

**THE ASSESSMENT OF THE READING SPEED
AND READING ABILITY OF THAI UNIVERSITY
COMMERCE AND ACCOUNTANCY STUDENTS
WHO ARE TRAINED BY USING A COMPUTER
READING PROGRAM**

Kulaporn Hiranburana

Prakaikaew Opanon-amata

Chulalongkorn University Language Institute

ABSTRACT

This research investigated the use of the computer in developing reading abilities, including speed reading and reading comprehension. In this study, 99 students from the Faculty of Commerce and Accountancy were trained in speed reading using a computer program in English. The program contained activities aimed at increasing reading speed such as eye movement, timed reading and paced reading. The performance of these students in speed reading, comprehension and general English proficiency pre-tests and post-tests was compared with that of students who did not take part in the training. The results show significant gains in the reading rates of the experimental group. Their reading comprehension and proficiency also improved but this improvement was not significantly different from that of the control group. The results of the study in the use of a speed reading computer program and its implications are then discussed.

Introduction

Reading ability in a foreign language, particularly English, plays a vital part in academic study, professional success and personal development. Speed and fast reading in English has become important in

the globalised and competitive world where quick access to information and fast text processing are required. It has been recognised that competent readers should acquire and display a reasonably high reading speed. There continues to be, however, a

contradiction relating to research in speed reading. Some studies (Carver, 1985a; 1985b; Himelstein & Greenberg, 1974) show that an increase in reading speed is likely to result in a decrease in comprehension. Gray (1984, p.38) also pointed out that the interrelation of speed and comprehension was "by no means invariable." Certain experiments, however, show that some speed readers can also achieve good comprehension (McConkie, Rayner & Wilson, 1973; Thomas, 1962). American high school students trained in speed reading by a computer program displayed growth in reading rates with no loss but rather gains in comprehension (Beers, 1986). Although there is controversy about the effectiveness of speed reading, since it is important for information search, speed reading training has been incorporated in many reading courses including the Wisconsin Workplace Partnership Training Program (1993) and the Oneida Career Development and Technical Training Service Project (Martin, 1995).

Speed reading plays an important role not only in first language acquisition but also in English as a second or foreign language learning programs such as in Malaysia (Lim, 1976) and in China (Zhang & Jiang, 1996). In an English as a Second Language (ESL) or as a Foreign Language (EFL) context, speed reading may be problematic as Parry (1987, p.62) pointed out that students lack the appropriate knowledge to work with "text and language, products of a culture alien to them." In Thailand, in particular, there has been little research into the effectiveness of speed reading training. This study is a small attempt to investigate this relatively unexplored area. Insight into speed reading will shed light on the reading process and development in relation to rapid reading and comprehension skills which are integral in communication

and information searching in this globalised world. Such knowledge could be helpful from a practical standpoint by suggesting teaching and training procedures which focus on speed reading. In so doing, it would be beneficial to count on some theoretical explanation and empirical evidence relating to the reading process which would help explain how students can be oriented towards the mastery and development of fluency and skills in reading.

The Reading Process

Reading is a process which involves many multifaceted factors. It is not only concerned with the visual information readers receive from print. Reading comprehension involves the interaction of visual and non-visual information; that is, prior knowledge. Some theorists and researchers in reading take two approaches to reading. The bottom-up approach presupposes the mastery of reading fundamentals related to the decoding process in which the reader identifies and recognises letter, word and sentence formation (Anderson, 1937; Gough, 1972). It has been reported that good readers recognise words, and guess the meaning of unknown words and their relationship (Golinkoff, 1975-1976). A study on text processing (McCormick & Samuels, 1979) shows that readers who have high scores in reading comprehension tend to be strong in word recognition. On the other hand, the top-down approach assumes that the reader's comprehension depends mainly on prior knowledge which is drawn on in the interpretation of meaning (Ausabel, 1980; Goodman, 1976; Pearson, Hansen, & Gordon, 1979; Smith, 1973). According to Smith (1988, p.65) reading is "the trade-off between visual and nonvisual information".

