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## Application of Metacognitive Strategies in English Study by Chinese Engineering Postgraduates

MA Li<sup>[a],\*</sup>; WANG Yucui<sup>[a]</sup>

<sup>[a]</sup>School of Foreign Languages, Dalian University of Technology, Dalian, China.

\* Corresponding author.

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### Abstract

Metacognition is people's cognition about their own cognitions. Advanced or experienced learners are conscious of monitoring and controlling their own learning process. In academic domains, teachers have been interested in the role of metacognition plays in self-regulated learning. This study aims at understanding the application of metacognitive strategies in English study among Chinese engineering postgraduates, and the relations between the use of metacognitive strategies and students' English competence. The method we used includes questionnaire and interview, with the data collected and analyzed by SPSS 19.0. The results of the survey indicate that among engineering postgraduates investigated, metacognitive strategies are not widely applied. Besides, evidence shows that there is a positive relation between students' metacognitive ability and their English competence.

**Key words:** Metacognition; English study; Engineering postgraduates

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### INTRODUCTION

Learning strategies of language learners have been a research focus among practicing educators, policy-makers, and education researchers since the 1970s when Rubin (1975), Stern (1975), and Naimain et al. (1978) analyzed and summarized the learning strategies of successful language learners. Scholars propose various classifications of strategies, such as O'Malley and Chamot's (1990) metacognitive strategies, cognitive strategies and social/affective strategies, Oxford's (1990) direct and indirect strategies, and Cohen's (1998) language learning and language using strategies. Among them, metacognitive strategies have been believed to have a positive relationship with language learners', especially the experienced ones' English competence.

Surveys about undergraduates' metacognitive learning strategies have been conducted by quite a large number of language instructors and researchers in China such as Yang & Zhang (2002), Ji (2005), and Lu (2002) since early 2000. However, very few researches investigate the application of metacognitive learning strategies by postgraduates. The purpose of this study is to solve two relevant problems: to understand the application of metacognitive strategies in English study among Chinese engineering postgraduates, and the relations between metacognitive strategies application and students' English competence.

### 1. LITERATURE REVIEW

#### 1.1 Metacognition

The term metacognition, coined by John Flavell from Stanford University in the 1970s, is a prominent construct in cognitive and educational psychology. It is "one's knowledge concerning one's own cognitive processes and products or anything related to them" (Flavell, 1976, p.232),

i.e., “cognition about cognition or thinking about one’s own thinking, including both the processes and products” (Hartman, 2002, p.xi). Some other scholars used different words, such as metamentation (Bogdan, 2000) etc. to mean the same thing. However, the definition that metacognition is individuals’ being aware of their learning pattern and being able to manage the pattern is the most widely adopted (Flavell, 1976; Brown, 1987; Schraw, 1994).

Metacognition is interrelated to cognition, in that the two of them both aim at accomplishing the task of cognition, yet metacognition is advanced intellectual activity on the basis of cognition, since it is the reexamination or reprocessing of cognition. Cognition is to fulfill a task, while metacognition helps students fulfill the cognitive task, comprehending the task of cognition and selecting the most effective strategies. According to Gourgey (1998), cognition is to form the learning process and information whereas metacognition is for individuals to observe, develop and evaluate their own processes and apply their knowledge to new situations.

Metacognition is important because it affects people’s acquisition, comprehension, retention and application of what is learned, in addition to affecting learning efficiency, critical thinking, and problem solving. According to Hartman (2002), the significance of metacognition for academic success can be shown in Sternberg’s triarchic theory of intellectual performance, extensive research on metacognition in reading, mathematics, and other areas.

Researchers divide metacognition into two parts. Flavell (1978) holds that there is metacognitive knowledge and metacognitive experiences, while Brown (1987) proposes the awareness and knowledge about the cognitive system and the control and regulation of cognition. Generally, metacognition includes both the dynamic processes of cognizing and the cognition products. There is the knowledge part of metacognition, as well as the practice part, i.e., learners’ awareness of effective cognitive method, process, strategies etc. and their application manipulation of this metacognitive knowledge during the learning practice.

### 1.2 Metacognitive Strategies

Learning strategies and the effectiveness have been the focus of language acquisition researchers since the mid-1970s (Rubin, 1975; Stern, 1975; Oxford, 1990, 1993; Cohen, 1990, 1998; Wenden, 1991). According to O’Malley and Chamot (1990), metacognition strategies can be taken as one of the three categories of learning strategies. They are higher order executive skills that may entail planning for, monitoring, and evaluating the success of a learning activity. Metacognitive strategies may include the processes of:

- a) Selective attention for special aspects of a learning task, as in planning to listen to key words or phrases.
- b) Planning the organization of either written or spoken discourse.
- c) Monitoring or reviewing attention to a

task, monitoring comprehension for information that should be remembered, or monitoring production while it is occurring. Moreover, d) Evaluating or checking comprehension after completion of a receptive language activity, or evaluating language production after it has taken place (O’Malley & Chamot, 1990, p.44).

