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Correlations between Metacognitive Monitoring Strategies and Autonomous Learning of College Learners

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***Abstract*—Previous researchers found that the adoption of meta-cognitive monitoring strategies is a way to improve the autonomous learning competence of students. However, these researches lack background support as to why meta-cognitive monitoring strategies help to improve autonomous learning. Quantitative correlation between them is rarely studied. By conducting questionnaire survey among college students, this paper studies the status of meta-cognitive monitoring and autonomous learning among college students and investigates the correlation between them. Results of data analysis show that the competences of self-monitoring and autonomous learning of the majority college students are poor; correlation between meta-cognitive monitoring strategies and autonomous learning is significant. Students who self-monitor their learning well also perform well in their autonomous learning. These findings offer a quantitative support to related researches, and inspire college teachers to update their teaching approaches and assist students to improve their autonomous learning competence through adopting meta-cognitive monitoring strategies.**

Keywords—Meta-cognitive monitoring strategy; autonomous learning; correlation; questionnaire

I. INTRODUCTION

To cultivate autonomous learning competence of college students is a task of high education teaching innovation. A lot of researches have been done to investigate this topic among which the researches from meta-cognitive strategy perspective are common. However, quantitative studies on relationship between autonomous learning and meta-cognitive monitoring strategies are rare. By employing questionnaire, this study inquires the status of autonomous learning and meta-cognitive monitoring strategies among college students and investigates the relationship between them. This paper firstly reviews the theoretical background of meta-cognitive monitoring strategies and autonomous learning. Secondly it states the questionnaire survey and data collection process in details. Then by employing software of Excel and SPSS, we analyze the data and obtain the results about the status of self-monitoring strategy adoption and autonomous learning of college students and the correlation between them. Next we discuss these results. Finally, we draw the findings of this study and the pedagogical meaning to college teaching.

II. LITERATURE REVIEW

Meta-cognition is self-awareness and self-consciousness of one's cognitive process. Flavell originally proposed the concept of meta-cognition in the year of 1976 as "an active monitoring and continuous adjustment and coordination on cognitive procedures for one specific target or task" [1]. Meta-cognitive monitoring involves planning, monitoring, and evaluating in the cognitive process. In learning, meta-cognitive monitoring refers to a process in which a learner, by reflecting on himself as a conscious object, monitors and adapts the learning activity in order to find proper methods to effectively fulfill the learning tasks. It involves the strategies the learners adopt to make plans before learning, reflect on and monitor learning activities during learning process, make timely adjustment according to the previous reflections and monitoring. Flavell [2] divided this process into four sections: planning, monitoring, checking and evaluating, and remedy. Planning is the first stage when the learner makes plan of his learning activity, predicts learning result, chooses learning strategies, and conceives solutions to possible problems and pre-evaluates its effect; monitoring is a stage of cognitive activity during which a learner responds to the process of cognitive activity, finds its setbacks and adjusts cognitive strategies in time to guarantee the fulfillment of cognitive activity; in the stage of checking the learners check and evaluate the various stages of cognitive activity and assess whether the aim of the cognitive activity has been achieved; remedy refers to the last stage when the learners correct the slips of cognitive activity on the basis of previous checking and evaluating. O'Malley defined the same process as "self-monitoring" which is composed of meta-cognitive strategies learners adopts to "check, verify, correct their comprehension of learning in order to fulfill a learning task."[3] Meta-cognitive monitoring determines the learning effect and whether the academic success is achieved.

The adoption of meta-cognitive monitoring strategies best presents the autonomous learning competence of learners. The earliest conception of learner autonomy was proposed by Henri Holec in the year of 1981. He regarded it as a potential ability which is realized under the circumstances of learning. "Autonomous learning is cultivated and formed as an ability of learners to take charge of their own learning."[4] In the year of

1985, he investigated the detailed elements in autonomous learning. "Autonomous learning consists in establishing learning goal, self-monitoring, and self-evaluating"[5]. Started from the 1980's, autonomous learning researches in the west have been a hot-heated topic, many related books appeared, such as Dickenson, Benson & Voller. Influenced by Flavell, many theories nowadays developed into the depth of cognition and psychology. For example, researches of Sare Sengul, Elahe Fallah & Parisa Abdolrezapour.

