another possible reason why our results differed from those of Mills, et al., even for the micro propositions, might be that our L2 readers, although at high-intermediate and advanced levels of ESL proficiency, do not yet have the ability in their L2 reading to adjust their metacognitive strategies to different reading purposes, which has also been suggested in the research literature as characteristic of weaker L1 readers (cf. Forrest & Waller, 1979; Smith, 1967 cited in Baker & Brown, 1984). In fact, we believe that our interaction results - showing a significant purpose-task interaction for the read-to-do purpose and conforming task but not showing a significant purpose-task interaction for the read-to-recall purpose and conforming task - may be due to the fact that the second language reading ability of our non-native readers may not be sufficiently advanced to permit flexible, metacognitive adjustment of their reading strategies to a full range of different reading purposes and related tasks. Moreover, we believe that the procedural text used in this study may have lent itself to the read-to-do purpose and task in the sense that Kieras and Bovair have suggested that procedural texts lend themselves to “characteristic ways of processing” (Bovair & Kieras, 1991, p. 208). However, due to the limitations of the study, detailed below, it is difficult to determine the ultimate causes for the results we obtained, or for the differences between our results and those of Mills et al. (1995). Clearly additional research, including replication studies of this research, is called for on the question of purpose for reading and the reading of instructional/procedural texts in ESL.

In conclusion, if reading for different purposes affects the reading process, as common sense and much of the L1 research seems to suggest, so that reading is somehow different when we are reading not only different types of materials but when we are reading for different purposes, we need much more research to demonstrate how these differences operate in reading in a second language. More research such as that reported in this study is needed, especially with reading procedural texts. Procedural texts and the processes of procedure acquisition are interesting areas of investigation from theoretical perspectives. If, as Kieras and Bovair (1984, 1986; Bovair & Kieras, 1991) maintain, there are different mental models or mental processing involved with reading a procedural text in order to learn how to perform the procedures than the mental modeling or mental processing of other types of texts read for other purposes, then more empirical research with procedural texts is needed to demonstrate these different mental models and mental processes.

**LIMITATIONS OF THE STUDY**

As with any empirical study, there are certain limitations of the current study. First, only one procedural text was utilized. As other first and second language reading research has shown, results can vary according to a particular text, as well as a particular type of text. Obviously there are different procedural texts, as well as different types of procedural texts - some are more narrative-like and include appropriate background information and explanations in grammatically complex sentences, others may be more list-like, written in short choppy sentences. As previously mentioned, some procedural texts involve procedures with natural or imposed ordering among the procedures: natural, if one procedure must inherently or logically precede a subsequent procedure, imposed, if, to achieve a good outcome, one procedure should precede a subsequent one, although there is no necessarily inherent or logical order to the procedures. Other procedural texts have less ordering (either natural or imposed) among the procedures. The tasks the procedural text describes may also differ in difficulty - some may be relatively easy for the reader to understand and perform, others may be relatively difficult. However, Mills, et al. (1995), who included two rather different types of procedural texts in their study, found no significant main effect of text in their results, nor did text interact with purpose. Given the findings of Mills, et al. with respect to the lack of a text effect, as well as practical limitations of access to participants’ time, it was deemed appropriate for this first look at the effects of purpose and task with procedural texts for second language readers to include only one procedural text. Future research should investigate different procedural texts and various procedural text types.

Second, although our participants were relatively homogeneous with respect to their level of second language proficiency, they were heterogeneous with respect to native language background. While we examined our results for the largest native language subgroup represented in our participant group (Vietnamese) and found no differences in the results for this homogeneous subgroup and the results for our heterogeneous group overall, it would nonetheless be important in the future to replicate this research design with a variety of homogeneous native language groups, to determine whether there are any differences due to native language.

Third, this study investigated only ESL learners at high intermediate and advanced proficiency levels (as defined by the IEP program in which they were enrolled). As proficiency levels of learners varies widely from those represented in this participant group, results may also differ.
Fourth, like Mills et al. (1995) all participants always recalled the text before doing the task “because the prompting of the task performance could greatly influence recall if task performance were done first” (p. 86). However, it is certainly possible that the task effect obtained in our study was due to the practice effect of the recall task on the performance task. It would be worthwhile including replicating the study with larger numbers of participants and experimentally controlling for order of task.

Finally, like Mills, et al. (1995) we deliberately selected two cognitively similar purposes for reading (read-to-do and read-to-recall) and hence, two cognitively similar conforming tasks (doing and recalling). The purposes and conforming tasks are similar in the following ways:

1. neither purpose/task relies simply on recognition or recognition memory;
2. both purposes/tasks involve extensive production (of actions on a computer, of language);
3. neither purpose/task is prompted by information embedded within the task;
4. both purposes/tasks demand deep levels of processing and comprehension of the passage; the deeper the comprehension, the more refined the reader’s mental representation of the passage upon which to draw in the performance of the tasks. We might expect, however, that results such as ours and those of Mills, et al., would differ if two more dramatically contrasting purposes/tasks were selected. For example, if the recall purpose/task had been instead a multiple-choice question-answer purpose/task. However, in a tight research design such as that used in the Mills et al. study and replicated in our study, where different purposes and tasks are to be directly compared, there must be comparability of the dependent measures.

REFERENCES


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