Despite some credibility in these two views of reading, it is more likely that the underlying process is interactive, thus involving both. In other words, readers not only rely on graphic information but they also draw on contextual information which contributes to the meaning they derive from text. To comprehend a text, the reader needs to examine how sentences combine in discourse to convey meanings which are of multiple levels: notional/conceptual, propositional, contextual and pragmatic meanings (Candlin, 1981; Nuttall, 1996). Notional/Conceptual meaning is what a word can mean on its own. Propositional meaning refers to the meaning a sentence can signify if it is not used in a context. Contextual meaning is the meaning a sentence conveys when it is used in context. Pragmatic meaning refers to the meaning which derives from the relationship and interaction between the writer and the reader and this reflects the writer's feelings, purposes and attitudes.

For a reader, to get the intended meaning or effect of the text, both graphic and nonvisual information are operating simultaneously and interdependently (Rumelhart, 1977). Therefore, the reader extracts the visual information from the printed text using linguistic knowledge to generate the meaning based on his prior knowledge held in long-term memory (Devine, 1986). These cognitive or mental structures of prior knowledge, known as schemata (Widdowson, 1983) play an important part in text processing. The process is explained as follows: ...The reader starts with the perception of graphic cues, but as soon as these are recognized as familiar, schemata derived from both linguistic knowledge and knowledge of the world in general are brought into play. The proportion of graphic cues that must be perceived varies

with individual texts and with individual readers according to the difficulty of the former and the knowledge and confidence in that knowledge of the latter. (Parry, 1987, p. 62).

Therefore, it is also the case that in developing reading ability, reading must be quick and selective (Smith, 1988). The relationship between comprehension and reading speed is complex. It has been observed that a slow reader is likely to read with poor understanding (De Leeuw, 1990). The reason is that slow reading with many fixations or pauses and regressions or backward movements along the line of print can result in tunnel vision (Mackworth, 1965), the condition in which the reader misses the general topic due to overattention to detail. Fry (1977) and Bergquist (1984) also point out that the reader who reads one word or a few letters at a time has difficulty in grasping the meaning as the mind deduces from the interrelationships of larger units. Skilled readers tend to make fewer fixations but pick up more information on each fixation with the stimulus perceived from the peripheral span. For instance, Sailor and Ball (1975) have confirmed that training in peripheral vision can improve reading rate and comprehension. Marcel (1974), in particular, experimented with fast and slow readers, and found that the increased reading speed which results in rapid scanning tends to cause fast readers to use context to derive meaning and maintain thematic content.

Although regressive eye movements are considered symptoms of poor comprehension and an impediment to reading speed by some reading practitioners, good readers also show some regressions. Nuttall (1996) points out that skilled readers can make a regression when they discover inconsistencies to their interpretation or prediction. As mentioned

earlier, skilled readers do not need to understand every word or sentence in the text. It is possible that they understand only bits of the text. Activating their schemata, they derive only some of the meanings and they keep on altering their interpretation as they go along. In doing this, they may need to check previous parts of the text and reinterpret them. In this respect, regressive eye movements could reflect the active and responsive participation of the good reader. Regression with no obvious purpose for comprehension, however, contributes little to reading ability, and thus should be avoided in training.

Practice in visual perception, grasp of meaning and recognising associations of ideas is integral to developing reading speed. Some speed reading programs use reading materials with timed readings and students complete comprehension questions such as those in the SRA Reading Laboratory. Recently, computers have been introduced to assist students improve their reading fluency and accuracy. What is important is the introduction of the text-window by Lundberg (1984) which sheds light on a variable length of text: the reader can adjust the speed of the text-window. With this new method, for example, Roth and Beck (1987) reported improvements in word recognition and decoding skills of the experimental group. Based on their study with American college students, Wepner, Feeley and Minery (1990) have also found that the computer group performed significantly better than the control group in reading rate and comprehension. Another study carried out by Watts (1993) shows that the use of computers with initial letters highlighted on the screen tends to enable students to recognise words better and faster. These studies emphasise the role which the

computer plays to provide helpful and effective reading practice environments.

