

Schema as a Springboard for Professional Reading Competence: Activating Schema via Self-Generated Questioning

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Abstract—To examine the impact of schema theory, the researcher conducted single-group pre-test-post-test experimental research investigating the effect of schema theory as a reading tool to enhance the professional reading competence of engineering students at Bangkok University, Thailand. Reading comprehension tests and a self-reported questionnaire were used as data collection tools to acquire information. The pre- and post-test scores were calculated by descriptive statistics and compared using a dependent t-test measure. It was found that students obtained higher scores for the post-test than for the pre-test at the 0.01 level of significance. That is, schema activated via pre-reading self-generated questions can help students develop their reading competence. Additionally, students stated that activating schema via self-generated questions during a pre-reading activity helped them to understand text better. This study strongly confirmed the previous studies showing that schemata significantly promote reading competence.

Index Terms—EFL, reading comprehension, schema theory, self-generated questioning.

I. INTRODUCTION

Reading with comprehension is one of the primary goals for students who want to achieve academic and professional success. Without comprehension, students are at risk of reading difficulties. Students who struggle with comprehension require effective reading techniques to make their reading tasks easier. One of the most important techniques to help struggling students better understand text is the development of background knowledge prior to reading [1]. To shift the focus to the EFL context regarding the importance of reading comprehension, it should be noted that EFL students need to gain an understanding of the world and of them that allows them to think about what they read. "The students also need to be taught to utilize schema" [2] at an initial stage as an instructional method to assist them in compensating for linguistic limitations in reading comprehension. Regarding the belief that background knowledge can overcome linguistic insufficiencies [3], the current study attempts to investigate the effective role of schema in promoting reading competence among engineering students to achieve professional success.

II. SCHEMA THEORY

A. Overriding Comprehension Difficulty by Activating Schemata

Schematic knowledge has been described as knowledge already stored in memory that functions in the process of interpreting new information [4]. "If a schema is totally lacking, comprehension will suffer, as readers attempt to build schema when they read" [5]. Students with high amounts of schemata comprehend text better than those with lesser amounts [5]. Concisely, "when the teacher enhances the students' prior knowledge (schema), texts become easier to understand" [6]. Studies have shown that a high degree of background knowledge can overcome linguistic insufficiencies [3]. It is understandable that "teaching [the] meaning of specific words and phrases does not assist the struggling students in fixing the problems arising due to a lack of reading comprehension" [7]. One possible way to help students "to overcome...comprehension difficulties is to enrich their background knowledge" [6] by activating the necessary schema without overreliance on linguistic competence. Thus, teachers should provide explicit instruction [8] "in accomplishing the goals of building new background knowledge, as well as activating existing background knowledge" [9]. Teachers should also support students' acquisition of world knowledge "by teaching students how to make text-to-text, text-to-self, and text-to-world connections so that students can more easily comprehend the text they read" [10]. Accordingly, the building of bridges between students' existing knowledge and new knowledge is necessary for text comprehension.

B. Activating Schemata via Self-Generated Questions

Generating questions is a mental process in which students question themselves and predict answers to activate their schemata and link what they already know to what they are currently reading. Individuals acquire schema through different hands-on and minds-on experiences. However, students' vicarious experiences also help them to expand associations and to see connections in self-questioning. An individual's background knowledge personalizes the questions. Training students to ask themselves such questions can help them to think deeply before they begin to read the text. Trained students can reflect on what they have learned and can pose questions about things that puzzle them. Self-questioning functions as a bridge connecting pre-existing knowledge to new information. Answering self-generated questions facilitates learning for trained students.

III. RELATED STUDIES

A. Studies on the Power of Schema

Several researchers have demonstrated that schemata influence the degree of comprehension. [4] examines the effect of background knowledge on reading comprehension and finds that schema is a crucial component in the comprehension process. [10] demonstrate the importance of prior knowledge in comprehending and communicating in virtual reading strategies. Additionally, [11] find that schema affects textual understanding during comprehension, not just during recall. In the EFL context, a study by [12] supports the power of schema theory in reading comprehension by claiming that schema theory can improve students' comprehension in many situations.

