The CATESOL Journal

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Using Think Alouds to Identify and Teach Reading Comprehension Strategies

■ **The purpose of this study was to determine the effectiveness and feasibility of using think alouds to identify and teach reading comprehension strategies. Part 1 was an analysis of the think-aloud protocols of nonnative speakers of English successfully completing their junior year at a university who, on the basis of test scores and professor judgment, had been identified as proficient readers. The analysis identified the strategies these students used when reading course materials. Part 2 was a teaching experiment in which think alouds were used to teach strategies identified in Part 1 to intermediate-level students enrolled in an intensive English program at the same university. This part of the study investigated whether the instructional procedure resulted in acquisition of the target strategies and comprehension of a reading passage. Results indicate that think alouds were an effective means of identifying reading strategies and may be a useful technique for helping nonnative speakers of English learn and apply reading strategies.**

The primary goal of intensive English programs in the US is to help foreign students develop the skills they need to become successful, matriculated students in American universities. One of the most important of these skills is the ability to comprehend the types of materials college students are typically required to read. Many programs that attempt to teach specific strategies for improving reading comprehension emphasize procedures to be carried out either before or after reading (e.g., prediction, summarization, mapping, and study techniques such as SQ3R—survey, question, read, recite, review). While these are important aspects of any proficient reader's repertoire of strategies, research with students whose native language is English (Bereiter & Bird, 1985; Ericsson & Simon, 1993; Johnston & Afflerbach, 1985; Luncan & Beck, 1997; Olshavsky, 1976; Pressley & Afflerbach, 1995; Pritchard, 1990) indicates that skilled readers are often distinguished by on-line processing behavior, that is, the strategies they employ while engaged in initial reading.

The studies cited above also indicate that the use of think-aloud procedures is one of the most effective ways to identify reading strategies. Although the majority of these studies have been conducted with native English speakers, there has been increased recognition that this type of process-oriented approach also yields great insight into the processing behaviors of L2 learners (Bhasin, Block, Cheng, & Martino, 1998; Block, 1986, 1992; Cohen, 1982; Cohen & Hosenfeld, 1981; Davies & Bistodeau, 1993; Jimenez, Garcia, & Pearson, 1996; Kamhi-Stein, 1998; Pritchard, 1999; Reyhan & Aykel, 2002; Upton, 1998).

In addition to being investigated as a means of *identifying* reading strategies, think-aloud procedures have also been researched as a tool for *teaching* reading strategies to students whose native language is English (Caldwell & Leslie, 2003; Cote, Goldman, & Saul, 1998; Crain-Thoreson, Lippman, & McClendon-Magnuson, 1997). However, even though 18 years have passed since Casanave (1988) pointed out that think alouds had not been tested "in systematic training studies with any of the many different ESL popula-

tions" (p. 296), the use of think-aloud procedures as a tool for teaching reading comprehension strategies to L2 learners has not been adequately investigated. Instead, researchers have focused on the impact of strategy instruction on the reading comprehension of L2 learners using other instructional approaches (Auerbach & Paxton, 1997; Carrell, Pharis, & Liberto, 1989; Raymond, 1993; Reyhan & Aykel, 2002; Song, 1998).

This study was undertaken in an effort to address this research gap by using think alouds in both the identification and teaching of reading comprehension strategies to ESL students. More specifically, this investigation attempted to:

- Determine the feasibility and effectiveness of using think-aloud protocols with nonnative speakers of English as both a data collection and teaching tool;
- Identify differences in reading-strategy usage and comprehension between treatment and control groups of nonnative speakers of English enrolled in an intensive English program at the postsecondary level.

Phase 1: Identifying Proficient Readers' Processing Strategies

Subjects

The purpose of the first phase of this study was to identify the reading strategies used by undergraduate foreign students who were identified as proficient readers of English. Chosen on the basis of test scores and teacher judgment, 10 subjects were selected from two sections of an Advanced Composition course for foreign students. The subjects had been in the US for approximately the same length of time (3-4 years) and were natives of the following countries: Indonesia, Japan, Korea, Kuwait, Malaysia, Mexico, People's Republic of China, Sierra Leone, Taiwan, and Thailand.