We have so far looked at what the literature says about reading in the first language. It is interesting to look at reading in a second or foreign language; the process in which research and experience (Clarke, 1979; Cummins, 1981; Cziko, 1980) have documented the interplay of language proficiency in the first and second language and the reading ability and skills in the first language. Research findings in EFL reading also support the view that students reading a foreign language read more slowly and with lower comprehension than reading in their native language (MacNamara, 1970). Owing to this difficulty in reading in a foreign language such as English, there is an urgent need to validate the use of the computer in speed reading training and its contributions to reading fluency and efficiency in a foreign language.

The purpose of the study was:

1. to assess students' improvement in reading rates and comprehension after a computer program training in speed reading in English;
2. to study the relationship between improvement in speed reading and reading comprehension in English and English proficiency.

The following were the hypotheses to be validated in the study :

1. No significant differences in rates and comprehension will be seen between the experimental group and the control group before and after the experimental students' participation in the speed reading training program.
2. No significant differences in English proficiency will be seen between the experimental group and the control

group before and after the experimental students' participation in the speed reading training program.

Method

To test the speed reading program, a pilot study in which 48 third-year students from the Faculty of Commerce and Accountancy, Chulalongkorn University received training over eight weeks was conducted to find potential problems in using the program. The information gained from the pilot study was used to design the main study.

Participants

The participants of the main study were 99 (78 women, 21 men) Chulalongkorn University Commerce and Accountancy third-year students who were randomly chosen from those enrolling in Social English, a compulsory course for all Commerce and Accountancy students. They were designated to form the experimental group (51) and the control group (48) by matching their proficiency of English based on the results of the Chulalongkorn University Test of English Proficiency (CU-TEP) pre-test. The reason for using CU-TEP was that it is a standardised test (rpb 0.6 ~ 0.30, KR20 0.89 ~ 0.92, Phi 0.79 ~ 0.80) and the correlation with TOEFL is high (RXY = 0.91 ~ 0.94). The experimental group contained 42 women and 9 men. The control group consisted of 36 women and 12 men. Neither group was significantly different in English proficiency or reading rate but the mean for the control group was slightly higher in comprehension at the start.

Materials and Procedure

The experimental group and the control group were both pre-tested in reading rate

and in comprehension. Only the experimental group worked outside class on a self-access learning program, Speed Reader by Davidson et al (1991) as the program is highly recommended by Teachers of English to Speakers of Other Languages (TESOL) subscribers to TESOL Internet service as being a very useful speed training computerised package, suitable for use on PCs.

The Speed Reader is a computer program designed for training speed reading skills. This program contains such activities as Reading Warm-ups, Eye Movement, Newspaper Reading, Paced Reading, Timed Reading and Eye Max.

In the "Reading Warm-ups," students choose the letter(s) or word(s) that they have just seen flashed on the screen. This increases their eye span and perception rate. As students advance from two letters or words to three or four, they learn to use their peripheral vision. "Eye Movement" trains the eye to move rhythmically from one group of words to the next across and down the screen, pausing only once per group of highlighted words. The number of these highlighted words can be chosen by students; for example, every two, three or four words. In "Newspaper Reading," one or two columns of words are displayed with each line highlighted in turn. This activity provides more practice in utilising peripheral vision. "Paced Reading" presents longer reading texts displayed at a preset pace. "Timed Reading" enables students to measure their reading rate and comprehension to gauge improvement. "Eye Max" is a game in which students choose one of the surrounding objects to match a central object after all of the subjects are flashed on the screen. This activity improves peripheral vision and eye perception. None

of the reading activities allow students to make regressions. They are, however, able to repeat the activity with the same reading passage or a new one. The topics used for the reading passages cover the following areas: business, human interest, innovations, literature, psychology, reading techniques, speeches, sport and technology.

After the pre-test which assesses students' initial reading speed, the training program sets the speed of the activities to suit students' ability to practise in order to reach the target speeds which are also set, based on the results of the pre-test. These speeds change depending on students' performance. It is possible that if a student performs unsatisfactorily in the comprehension test after a timed reading, for instance, the speed set for this activity in the following session would decrease. Students could increase the speed once their performance had improved.

