The effect of metacognitive strategy training on reading comprehension and metacognitive awareness of English majors in a vocational technology college

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ABSTRACT: Metacognition, first proposed by American psychologist Flavell in the 1970s, has become a much discussed topic in educational psychology ever since [1]. It is simply defined as thinking about thinking. On the other hand, reading is claimed to be a guessing game by Goodman [2]. Therefore, the experiment conducted by the author was to investigate the relationship of metacognitive strategy and reading comprehension and metacognitive knowledge. Questionnaires and reading tests were given to English major students in Zhejiang Industry and Trade Vocational College to accomplish a task providing answers to three questions: One is, *What is the present status of metacognitive knowledge among higher vocational technology college English-major students in reading?* The other is, *What are the effects of metacognitive strategy training on reading competence and metacognitive knowledge?*; and the third is, *How could teachers apply metacognitive strategy in technology education?* All the data collected were analysed using SPSS (Statistical Package for the Social Sciences) V.20.0. After the experiment, findings were produced.

INTRODUCTION

Nowadays, learning strategy research is popular and even practical. But most learning strategies are limited to general strategies, particularly cognitive strategies. The metacognitive field is rarely touched upon by researchers. Recently, metacognition has been found to be effective in second language teaching and learning. Anderson considers that developing metacognitive awareness in learners may also lead to the development of stronger cognitive skills and much deeper processing [3]. In fact, metacognitive strategy is useful in daily life.

The investigation reported here involved 63 students of the 2011 cohort from the Zhejiang Industry and Trade Vocational College. They were sophomores whose major was Business English and were academically comparable. These students were divided into two groups: an experimental group and a control group. Reading strategy training was applied to the two groups. However, metacognitive strategies were applied only to the experimental group, while the control group only had traditional strategy training. The groups were tested by questionnaire and reading comprehension papers before and after the reading strategy training. The collected data were analysed using SPSS (Statistical Package for the Social Sciences) V.20.0, to conduct a statistical analysis.

The purpose of this research is to determine the current situation. On account of word decoding, phrase collocation and sentence identification involved in reading, readers need higher language skills [4]. College students have poor language skills, especially reading. On the other hand, the scores on reading comprehension, to some extent, determine the success of the CET (College English Test). Therefore, the CET pass rate is not satisfactory.

This investigation aimed to strengthen students' reading ability and improve the CET pass rate. Also, it paves the way for applying metacognitive strategy training to other courses and opens up a new area for teaching reform in the Zhejiang Industry and Trade Vocational College. Research on metacognitive strategy training is specific to teaching content, which is significant theoretically and practically important.

EFFECTIVENESS OF THIS PROGRAMME

Researchers have undertaken empirical investigations of the application of metacognitive strategies to SLA (Second Language Acquisition). Previous research has shown that metacognitive strategies play an important role in EFL (English as a Foreign Language) but this research only concerned undergraduates. In contrast, this programme is intended to explore the effects of metacognitive strategy training on reading of higher vocational technology college English-major students. It will also be applied to the field of engineering technology education. The following questions are addressed:

- What is the present status of metacognitive knowledge in reading among higher vocational technology college English-major students?
- What are the effects of metacognitive strategy training on reading competence and metacognitive knowledge?
- How could teachers apply metacognitive strategy in technology education?

Effective reading is a cognitive and metacognitive process. As indicated earlier, on account of word decoding, phrase collocation and sentence identification involved in reading, readers need higher language skills [4]. College students have poor language skills, especially reading. On the other hand, the scores on reading comprehension, to some extent, determine the success of the CET. Therefore, the CET pass rate is not satisfactory. Hence, the aim of this investigation was to strengthen students' reading ability and improve the CET pass rate. Otherwise, it paves the way to apply metacognitive strategy training in technology education and opens up a new area for teaching method reform in the area of technology education.

METHODOLOGY

Participants: the investigation involved 63 students of the 2011 cohort from the Zhejiang Industry and Trade Vocational College. They were sophomores and major in Business English. They were senior middle school students, who had had at least six years learning English before enrolment. From September 2012 until now, they have received the same training in language skills. The 63 students were from two classes, of which 32 students were in Class 1 and 31 students were in Class 2. These two classes were selected for the experiment because of their comparability (Table 1).