B. Studies on the Effectiveness of Self-Questioning

Students enhance their reading comprehension by activating their prior knowledge via training in self-questioning strategies [13], [14] confirms the effectiveness of self-questioning strategies to activate students' background knowledge by showing that when self-questioning strategies are used as a reading approach for ESL or EFL students, students' backgrounds should be considered. [15] shows that self-explanation is an effective method for improving reading comprehension. In the same manner, [16] finds that self-questioning effectively improves reading comprehension and helps students to activate their prior knowledge. Likewise, [17] emphasize the effect of self-questioning on the development of EFL learners' reading comprehension. This study finds that self-questioning is an effective strategy to enhance students' reading comprehension due to three essential components: active, metacognitive, and schema processing. One interesting finding in [18]'s study is that if students lack schema, their reading comprehension may not be improved via the use of self-questioning strategies.

Building on previous studies, the current study aimed to improve the reading competence of engineering students by identifying the role of schema theory in pre-reading self-questioning training. The two specific research questions are 1) To what extent do students improve their reading comprehension after being trained to activate schema via self-generated questioning before reading? 2) Do students express positive attitudes toward the schema activation via self-questioning for reading comprehension?

IV. METHODOLOGY

A. Setting and Participants

This study involved quasi-experimental research using a pre-test and a post-test. This experiment was conducted in an English class during the first semester of the 2012 academic year at Bangkok, Thailand. The participants consisted of 40 first-year engineering students who were selected by a purposive sampling technique. Among these participants, 28 were males, and 12 were females. The age of the participants ranged from 18 to 20 years old. All of them were enrolled in a required three-credit English course.

B. Instrument and Data Analysis

Multiple-choice reading comprehension tests were designed to check reading comprehension. One reading comprehension test was given in the first week as the pre-test, and the other was given as the post-test. The reading comprehension tests consisted of a reading passage adapted from Cambridge English for Engineering [19]. The content of the reading passage related to engineering subject areas. The length of the texts was approximately 400 words. The test consisted of 20 multiple-choice comprehension questions addressing both explicitly stated information and knowledge inferred from the text. The difficulty level was very similar. To ensure the reliability of the reading comprehension test, it was pilot-tested using other first-year engineering students. In addition to the reading comprehension tests, a 10-item attitudinal self-report questionnaire that was administered to the participants to evaluate their views regarding the effect of schema on their reading comprehension competence immediately after the training session. The questionnaire allowed the respondents to express degrees of opinion, such as strongly agree, agree, disagree, or strongly disagree, but it did not allow neutral responses. The survey results captured the participants' overall perceptions of the impact of schema via self-questioning on reading comprehension. The data obtained from this study were subjected to a number of statistical techniques, including basic descriptive statistics, such as the mean, standard deviation, and variance.

C. Procedure

Data collection occurred over a seven-week period, including pre-test and post-test sessions at the research site. The training session to activate schema via self-generated questioning lasted five weeks. The details of the procedures are as follows.

Pre-test session (week 1): the participants were asked to read the text and answer 20 multiple-choice questions corresponding to the text. The content of the reading comprehension pre-test focused on engineering subject areas. In this period, there was no explanation or introduction of schema theory or connection to background knowledge. The time allotted for the test was 30 minutes, with a total score of 20 points. At the end of the time limit, the tests were collected and scored by the teacher.

Training sessions (weeks 2-6): the training began by explaining the role of schemata and self-questioning in reading comprehension. The teacher also explained how to activate and develop a schema through the self-questioning method. The reading passage was presented to the participants. Then, the teacher demonstrated how to generate the questions to activate background knowledge. The participants were also introduced to how to ask themselves questions through in-head question generation. The teacher provided ample assisted practice time for generating questions. The participants were required to independently employ the schematic self-questioning to the reading tasks. The teacher monitored the students and provided cues and feedback. During the five-week training, schema-based self-questioning practices were administered to the participants as one part of the regular class reading activities. Various reading comprehension exercises were assigned to the participants to practice questioning before reading. The participants were trained to connect their background

knowledge and experiences to the generation of questions and possible answers. In this phase of training, the teacher ensured that students' background knowledge in the content areas was extended through the self-questioning method. The self-questioning technique required the students to silently read and ask as well as answer questions related to the reading passage [1]. The students were asked to practice generating questions individually.

Post-test and attitudinal self-report session (week 7): the participants were asked to answer 20 multiple-choice questions with a total score of 20 points. The content of the second reading comprehension post-test was in engineering areas, but it was completely different from the pre-test. The time allotted for the test was 30 minutes. After the post-test, the ten-statement self-reported questionnaires were given to the participants.