The experimental group spent one hour twice a week over 10 weeks on the Speed Reader complementing the regular English course which required three contact hours per week for about twelve weeks. The control group took only the regular course. In the training program, the experimental group kept records of their performance in each activity in a file apart from the records which were automatically saved on diskette. In this way, their performance could be regularly monitored by the researcher. After the ten-week program, the experimental group took the post-tests in speed, comprehension and English proficiency at the same time as the control. The post-tests in speed and comprehension were parallel to the pre-tests. They were randomly chosen from the same bank of assessment tests as the pre-tests. The readability level of the reading texts used in the pre-tests and post-

tests is about 8 (according to Gunning's Fog Index). The topic of each reading text was of general interest. The comprehension tests were composed of a set of six to eight multiple choice questions at the end of reading texts in the assessment tests. These questions yielded measures of reading skills such as identifying the topic and the main point(s); distinguishing important and unimportant points and supporting details, facts and opinion, relevance and irrelevance, sound and unsound conclusions, adequate and inadequate evidence, valid and invalid inference and identifying the writer's purpose and attitude.

Analysis

The two-sample dependent t-test (the paired two sample t-test) was applied to examine whether there was a significant difference between the experimental group's reading rates and scores on the pre-comprehension test and the post-test (parallel). In addition, the application of the two-sample independent t-test was made to find whether there was a significant difference between the experimental group and the control group in their reading rates and their percentage in the pre-comprehension test and the post-test (parallel), and also in their scores on the English proficiency test, the CU-TEP.

To assess attitudes toward the speed reading training program, an evaluation form, with a 5-point Likert scale rating including items about different aspects of the effectiveness and usefulness of the program, was administered to the experimental group immediately after the post-tests. The results were produced in the form of a table. The last part of the form asked students to give general comment on the program.

Results

Pre-training

A comparison of the mean reading rate, the mean comprehension percentage and the mean proficiency in the pre-tests (Table 1) shows no significant differences in reading rate and proficiency between the

experimental group and the control group. This indicates that before speed training began the two groups were the same in their reading speed and proficiency. The mean score of the experimental group for reading comprehension was, however, a little lower than that of the control group.

Table 1. Pre-test Means and Standard Deviations for Reading Rates, Comprehension and English Proficiency of the Experimental Group and of the Control Group – Pre-training

	Control(n=48)		Experimental(n=51)		<i>df</i>	<i>t</i> value	<i>p</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>			
Rate	105.02	38.80	104.41	37.39	97	.08	.937
Comprehension	77.52	15.55	73.96	17.85	97	1.06	.294
Proficiency	489.69	41.57	488.65	45.82	97	.12	.906

Post-Training

Reading Speed.

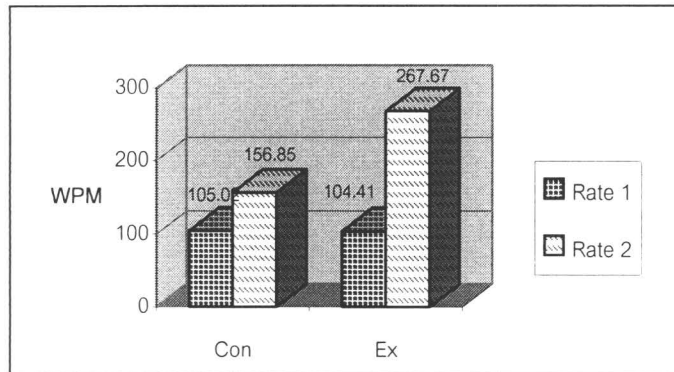
The results of the post-test indicated a significant improvement in the mean rates of both the experimental group and the control group. The post-test experimental group's mean rate (267.67 wpm) was significantly higher than that in the pre-test (104.41 wpm), $t(50) = -11.13$, $p < .001$. The difference between the control group's mean rate in the pre-test (105.02 wpm) and that in the post-test (156.85 wpm) was statistically significant, $t(47) = -6.89$, $p < .001$ (See Figure 1). This finding is not surprising

because, as mentioned earlier, the control group took the compulsory English course which probably would have had some effect on their rates. What is more interesting is that the experimental group made a lot more progress in their reading speed than the control group. Table 2 shows that the experimental group's post-test mean rate (267.67 wpm) was statistically higher than that of the control (156.85 wpm). The finding also confirms the results of the pilot study in which speed training improved students' reading rate or fluency.