Materials

All students in the Advanced Composition course were asked to complete a survey indicating the types of classes they had taken since enrolling in the university. The results of the survey indicated that, with the exception of English, the courses most commonly taken were history and natural science. Consequently, an excerpt was taken from both the science text and history text used in the lower-division general-education course required by each of these departments. Each excerpt was an intact section from a chapter, approximately 400 words in length, and at the college difficulty level according to the Fry Readability Formula, one of the most widely used and easy-to-use readability graphs for educators (Fry, 1977).

Procedures

A researcher met individually with each subject during the school day in a private office that was not being used for any other purpose. At each session the researcher and subject sat side by side at a table on which there were a tape recorder and a folder containing the experimental materials. These materials consisted of a sheet of directions, a practice passage, and the science and history passages.

Approximately the first 5 minutes of each session were spent conversing with the subjects in an attempt to establish rapport with them. They were told that the purpose of the study was to determine how college students read rather than to test them personally. After they had had the opportunity to reflect on how they read and to express those thoughts, they were given the following directions. These directions, written in English and typed on a piece of paper, were read to the subjects orally while they read them silently.

1. You will be given two passages to read silently.
2. As you are reading, anytime you want, talk out loud about what you are doing and thinking as you read.
3. When you see a red dot [a red dot was placed after each paragraph], stop reading and explain what you are doing and thinking as you read.

Each subject then received approximately 10 minutes of training in thinking aloud while reading. Once the subjects had become accustomed to the procedure, the directions were reviewed and the subjects were asked to read the history and science passages, which were presented in counterbalanced order.

Data Collection and Analysis

Based on an analysis of the subjects' protocols, reader strategies were identified and analyzed. This analysis was conducted in the following manner. First, each subject's tape-recorded responses were transcribed verbatim and were cross-checked for accuracy by the researchers. Second, the transcribed protocols were compared with the stimulus sentences in each passage and were numbered to correspond to those sentences. The following is an example of a sentence from a passage and the corresponding protocol of one of the subjects.

> Passage: They also discussed when they would meet to settle the estate but it wasn't finalized, so they're going to consider it again later.
> Subject protocol: Talking about an estate makes me think that this culture or society may be a little more advanced than I thought before, but I wonder if that is true.

Next, each protocol was analyzed to determine which cognitive operations the reader undertook when reading the sentence. Once a determination was made, a description of each response was recorded. For instance:

> Passage: They also discussed when they would meet to settle the estate but it wasn't finalized, so they're going to consider it again later.
> Subject protocol: Talking about an estate makes me think that this culture or society may be a little more advanced than I thought before, but I wonder if that is true.
> Description: The reader is questioning his interpretation of events in the passage.

These descriptions were then examined to determine whether or not they met the definition of strategy (deliberate action that readers take voluntarily to identify and solve problems in comprehension), and when appropriate, labels were assigned. For example:

> Passage: They also discussed when they would meet to settle the estate, but it wasn't finalized, so they're going to consider it again later.
> Subject protocol: Talking about an estate makes me think that this culture or society may be a little more advanced than I thought before, but I wonder if that is true.
> Description: The reader is questioning his interpretation of events in the passage.
> Strategy: Questioning yourself as you read.

Results

Six strategies emerged from an analysis of the subjects' think-aloud protocols:

- *Using background knowledge (BK)* represents subjects' responses that use some aspect of their background knowledge to build their understanding of the passage.
- *Visualizing (V)* represents subjects' responses that describe a visual image evoked by the text.
- *Questioning yourself as you read (Q)* represents subjects' responses that raise a question evoked by the text, their background knowledge, or the situational context.
- *Accepting ambiguity and reading on (AA)* represents subjects' responses that indicate they are reading on and not abandoning their attempts to understand the passage, even if the comprehension process had temporarily short-circuited.
- *Searching for connections (SC)* represents subjects' responses that indicate an attempt to integrate information from different areas in the passage.