Table 1: The comparison of students from Class 1 and Class 2.

	Total number	Female/ Male	Final intensive reading test (Average)	Final extensive reading test (Average)	Teacher (IR)	Teacher (IR)
Class 1	32	31/1	76.12	81.69	Wang	He
Class 2	31	30/1	76.34	81.03	Wang	He

Class 1 was the experimental group and Class 2 was the control group. Both groups took part in regular classes and receive reading training once a week. Metacognitive strategies were systemically applied to the experimental group, while the control group received traditional training.

Variables: the independent variable of this experiment is the teaching method. The experimental group was taught using metacognitive methods. Metacognitive training emphasises metacognitive knowledge and experience. Metacognitive strategy facilitates the self-regulation of students [1]. Detailed metacognitive strategy training methods include: verbal reports, interactive teaching methods and imparting knowledge. On the other hand, the teacher adopted traditional teacher-centred methods for the control group, in which the teacher imparts knowledge and, then, instructs students to do many exercises. Students do not establish plans, choose strategies or determine their own reading, but rather only follow the teacher's instructions.

The dependent variable is the reading capability of the students, as measured by scores on a reading comprehension test and marks for a questionnaire on metacognitive strategy competence. The control variable was to ensure that all the regular teaching tasks and course content were unchanged. The same teacher employed the same teaching materials for these two groups and the experimenter did not communicate with other teachers. Both the experimental group and the control group had extra reading classes once a week. The whole experiment lasted ten weeks and involved two periods totalling 100 minutes a week.

Instruments: two questionnaires for metacognitive strategy competence and two reading comprehension tests were used to check English language proficiency in reading.

Test papers: two test papers used in this study were a pre-test paper and a post-test paper, chosen from exercises in *New College English* and *Reading Comprehension*. These two tests are English proficiency tests, checking the general language ability of participants in reading comprehension. They are composed of two parts: reading comprehension, and skimming and scanning, which are equal in difficulty to CET Four. The reading comprehension part consists of three passages each with five multiple-choice questions. In the skimming and scanning part, there are ten questions, seven items with *Yes* or *No* answers, and three *filling in the blank* items.

Questionnaires: a questionnaire named Questionnaire of L2 Reading Metacognitive Knowledge (QRMK) was prepared to evaluate participants' metacognitive awareness and metacognitive strategy. Taking Oxford's [5] and Wen Quifang's questionnaires [5][6] for reference, the researcher designed the QRMK. There are 30 items falling into the categories of person knowledge (items 1-10), strategy knowledge (11-23) and task knowledge (24-30). The students were allowed to

respond on a 5-point Likert Scale, from 1 (always or almost true for me) to 5 (never or almost never true for me). In the interest of gaining a better comprehension of all the questions and more spontaneous responses, all the questions were presented in Chinese. This questionnaire was used before the pre-test and after the post-test. The QRMK used before the pre-test is named QRMK 1 and after the post-test is QRMK 2. The questionnaires have a reliability coefficient of 0.71.

EXPERIMENTAL PROCEDURE

Pre-experiment: the pre-experiment information was collected. Two factors are important, i.e. the scores from the enrolment examination and that the students in the two groups had received the same English language training. This is verified by the scores from their reading course. A close correlation exists between the English language proficiency and reading comprehension. Therefore, if students in the control and experimental groups were equal in reading comprehension the experiment could proceed. The QRMK 1 and pre-test was used for all 63 students. Finally, it was necessary to analyse all the data. There was no statistical difference between the two groups on metacognitive knowledge and reading comprehension.

During-the-experiment: the students were randomly divided into two classes: Class 1 is defined as the experimental group and Class 2 is defined as the control group. Class 1 was trained in reading comprehension once a week using metacognitive strategy teaching methods. Class 2 was trained in reading comprehension once a week using traditional teaching methods.