### 1.3 Metacognitive Strategies and Second Language Acquisition

Wenden (1987) is one of the first researchers that introduced the concept of metacognition into the studies of second language acquisition. She finds that metacognition plays an important role in planning, controlling and evaluating the language learning process. Instructors should help to improve students’ knowledge and awareness of metacognition, developing among the students metacognitive learning strategies. Anderson (2003) also believes that as long as language learners are able to regulate their learning through the use of metacognitive strategies, language acquisition could proceed rapidly.

Researchers studied from different perspectives the relations between metacognitive strategies and second language learning. It is generally believed that metacognition has a positive influence on language acquisition, leading to better achievements and learning outcome (Baker & Brown, 1984; Zimmerman, 1989; Dickinson, 1995). The influence of metacognitive strategies on the listening (Holec, 1987; Nunan, 1997), reading (Garner, 1988; Brown, 1987; Yang, 2002), writing (Devine, Railey, & Boshoff, 1993; Kasper, 1997; Victori, 1999) ability of language learners is also reported through various teaching practices of different levels. The findings of these studies show that successful language learners have better comprehension of metacognitive skills that lead to higher proficiency in processing and storing new information.

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## 2. METHODOLOGY

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### 2.1 Participants

The study involved a sample of 123 first-year postgraduates majoring in engineering at a university of technology in northeastern China. The students were randomly chosen, with 74 (60.2%) male while 49 (39.8%) female, aging between 20-30 years old. Most of the students have been studying English as a foreign language for about 8 years, 3 years at junior middle school and high school respectively, and 2 years at college. 30 (24.4%) of the participants were recommended for admission to be postgraduates without taking exams, while 93 (75.6%) of them took the National Postgraduates Entrance Examination.

### 2.2 Instruments

Based on O’Malley and Chamot’s categorization, the researchers of this study designed a questionnaire to investigate the application of postgraduates’ metacognitive

strategies in English study, referring to Qiufang Wen's questionnaire about Chinese students' English Learning in 1994 and Oxford's in 1990. The questionnaire includes two parts. The first part contains demographic information of the subjects, including gender, major and their scores of National Postgraduates Entrance Examination of English (NPEEE), College English Test (CET) band 4 and 6. The second part consists of 16 items in 3 categories, i.e., planning strategies (6 items), controlling strategies (6 items), and evaluating strategies (4 items). The statements in the questionnaire used Likert scale which ranged from 1 (I never or almost never use this strategy) to 5 (I always or almost always use this strategy). In order to eliminate the possible misunderstandings on survey items due to language barriers, the questionnaire was administered to participants with Chinese version of students' mother tongue.

Construct validity and internal reliability of the questionnaire were checked by the software SPSS 19.0. According to the KMO and Bartlett's test in Table 1, sampling adequacy is .836 and significance is .000, which confirms the feasibility of factor analysis. The internal reliability of the questionnaire is evaluated with the Cronbach's Alpha value, which is .875, as shown in Table 2. It proves that the internal reliability of the questionnaire is high.

**Table 1**  
**KMO and Bartlett's Test**

Kaiser-meyer-olkin measure of sampling adequacy		.836
Bartlett's test of sphericity	Approx. chi-square	689.052
	df	120
	Sig.	.000

**Table 2**  
**Reliability**

Cronbach's alpha	Cronbach's alpha based on standardized items	Items
.875	.877	16

### 3. RESULTS AND DATA ANALYSIS

Of the 123 questionnaires returned, 117 are valid. The result shows that, students' scores of NPEEE range from 45 to 74. 114 of the participants took CET4, and 106 of them took CET 6. The scores range from 425 to 575, 330 to 538 respectively.

#### 3.1 Mean Values of Students' Metacognitive Strategies

Table 3 displays minimum value, maximum value, mean value and the standard deviation of the 16 items in the questionnaire and those of the three categories (item 1 to 6 are about planning strategies, 7-12 controlling strategies, and 13-16 evaluating strategies). The table shows that the postgraduates we investigated do not

have a good command of metacognitive strategies in learning English. The only mean score above 3.5 (70%) is item10 of the controlling strategies, which states, "I am fully aware of the difficulties that I have when studying English." This shows that the postgraduates of engineering we studied are clear with the problems they encounter during learning English. However, the research doesn't give strong proof that they try to improve through applying metacognitive strategies.

As is demonstrated in the table, in contrast to item 10, the mean value of item15, 2.14 (42.8%), is the lowest. Item 15 states that "Comparing to my classmates, I have better capability of studying English". Through interviewing some of the students face to face, the researchers found that the students may not have an objective evaluation of their own ability or performance. One of the reasons is that the first-year postgraduates do not have the idea of their classmates' English competence yet. Another possible reason is that Chinese students are reluctant to admit their superiority to others due to the tradition of being modest.