Table 2. Means and Standard Deviations for Reading Rates, Comprehension and English Proficiency of the Experimental Group and of the Control Group – Post-training

	Control(n=48)		Experimental(n=51)		<i>df</i>	<i>t</i> value	<i>p</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>			
Rate	156.85	58.25	267.67	117.40	97	-5.89	.000
Comprehension	78.77	23.52	77.55	17.85	97	.29	.771
Proficiency	500.42	54.28	495.96	50.89	97	.42	.674

Figure 1. Means, Standard Deviations and t-test of Mean Differences of the Experimental Group's Pre-training and Post-training Reading Rates Compared with those of the Control Group.



The Control group's mean rate difference $t(47) = -6.89, SD=52.09, p < .001$

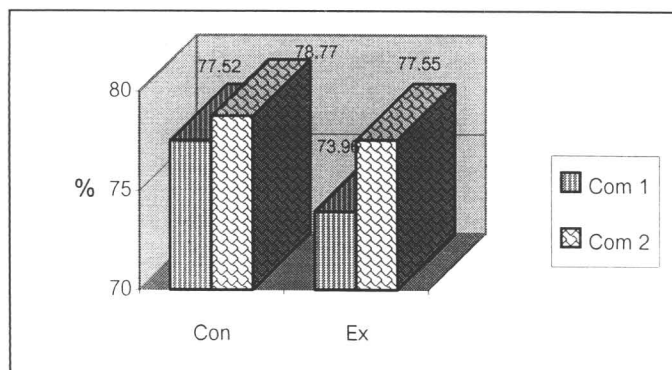
The Experimental group's mean rate difference $t(50) = -11.13, SD = 104.76, p < .001$

Reading Comprehension.

It is also worth noting that students of both groups scored better in the comprehension post-test. Their gains were not, however, of statistical significance. (See Figure 2). A comparison of the experimental group and the control group, interestingly, reveals the experimental students' higher growth in reading comprehension than that of the controls but no statistically significant difference was seen between the two groups'

means. (See Table 2.) These findings contradict those of the pilot study in which students did not show any improvement in reading comprehension in the post-test. The experimental group's development in reading comprehension could possibly be explained by the fact that students in the main study received a longer period training (10 weeks) than those in the pilot study which lasted only eight weeks.

Figure 2. Means, Standard Deviations and t-test of Mean Differences of the Experimental, Group's Pre-Course and Post-Course Reading Comprehension Compared with Those of the Control Group.



The Control group's mean comprehension difference $t(47) = -.36, SD = 24.39, p > .05$

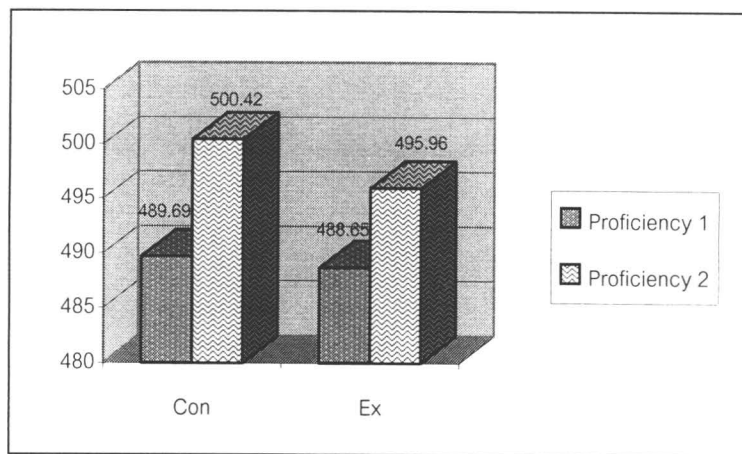
The Experimental group's mean comprehension difference $t(50) = -1.05, SD = 24.41, p > .05$

English Proficiency.