The point of this investigation was to reveal the impact on the reading comprehension resulting from different teaching methods. The definition of metacognitive strategy training and traditional training is key. Different teaching methods can cause a dissimilarity in the training [7]. In order to avoid ambiguity with this control variable, three metacognitive strategy training teaching methods were used:

- Verbal reports. As mentioned above, verbal reports, also called the *think-aloud method*, are frequently chosen by L2 researchers in metacognitive training. Getting students to think aloud and use a verbal report is a beneficial metacognitive activity. Irwin states that *When students think aloud or hear others think aloud, their metacognitive awareness of options for responding to text increases. It can also help them to become aware of how much thinking goes into comprehending a text* [8].
  Traditional teaching has psychological implications. For instance, during the class, teachers ask students to read a passage first and then ask questions, which means students follow the direction of the teacher. Thus, students have no power in regulating their learning, but passively accept what the teacher says. In the experimental class, a teacher not only reveals the teaching strategy, but also talks about the thinking process while dealing with the task of reading [9]. Hence, teachers provide an overt, verbal expression of the mental process students are engaged with when they are interacting with the text. Then, the teacher will ask the students to speak about all their thoughts and all that occurs to them while reading. They are required to stop periodically, reflect on how a text is being processed and understood, and the kinds of strategy being employed. In this way, students are able to understand their own reading process clearly and find out problems and the solutions to them. In addition, the metacognitive experience of students is increased, along with their self-monitoring of the process during reading. The metacognitive strategy learning has been improved accordingly.
  For practical teaching, most students are not inclined to use this strategy and so an interactive approach was used in which two students ask each other questions while reading a passage. Examples of questions are: what is the theme of this passage; what strategies do you think can best be applied for reading this passage; how do you guess the meaning of this word. In addition, the teacher would invite some students to speak about their own monitoring of the reading process. After repeated practice, students are able to monitor their reading processes by means of verbal reports.
- Interactive teaching. Palincsar and Brown propose a mode of interactive teaching involving a role reversal between student and teacher [10]. Their research indicates that students' reading is improved that way. Interactive teaching applied to this experiment involves two procedures. First, the teacher demonstrates how to cope with reading by monitoring and instructs students in the use of reading strategies. Second, the students assume the role of teacher to accomplish the teaching task about a certain reading through explanation, questions or other activities. In this way, students get a deeper understanding of the reading process.
- Knowledge impartation. Provided students approach reading with metacognitive knowledge, they will use metacognitive strategy in reading [11]. Dongqi indicates that in the cultivation of self-monitoring, if theoretical knowledge concerning the definition, content and value of self-monitoring are being taught, students' motivation and enthusiasm for learning must be increased [12]. For this experiment, a course of lectures on metacognition was held for the experimental group. Topics included the origin, definition, and elements of metacognition and metacognitive strategy applications and meaning. Students in the control group did not attend this lecture.

Post-experiment: after the ten-week experiment, post-test and QRMK 2 were used to check students' reading ability and metacognitive knowledge. A statistical analysis of the data was carried out using SPSS V.20.0.

RESULTS

Results for metacognitive knowledge: the experiment has furnished the researcher with detailed information about the general status of students' metacognitive knowledge. At the same time, data were processed and analysed for three categories of metacognitive knowledge.

From the result of the pre-test in QRMK (Table 1), it can be seen that the overall level of students' metacognitive knowledge is relatively low and there are distinct differences in students' reading metacognitive knowledge.

Table 2: Results of QRMK for pre-test and post-test.