- *Reading selectively (RS)* represents subjects' responses in which they state that they intentionally skipped a part of the passage.

These strategies formed the basis of the experimental, instructional procedure used to improve the reading comprehension of nonmatriculated foreign students in Phase 2 of this investigation.

It is appropriate at this point to discuss the steps that were taken to ensure the reliability of the subjects' performance in Phase 1. These included the care with which the directions for the experimental tasks were developed and administered, the care with which the data collection procedures were set up and implemented, and the completion of a pilot study. The research and planning that were conducted in preparation for each of these steps had a significant effect on the quality of the data these procedures yielded. Therefore, even though the nature of the data precluded the use of more traditional reliability checks, these researchers are confident that the preceding steps helped to ensure that the subjects exhibited a reliable performance.

Phase 2: Improving Comprehension by Teaching Reading Strategies

Instructional Setting

The American English Institute (AEI) is an intensive English program at a 4-year university in California. AEI offers three sessions: a 12-week session in the fall and spring and a 10-week session in the summer. An average of 100 students per session attend 21 hours per week of course instruction in reading/writing, listening/speaking, grammar, and TOEFL preparation. The majority of students attend AEI in preparation for attaining a high score on the TOEFL and entering an American postsecondary institution.

Subjects

The 20 students who participated in Phase 2 of this research project were enrolled in an intermediate-level reading class at AEI during the summer session. They represented a variety of cultural and linguistic backgrounds: 10 Japanese, 4 Indonesians, 3 Koreans, 1 Thai, 1 Yemeni, and 1 Moroccan. Students were randomly assigned to either the control group or the treatment group (10 students each), although minimal changes were made in the assignments to ensure that the number of students from various language families was proportional in each group. Results of a presession Nelson Reading Test indicated that the average group reading level for the control group was grade equivalent 4.5 and for the treatment group was 4.7. The control group averaged 5.6 years of English study before entering the US, while the treatment group averaged 5.8, and 68% of all students had been in the US less than 1 month. Independent *t*-tests on all dependent variables revealed that there were no significant differences between the two groups at the time the pretests were administered.

Procedures: Class Instruction —Control Group

Research was conducted during a 3-week period in the reading course, which consisted of three 50-minute class periods per week. During each week, students read three thematically related articles from the textbook. In addition to the theme, students focused on acquiring a specific reading skill each week:

Week 1: Getting the main ideas of the text;
Week 2: Skimming and scanning;
Week 3: Making inferences.

The instructional sequence for the control group was the one presented in the textbook. All exercises, in and out of class, were presented in the text. Additional vocabulary-building exercises were included, such as guessing the meaning of words in context.

The first day of each week the instructor introduced the reading by encouraging discussion of its title and a picture taken from the text. In preparation for reading the text,

members of the class familiarized themselves with some prereading questions that would provide a reading purpose. Students then read the text silently in class. When finished, they completed exercises focusing on the skill of the week.

Day 2 began with a brief review of the ideas covered in the previous class period. Again, students used a title and/or picture as tools to generate interest in the text. Students then read the text silently in class, followed by exercises designed to give practice in the weekly skill.

On the third class day, students again used a picture or title for discussion, read several prereading questions on which to focus while reading, and then read the text silently in class. After reading, students engaged in an exercise related to developing the reading skill for that week. The day ended with a brief class discussion about the week's topic.

Homework assignments were consistent each week. A vocabulary exercise (guessing the meaning of a word from context, for example) was assigned at the end of Day 1. The homework for Day 2 required students to respond to the topic in their reading journals; additionally, they completed a follow-up vocabulary exercise. On the last class day, students were asked to find a related article and summarize it, or to write a short narrative of an event in their lives related to the topic.