V. RESULTS

A. Research Question 1: To What Extent did the Students Improve Their Reading Comprehension after Being Trained to Activate Schema via Self-Generated Questioning before Reading?

The mean of the post-test is higher than that of the pre-test according to the dependent samples t-test, which showed that the participants obtained statistically higher scores ($p < .01$). The result of this experiment presents strong evidence of the schema activation via self-generated questioning strategy, which can have a substantial impact on students' reading comprehension scores.

B. Research Question 2: Do the Students Express Positive Attitudes toward the Training of Activating Schema via Self-Questioning on Reading Comprehension?

To answer question 2, an attitude questionnaire was employed to analyze the data in this study. The results from the questionnaire show that the overall mean score is at a high level (Mean = 4.05, S.D. = .536). This finding shows that students have positive attitudes toward schema theory and activating background knowledge via self-questioning before they read the text. The three highest scores for the participants' opinions were for statements 2, 8, and 6 (Mean = 4.40, 4.28, 4.25), respectively. That is, the participants strongly agreed that the benefits of schema help to increase their reading competence. They also believe that connecting their pre-existing schema with the reading text has three advantages for reading comprehension scores: 1) enriching background knowledge of subject matter before reading makes reading comprehension tests more familiar and comprehensive, 2) honing hands-on and minds-on experiences with self-questioning helps to improve reading comprehension, and 3) having schematic knowledge helps them to understand texts despite having limited vocabulary knowledge. Overall, after being trained to activate schemata through a self-generated questioning method, the majority of the participants stated that their reading competencies were significantly improved.

VI. DISCUSSION

The aim of this study was to prove that activating schema

via self-questioning training can promote engineering students' reading abilities. The findings replicated those of previous studies indicating that schema theory is a crucial instructional method for assisting students in relating new information to existing information [9]-[12]. It is clear from the findings that the engineering students benefited from activating the schema via a self-generated questioning technique. The common thread running through these discussions is that one major step toward improving reading comprehension is to activate prior knowledge of topics [5] by honing existing information through in-head question generating before reading. It is believed that schemata promote students' professional reading competence [12]. This view is supported by [10], who find that prior knowledge provides a schema structure that assists with thinking. The current study also suggests that self-generated questioning is an effective method of evoking existing background knowledge. Self-questioning strategies are used to activate students' schema and allow them to link known information to new information, making reading comprehension easier [13]-[16]. In summary, activating a schema via self-questioning instruction seems to be an effective approach to improve students' text comprehension. Furthermore, the findings indicate that the students maintained a positive attitude toward self-questioning as a schema activation method. Most participants agreed that "Enriching background knowledge of subject matter before reading makes the reading comprehension test more familiar and comprehensive." This view is in accordance with [6], who showed that texts become easier to understand when the teacher enhances the students' prior knowledge. The participants also stated that honing hands-on and minds-on experiences with questioning helps to improve reading comprehension. This finding is similar to [18]'s finding that students who lack schema cannot improve their reading comprehension via self-questioning strategies. Thus, students should store their existing knowledge in their memory so that they have adequate information to compare with new information to make their reading comprehensive. Lastly, the participants stated that having schematic knowledge helps to understand text despite limited vocabulary knowledge. This finding is supported by [3], who found that the general beneficial effect of prior-knowledge activation helps students to overcome reading difficulties due to linguistic insufficiency.

VII. CONCLUSION

This study concludes that the more knowledge of the world a student has, the better comprehension the student will regarding a text. When a reader comprehends a text, background knowledge is typically integrated with the literal meaning of the text. My teaching experience allows me to conclude that we, as EFL teachers, can encourage students to invoke their pre-existing knowledge and to make conceptual guesses by questioning themselves before they read. Self-questioning is considered the easiest way to develop students' personal skill through their stored knowledge. It is also acknowledged that individuals acquire schemata through their own experiences. Students who have less schemata or

inadequate background knowledge require support from teachers to help them develop background knowledge through hands-on and minds-on experiences. This study provides direct evidence that activating schema via self-generated questioning is an important tool for the development of students' reading competence. It is possible that schemata affect students' reading skills and competence. The need to develop students' schemata through visual aids, in-class activities, hands-on activities, or overseas field trips. As a result, students can individually improve their reading competence, which can lead them to successful career paths.

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