		Experimental group			Control group		
		Pre-test	Post- test	*t*-value	Pre-test	Post-test	*t*-value
Person Knowledge	1	3.58±0.76	4.13±0.62	-3.5919	3.52±0.77	3.29±0.69	1.423
	2	3.45±0.96	3.94±0.77	-2.4682	3.26±0.93	3.90±0.83	-3.647
	3	3.77±0.76	4.19±0.83	-2.6354	3.68±0.94	3.97±1.02	-1.247
	4	2.29±1.04	2.71±1.16	-2.0336	2.77±1.12	2.71±1.19	0.259
	5	3.29±0.94	3.58±0.92	-1.3289	3.39±1.12	3.61±0.92	-1.097
	6	2.42±0.99	2.65±0.80	-1.4230	2.06±0.68	2.55±0.77	-2.908
	7	3.58±0.99	3.90±0.70	-1.5041	3.58±1.06	3.81±0.83	-1.366
	8	2.65±0.98	3.13±0.99	-2.2311	2.81±1.11	3.26±1.09	-2.830
	9	1.97±0.84	2.52±1.06	-2.2412	2.74±1.15	2.77±0.80	-0.162
	10	2.19±0.79	3.81±0.70	-11.807	2.42±0.96	2.94±1.06	-2.497
Strategy Knowledge	11	2.29±0.86	2.61±0.80	-1.7733	2.42±0.81	2.81±0.98	-2.443
	12	4.00±0.77	3.81±0.95	0.8624	4.00±1.10	3.77±1.23	0.960
	13	3.77±0.99	3.81±0.75	-0.1576	3.94±1.03	2.52±0.68	7.473
	14	2.29±0.97	2.94±0.85	-3.1466	2.39±0.99	1.87±0.62	2.886
	15	2.32±0.65	2.68±0.91	-1.6880	2.42±0.92	2.84±0.90	-2.892
	16	2.06±0.89	2.03±0.95	0.1576	2.19±0.95	1.94±0.63	1.680
	17	2.84±0.97	3.39±0.80	-2.7245	2.84±0.97	3.29±0.82	-2.373
	18	2.81±0.95	3.39±0.88	-2.4663	3.06±1.03	3.32±0.79	-1.489
	19	2.94±0.73	3.19±0.95	-1.1137	3.19±0.87	2.48±0.85	4.213
	20	2.32±0.75	2.61±0.99	-1.8712	2.10±0.87	2.45±0.72	-2.006
	21	2.84±1.24	2.90±1.25	-0.4654	2.94±1.00	3.23±1.20	-1.223
	22	2.42±0.92	2.65±1.05	-1.0968	2.55±0.96	2.84±0.86	-1.510
	23	3.84±1.13	4.19±0.98	-1.7767	4.45±0.85	4.26±0.82	1.293
	24	3.74±0.82	3.87±0.72	-0.8915	3.65±0.84	3.77±0.80	-0.849
	25	3.35±0.80	3.81±0.79	-3.1047	3.52±1.00	3.61±0.92	-0.452
Task Knowledge	26	2.19±0.79	3.84±0.73	-8.7208	2.45±0.85	2.87±0.72	-3.243
	27	2.97±0.91	3.35±1.02	-1.6803	2.97±0.98	3.23±0.96	-1.438
	28	3.26±0.96	3.55±0.85	-2.1871	3.26±1.03	3.42±0.81	-0.961
	29	2.94±0.89	3.35±0.75	-2.4365	2.90±0.70	3.32±0.83	-2.755
	30	3.42±0.92	3.77±0.76	-2.0061	3.35±0.98	3.32±0.91	0.162
	Total	87.81±10.20	100.29±11.87	-5.367	90.81±12.61	93.97±14.29	-1.488

From Table 2, it is inferred that most students have ambiguous ideas about some items and neglect some metacognitive knowledge especially for effectiveness and difficulty. Exploring each category of metacognitive knowledge, there are both strong and weak points in participants' metacognitive knowledge.

Person knowledge: most students misunderstand the importance of the association between the text and previous knowledge, although they have great confidence in their reading. The scores for items 1, 2, 5 and 7 are relatively high, but the ones for items 4, 9 and 10 are low. From this, it can be inferred that they are quite sure about their individual knowledge. All the participants show that they have a purpose in reading and they know what they understand and do not understand. However, students are poor at associating previous knowledge with present tasks. Meanwhile, they do not sense the importance of preparation for the next reading tasks. It implies that students pay more attention to intraindividual knowledge and universal knowledge but neglect interindividual knowledge and feedback.

Strategy knowledge: in the strategy knowledge part, the scores for items 12, 13, 23 are a little higher than the other items. This clearly implies that most students have cognitive strategies but often fail to monitor and regulate their

reading process, because they hold vague ideas about how to use these strategies and, to some extent, have developed some bad reading habits.

Task knowledge: the scores for items 24, 25, 28 and 30 are relatively high, but items 26, 27 and 29 are quite low. It can be concluded that students intend to finish the reading task and try their best to do so, but fail due to their poor self-regulation. The statistics shows that students' task knowledge is insufficient.