The pre- and post-test scores of the experimental group and the control group on the CU-TEP show that their performance in the proficiency post-test was better. (See Figure 3.) It does not, however, show a significant gain in both groups. (See Table

2.) It is worth noticing that the experimental group's lower scores could be related to physical condition during testing because there was a power-cut which resulted in the students having to move to another room in the middle of the test.

Figure 3. Means, Standard Deviations and *t*-test of Mean Differences of the Experimental Group's Pre-Course and Post-Course CU-TEP Compared with Those of the Control Group.



The Control group's mean proficiency difference $t(47) = -2.47, SD = 30.13, p < .025$

The Experimental group's mean proficiency difference $t(50) = -2.19, SD = 23.84, p < .05$

Questionnaire.

When we asked the experimental group to evaluate the training program, the majority were positive although quite a number experienced some technical problems with the program. (See Appendix 1.) They considered the program to be very useful in their studies and future careers. They also thought that their reading rate and comprehension had improved at the end of the training. Furthermore, most of them found the time allotted and the level of difficulty of the program appropriate and the content interesting. Quite a large number of them thought that the training had enabled

them to improve their English proficiency. Many of them wanted to continue their speed reading training and felt that all students would benefit from this. Some students who improved in reading comprehension after the speed training revealed that they were able to answer questions on comprehension by partly making speculations based on the available clues or words. Quite a few also wanted to have further practice on vocabulary in context.

Discussion and Implications

Speed and Reading ability

The results of this study suggest that reading is a complex communication process. Growth in reading rate could be helpful but it is part of the whole reading process which involves not only a bottom-up or passive serial processing in which the reader merely adopts a letter-by-letter analysis, leading to positive recognition of individual words, sentences and paragraphs, but also requires the use of top-down as meaning identification before word identification. It is quite possible that the reader formulates a hypothesis regarding the information to be processed. Then he or she may make use of the available minimal language cues from perceptual input to assist in confirming, correcting or rejecting the predictions he or she makes about the message.

The findings of the study tend to support the view that reading is multileveled (Shuy, 1977; Spiro, 1980) and interactive (Rumelhart, 1980; Ulijn, 1977, 1980). In this view, the reader draws on his or her language knowledge at different levels: phonological, morphological, syntactic, discourse and pragmatic and also world knowledge in constructing and reconstructing meaning. It could be interactive, in that reading comprehension is likely to be driven by the reader's knowledge structures or schemata and the specific content and linguistic structures in the text. The reader seems to use many levels (linguistic, conceptual, pragmatic and social) of background knowledge which interact simultaneously and interdependently as he or she constructs a meaning from the text by making predictions and confirming or rejecting them. Therefore, the improvement of reading ability requires not

only lower level reading skills, but also higher ones as well. This is probably of consequence for students who read English as a second or foreign language.

As revealed in this study, reading skills to handle the lower level structural aspects of the text such as the perception of letters, words, sentences and paragraphs including eye fixations are quite relevant. In fact, the improving of reading ability focussing on visual and graphic information occupies the attention of ESL and, in particular, EFL reading teachers. Eskey (1988) even suggested that it was necessary for ESL readers to pay more attention to bottom-up features than first language readers because the linguistic competence of the former was not as good; therefore, they were less able to make use of the range of cues in and outside the text. This study, however, clearly shows that the experimental group's remarkable growth in reading rates over the control group after the ten-week speed training led to only a small improvement in reading comprehension. It is obvious that the students satisfactorily developed their reading speed but they also need more practice in developing schematic knowledge regarding the higher levels of text processing. This includes top-level structure (Kintsch & van Dijk, 1978, Meyer, Brandt & Bluth, 1980) such as the patterning of various types of text which makes it easier to find the topic and the overall idea of the text. These higher level elements have been found to be used by fluent and mature readers in text processing, thus resulting in better comprehension. An integration of practice in top-level features in the training program could enhance the reading ability of ESL or EFL students in complementing their speed training. Of course, the interactive model of

the bottom and top would yield a more effective extensive reading program.