**Table 3**  
**Descriptive Statistics of the Items**

	Mini V	Max V	Means	Std. deviation
PS 1	1	5	2.92	.863
PS 2	1	4	2.69	.701
PS 3	1	5	2.74	.745
PS 4	1	5	3.37	.934
PS 5	1	5	3.21	.943
PS 6	1	5	2.65	.950
CS 7	1	5	2.85	.867
CS 8	1	5	2.68	.899
CS 9	1	5	2.85	.922
CS 10	2	5	3.65	.884
CS 11	1	5	3.10	.932
CS 12	1	5	3.07	.944
ES 13	1	5	3.03	.809
ES 14	1	5	2.82	.857
ES 15	1	5	2.14	.840
ES 16	1	5	2.80	.863
PS	6	27	17.58	3.480
CS	10	30	18.20	3.371
ES	4	18	10.79	2.561
TOT	20	73	46.57	8.249

#### 3.2 Correlations Between the Variables

Table 4 is the correlation between students' English competence and the use of metacognitive learning strategies. From the table we can see that students' score of NPEEE is correlated with their application of Evaluating Strategies in general. The correlation (correlation value of  $r=.241^*$ ) is significant on the level of .05. The correlations between students' CET6 score and their controlling strategies ( $r=.294^*$ ), estimating strategies ( $r=.220^*$ ) and metacognitive strategies in English learning in general ( $r=.258^*$ ) are significant at  $p<.05$ . According to the table, there is no significant correlation between the score of CET4 and the students' adoption of metacognitive strategies.

In mainland China, CET4 is taken by undergraduates before graduation from college. A good performance in CET4 (e.g., above the score of 425 in 2012) is a prerequisite to CET6, therefore, one's score of CET4 shows the basic level of English proficiency comparing to CET6 and NPEEE. The findings prove that of higher level of English competence, the more metacognitive strategies students use, the higher their scores are. The result is consistent with those of the studies conducted by Yang (2009) and Lam (2009), which shows that there is a positive relationship between the application of metacognitive strategies and English ability.

The Pearson correlations of gender and controlling strategies, estimating strategies and total metacognitive strategies are .232\*, .182\*, and .193\*, significant on the level of .05. According to the statistics, female students use more metacognitive learning strategies than male do, which is on the contrary to the findings of Kummin and Rahman's (2010).

**Table 5**  
**Coefficient**

Model		Unstandardized coefficients		Standardized coefficients	t	Sig.
		B	Std error	Beta		
1	(Constant)	454.784	19.881		22.875	0
	TOT	0.58	0.42	0.132	1.383	0.17

Dependent variable: CET6.

**Table 6**  
**Model Summary**

Model	R	R <sup>2</sup>	Adj R <sup>2</sup>	Std. error of the estimate
1	.258 <sup>a</sup>	0.066	0.056	36.614

Estimated variable: TA.

## CONCLUSION

The findings of the research indicate that engineering postgraduates do not have a good command of metacognitive strategies in learning English. The knowledge of metacognition is insufficient and the use of related strategies to improve their language competence is not frequent. It doesn't show that there are significant

**Table 4**  
**Correlation Between Variables**

		Gender	NPEEE	CET4	CET6
PST	Pearson correlation	-.099	.098	.006	.159
	Sig. (2-tailed)	.288	.366	.948	.132
CST	Pearson correlation	-.232*	.175	.186	.294*
	Sig. (2-tailed)	.012	.106	.052	.005
EST	Pearson correlation	-.182*	.241*	.173	.220*
	Sig. (2-tailed)	.049	.025	.07	.037
TOT	Pearson correlation	-.193*	.187	.132	.258*
	Sig. (2-tailed)	.037	.083	.17	.014

\* Significant on .05 level (2-tailed).

### 3.3 Regression Analysis

To further check the influence of independent variables on the dependent variables, a linear regression analysis was carried out. As is shown in Table 5, the regression coefficient of students' total metacognitive strategies and CET6 scores is .170, which means that there is a positive relation between the independent variable of students' application of metacognitive strategies and their CET6 scores. However, the Adj R<sup>2</sup> in Table 6 is only .056, which suggests that although there is a positive influence of students' use of general metacognitive strategies on their English capability (represented by their CET6 scores), the strategies could only account for 5.6% of their competence. For students' CET6 scores, there do exist other influential factors such as students' endeavor, vocabulary range, the use of other learning strategies and so on. The regression analysis supports the researchers' assumption that frequent use of metacognitive strategies has a positive influence on students' proficiency in English.

relations between metacognitive strategies application and each of the three test scores (CET4, CET6 and NPEEE) we adopt to represent students' English proficiency. However, statistics confirms the researchers' anticipation and other research findings that the learning strategies of metacognition have a positive relation to students' achievements in English, especially on higher levels such as CET6 and NPEEE. Advanced learners who are aware of their own cognitive process of learning according to which they adjust their learning strategies may have better proficiency in English.

On the basis of the research result, some suggestions are proposed to teachers of English and the engineering postgraduates in China. The teachers should instruct students about the knowledge of metacognition in class,

increase their awareness of the mental process during language studies, and help them practice the use of metacognitive strategies. For senior and experienced English learners like engineering postgraduates, they had better develop the ability to plan, control and evaluate their learning process, and be more active in managing their own learning activities so as to gain better achievement in language.

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