Relationship between metacognitive training and metacognitive knowledge: before the metacognitive strategy training, both the experimental group and the control group were tested using QRMK 1. The data collected were analysed by an independent-samples *t*-test. The results are shown in Table 3.

Table 3: Comparison of QRMKs (1 and 2) and reading tests (1 and 2) before metacognitive strategy training ($\bar{x} \pm S$).

	Experimental group	Control group	*t*-value
Questionnaire	87.81 ± 10.20	90.81 ± 12.61	-1.107
Reading test	14.71 ± 3.35	15.03 ± 2.15	-0.436

From Table 3, there is no marked difference between the experimental and control group, which shows that the level of metacognitive knowledge of students in these two groups is the same.

After the metacognitive strategy, the experimental group and control group undertook QRMK 2. Data analysis results are shown in Table 4.

Table 4: Comparison of QRMKs (1 and 2) and reading tests (1 and 2) after metacognitive strategy training ($\bar{x} \pm S$).

	Experimental group	Control group	*t*-value
Questionnaire	100.29 ± 11.87	93.97 ± 14.29	2.260
Reading Test	16.45 ± 1.59	15.51 ± 1.63	2.139

Table 5 is a comparison of the differences between metacognitive knowledge levels of both the experimental and control group before and after the metacognitive strategy training.

Table 5: Comparison of questionnaires and reading tests before and after the metacognitive strategy training ($\bar{x} \pm S$).

	Experimental group			Control group		
	Pre-test	Post-test	*t*-value	Pre-test	Post-test	*t*-value
Questionnaire	87.81 ± 10.20	100.29 ± 11.87	-5.367	90.81 ± 12.61	93.97 ± 14.29	-1.488
Reading Test	14.71 ± 3.35	16.45 ± 1.59	-2.556	15.03 ± 2.15	15.51 ± 1.63	-1.286

Table 4 and Table 5 show that the level of metacongitive knowledge for the experimental group has improved significantly, but for the control group, there is no evidence of change. In other words, the metacognitive strategy training is beneficial to metacognitive knowledge. With the application of metacognitive training, students' metacognitive knowledge has improved.

Relationship between metacognitive training and reading comprehension: the experimental group and control group carried out a reading comprehension test 1 before metacognitive strategy training. Analysis of data in Table 3 shows that the reading proficiency of students in these two different groups is the same.

Then, after metacognitive strategy training, reading comprehension test 2 was used to check students' reading ability. The results of data analysis are shown in Table 4. Table 5 is the comparison of reading comprehension scores between the experimental group and the control group. From Table 4 and Table 5, data analysis indicates that the reading test scores of both the experimental group and control group have improved. However, using *t*-value testing, it is obvious that the scores have improved much more in the experimental group than in the control group.

CONCLUSIONS

After a ten-week experiment, the researcher has concluded:

- First, there is little use made of metacognitive reading strategies by higher vocational college students, especially technology students. Metacognitive strategies are able to assist students plan, monitor and evaluate their reading process; and for English majors, it is even more necessary to be familiar with efficient reading strategies. In fact, students are using non-contributory reading strategies in daily life although they are not aware of it. Therefore, it is important for teachers to integrate effective and feasible reading strategies into the classroom.
- Second, a metacognitive strategy indeed plays a significant role in students' reading. The results of this investigation indicate that metacognitive strategy training, which the participants were exposed to, influenced their use of metacognitive strategy in reading. As was shown, the experimental group outperformed the control group in English proficiency. The experimental group received instruction about how to do reading tasks effectively and efficiently with the direct purpose of improving English reading proficiency.
- Third, the training conducted using the verbal reporting method enables students to perform better and learn more. The key point to the successful application of metacognitive strategy is that when students are taught appropriately, metacognitive strategy helps them become independent learners. The students who know about different learning strategies are more likely to use them when necessary. The results show that direct training on metacognitive strategies has a positive impact on students' reading performance. Moreover, metacognitive strategies employed by participants are used more frequently than before the instruction. The use of the interactive teaching model is an effective way to ensure that students understand the purpose of the study, how to use it and under what condition to use it.

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