Procedures: Class Instruction —Treatment Group

The treatment group also met for three 50-minute sessions per week and was taught by the same instructor as the control group. Each week the class focused on two of the six reading strategies that emerged from the first phase of this study:

Week 1: Using background knowledge *and* visualizing;
Week 2: Questioning yourself as you read *and* accepting ambiguity and reading on;
Week 3: Searching for connections in the text *and* reading selectively.

This group received a "modeling-plus-instruction" treatment that consisted of three basic procedures: teacher-directed explanation of target strategies with modeling and examples; teacher-guided identification practice using symbols to represent strategies used by the reader; and student-directed practice using the strategies while reading. In other words, a gradual release of responsibility occurred once the teacher had explained and modeled each strategy. As instruction continued and the teacher's role became more akin to that of a coach, teacher and student responsibilities were more equal. Eventually, the students assumed primary responsibility for practicing the strategies and trying to apply them in new situations. The strategies introduced in one week were reinforced in later weeks.

Each new strategy was introduced in the same manner. The teacher read a passage orally while using the think-aloud technique to model the use of the assigned strategies. Students were then asked if they could identify the strategies the teacher had used. The class members discussed what they thought the strategies were, when they were used, and why they were used. The instructor then defined each strategy used and indicated the kinds of reading situations to which the strategies applied, demonstrating their use by thinking aloud while reading appropriate material. Students were then asked to finish reading the article on their own and were encouraged to be aware of when and why they used the strategies.

The next class period the teacher again modeled the strategies. Students were asked to listen while the teacher read and to mark symbols assigned to each strategy (BK, V, Q, AA, SC, and RS) in the text whenever the teacher used that particular strategy. Students compared their answers with a partner, and the class discussed the text together. Emphasis was again on when and why the

teacher used a particular strategy and if that strategy were helpful or not.

During the third class period, students individually practiced the strategies. They read a text, marking the text with the appropriate symbol when they used that strategy. The teacher monitored the students, facilitating only if a student was not on task. Students compared their answers as a class using a transparency and overhead projector. At the end of the day, the class reviewed the strategies, reiterating what they were, when to use them, and why good readers use them.

Homework assignments for Days 1 and 2 included finishing the reading of an article, marking it with the symbols of the appropriate strategy (when used), and answering comprehension questions. Homework for the third class period was designed to give students the opportunity to apply the strategies to a different text. In their reading journals, students responded to the following:

1. Give a brief description of the text and identify its source.
2. Discuss whether or not you were able to use the strategies.
3. Describe whether or not using the strategies helped you as a reader.

Data Collection and Analysis

Both the treatment and control groups were administered pre- and posttests on two reading comprehension measures (post-reading comprehension questions and a written summary) and two strategy-usage measures (the Metacognitive Strategy Index [MSI] and a strategy checklist). These were chosen because we wanted to investigate the treatment effects on both comprehension and comprehending. The former denotes product while the latter indicates the process itself.

These procedures were administered in the following sequence. First, the students completed the MSI (Schmitt, 1990), which was designed to be a measure of students' awareness of reading strategies normally used by good readers. The second task was related to a one-page reading passage that students were asked to read as they normally would for a class assignment. Using the strategies checklist while reading, they placed a check mark next to a strategy each time they used it. When they finished reading, students reviewed the checklist and retrospectively marked any strategies they may not have marked while reading. To measure their comprehension, students were given a set of 10 questions to answer after reading each passage. These questions focused on important information in the passage and were written

Table 1
Means and Standard Deviations by Groups for the Strategy and Comprehension Measures

	Metacognitive Strategy Index		*Strategy checklist*		*Reading comprehension*		*Written summary*	
Group	***Pre***	***Post***	***Pre***	***Post***	***Pre***	***Post***	***Pre***	***Post***
Treatment	12.00	13.50	14.70	19.90	5.75	8.50	5.60	7.80
(*N*=10)	(2.87)	(2.84)	(9.36)	(8.56)	(1.57)	(.82)	(2.63)	(2.97)
Control	14.10	13.60	12.60	12.30	5.65	7.60	5.70	6.80
(*N*=10)	(3.07)	(5.50)	(7.24)	(4.45)	(2.31)	1.79)	(2.98)	2.78)
Total	13.05	13.55	13.65	16.10	5.70	8.05	5.65	7.30
(*N*=20)	(3.09)	(4.26)	(8.22)	(7.70)	(1.92)	(1.43)	(2.74)	(2.85)