Speed and Language Proficiency

Similar to reading comprehension, general language proficiency is not significantly related to an improvement in reading rates, based on the results of the study. This finding has shed some light on the relation of language proficiency and second and foreign language reading. As revealed by research, second and foreign language proficiency has significant effects on second and foreign reading ability (Carrell, 1991). One would expect that reading ability would improve second or foreign language proficiency and some research in this field has suggested that reading in a second language can facilitate growth in second language proficiency (Cummins, 1979) but this study reveals that it need not always be the case. Training in physical aspects including eye movement and fixations can enhance reading speed and comprehension to a certain extent but it is only mechanical and not sufficient to deal with competency in language use which is more complex. Another possible reason for little growth in language proficiency is the way in which a text is blocked into groups of words to be highlighted on the computer screen for training fixations. In other words, the basis on which students choose the number of words in a text to be blocked and highlighted in groups for training eye movement and fixations is mechanical. It is not related either to sense groups (Nuttall, 1996) or meaningful units consisting of several words. Therefore, the way students learn to take in words for each fixation does not correspond to the way English is used naturally. Recent research by Just and Carpenter (1980) also suggest that eyes tend

to fixate on almost all content words in text and that longer fixations on infrequent words and at sentence ends when inferences are being made. If students have practice in eye movement of sense groups and larger blocks at each fixation, it is possible that they might develop better comprehension and proficiency and this needs further investigation.

Conclusion and Further Research

Speed reading and fast reading play an important role in reading in a foreign language, especially English. This study shows that Commerce students at Chulalongkorn University who study English as a foreign language were able to increase their rates of reading English after being trained in speed reading by a computer program. Their comprehension and proficiency in English also improved, though their growth was not significantly different from that of the control group. The development of an extensive reading program which incorporates speed reading training emphasising rapid eye movement, fixations and text processing with sense groups and also schematic knowledge of text structure or different genres in English could be useful and practical. This development will not be empirically supported or even possible if no further research is conducted to explore the strategies competent second or foreign speed readers use in text processing and to incorporate those features in a speed reading computer program for ESL or EFL training. Further study on the relationship of speed reading and reading comprehension and also their relevance to foreign language proficiency are necessary and challenging, particularly having in mind the significant of English in the globalisation of world communication.

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The Authors

Dr. Kulaporn Hiranburana is an Assistant Professor at Chulalongkorn University Language Institute. She graduated with a Ph. D (Education) in ESL from the Flinders University of South Australia, Australia. She currently works as Deputy Director for Research. She has been instructing and researching in business communication with an emphasis on discourse analysis and cross-cultural communication. Her previous works include *Cross-cultural Strategies and the Use of English in International Business Correspondence*, *A Survey of Performance Objectives of Teaching English for Communication at Three Levels in Thailand* (co-researcher).

Prakaikaew Opanon-amata is an Assistant Professor at CULI. She was Treasurer of Thai TESOL in 1997, Deputy Director for International Affairs of CULI from 1998-1999 and has been Deputy Director of Academic Testing Center of Chulalongkorn University since 2000. She is interested in teaching Business English.

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Appendix 1

Questions and percentages of the experimental students' response to the questionnaire that followed the training program

Questions	5 (Most)	4	3	2	1
1. I think the program was useful for my study.	29.41	49.02	19.61	0	0
2. I think the program would be useful for future career.	35.29	39.22	21.57	0	0
3. After completing the program, I have improved my reading rate and comprehension.	17.65	52.94	21.57	3.92	0
4. The time allotted to the program was appropriate.	11.77	33.33	39.32	11.77	0
5. Difficulty of speed reading exercises/activities was suitable.	7.84	35.29	45.1	5.9	0
6. The content of the program was interesting.	15.67	35.29	39.22	7.84	0
7. I had problems in training.	13.73	35.29	27.45	17.65	5.9
8. I think the training has helped me to improve my English proficiency.	11.77	52.94	31.37	3.92	0
9. I am interested in continuing my speed reading training.	33.33	31.37	27.45	3.92	0
10. I think all students should have speed reading training.	43.14	39.22	15.67	0	0