Table 2
Summary Table for the 2 X 2 (Group X Time) Repeated Measure Analyses of Variance for the Strategy and Comprehension Measures

		Metacognitive Strategy Index		*Strategy checklist*		*Reading comprehension*		*Written summary*	
Source	***df***	***F***	***p***	***F***	***p***	***F***	***p***	***F***	***P***
Between subjects									
Group	1	0.56	0.41	2.49	0.13	0.63	0.44	0.22	0.64
Error	18								
Within subjects									
Time	1	0.39	0.54	2.71	0.12	29.30	0.0001	3.79	0.07
Group X Time	1	1.56	0.23	3.41	0.08	0.85	0.37	0.42	0.52
Error	18								

to reflect different levels of comprehension. Upon completion of the questions, they wrote one paragraph summarizing the most important information in the passage after being instructed not to look back at the passage. Each summary was evaluated using a 5-point holistic scale based on the number of main ideas included in the summary. The means and standard deviations for the pre- and posttests for all measures by groups and for all subjects appear in Table 1.

To address the major research foci of this study, we conducted a series of statistical analyses. The first (a 2 X 2 repeated measure, multivariate analysis of variance) focused on whether the treatment group had higher gains through time on the product and process measures. The results indicate that this hypothesis was confirmed ($F = 23.68$; $df = 7, 12$; $p = .0001$). While the results for both group differences ($F = 2.11$, $df = 8, 11$, $p = .13$) and the group by time interaction ($F = 1.87$, $df = 7, 12$, $p = .16$) were not statistically significant, these results suggest that repeating the study with a larger sample size is warranted and would likely result in a statistically significant finding. The other procedures (a series of Group X Time analysis of variance tests) show significant increases through time for the two comprehension variables: the reading comprehension test ($F = 29.30$, $df = 1.18$, $p = .0001$) and the writing test ($F = 3.79$, $df = 1.18$, $p = .07$) as well as for the strategy checklist ($F = 3.41$, $df = 1.18$, $p = .08$). A summary table of these results appears in Table 2.

Conclusions

Using think alouds proved to be a feasible and effective means of identifying and teaching reading comprehension strategies. Thus, the results of this study are encouraging from two perspectives. First, think alouds were clearly an effective means of identifying the reading strategies used by the subjects in Phase 1 of this study. From a research perspective, think alouds provided insights into on-line processing behavior that would have gone unrecognized in more typical, product-oriented data collection procedures.

Second, as an instructional approach, think alouds showed the potential to be a useful technique for helping nonnative speakers of English learn and apply processing strategies to their reading. This conclusion is sup-

ported by the statistically significant higher gains on the strategy checklist through time for the treatment group. The strategy checklist measured the strategies students used when reading passages in class while the MSI measured students' awareness of strategies used by good readers. This suggests that using think alouds as an instructional approach can influence student use of particular strategies, even though student understanding of the efficacy of a broader range of strategies may not be affected.

In regard to comprehension, there was a statistically significant difference between subjects' pre- and posttest questions and written summary scores for both the control group and the treatment group. However, there was a not a statistically significant difference in the gain on these measures between the treatment and control groups. Nonetheless, the mean scores show that there was a greater gain on both scores for the treatment group.

Trends in the data from Phase 2 suggest that replication of the instructional phase of this study with a larger sample is warranted and is likely to yield significant differences. Thus, despite the lack of statistical significance, the researchers believe that the educational significance of developing more strategic, process-oriented approaches to the instruction of ESL students necessitates continued investigations into the efficacy of think alouds as an instructional technique in ESL classrooms.

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