Compared with foreign researches, research on autonomous learning in China started later at the 1990's and developed slowly. At the turn of this century, Chinese researches mainly focus on the introduction of western research findings and cultivation of autonomous learning competence of Chinese students. Cheng Xiaotang believed autonomous learning is a cooperative optical activity between learners and teachers achieved through various accesses and strategies. "It is a comprehensive learning schema dominated by learning attitude, learning competence and learning strategies."[6] Jin Yuyue proposed that in autonomous learning, the learners actively monitor the learning stages and regulate these strategies on the basis of learning task and learning competence [7]. In recent years, some empirical studies appeared, like Huang He, Yan Tingli. Among all these researches, 80% are speculative researches; empirical studies occupy 20%. Compared with foreign researches among which half are empirical ones, the percentage in China is off balance. Autonomous learning is a meta-cognitive self- monitoring process. Focusing on this mixture feature of learner autonomy and self-monitoring, this study conducts a quantitative empirical research to investigate correlation between them.

III. METHODOLOGY

A. Subjects

We randomly sampled two hundred college freshmen students from Commercial College in Shandong University of Political Science and Law, among who ninety eight are boy students and one hundred and two are girl students. All subjects were encoded from one to two hundred.

B. Questionnaires

We designed two questionnaires. One is meta-cognitive monitoring questionnaire, the other autonomous learning questionnaire. Meta-cognitive monitoring questionnaire is composed of four sections: planning monitoring, evaluating, and remedying. Autonomous learning questionnaire basing on the questionnaire of O'Malley,[3] consists in learning strategy investigation (making plan; choosing materials, previewing, self-evaluating, and remedying) and mental preparation (recording one's learning, aware of weakness and progress, adjusting attitude, and self-inspiring). Both questionnaires include twenty items. Answers were marked according to Linket Five Scales with one hundred being the full mark.

C. Treatment

We assembled all subjects in a classroom. Two questionnaires were handed out to investigate their autonomous learning competence and self-monitoring strategies adoption. Each is tested for 20 minutes. We collected 200 questionnaires, 195 of which were valid.

35 subjects who obtained marks above 80 and 121 subjects whose marks were lower than 60 were sampled to have autonomous learning test. Questionnaires were handed out to each subject and collected in 20 minutes. We received 156 questionnaires and 151 among which were valid.

IV. RESULTS AND ANALYSIS

Before the start of questionnaire survey, we tested the reliability and validity of the two self-designed questionnaires. Result is shown in TABLE I. Qu1 stands for meta-cognitive monitoring questionnaire; Qu2 stands for autonomous learning questionnaires.

TABLE I. RELIABILITY AND VALIDITY OF TWO QUESTIONNAIRES

	Cronbach Alpha	***Kmo***	***Bartlett's Sig.***
Qu 1	.761*	682*	.000*
Qu 2	.819*	603*	.000*

[a.] Note: * Bartlett's is significant at the 0.001 level (2-tailed)

As is shown in TABLE I, the two Cronbach Alpha values are in the range of 0.5-1, which suggests data collected from the two questionnaires are reliable; Kmo values are both above 0.5 and P values are below 0.001, which indicates that the two questionnaires meet the requirement of validity. TABLE I shows data collected from the two questionnaires are reliable and valid for further analysis.

We input the total marks of all subjects on meta-cognitive monitoring strategy questionnaire into Excel and calculate the mark distribution. We define marks above 80 as "good" marks, marks between 60 and 80 as "average" marks and marks below 60 as "poor" marks. Result is shown in TABLE II.

TABLE II. TOTAL MARKS OF META-COGNITIVE MONITORING STRATEGIES

Good (80-100)		***Average (60-80)***		***Poor (< 60)***	
N	Pct	N	Pct	N	Pct.
35	17.9%	59	30.3%	101	51.9%

TABLE II shows the distribution of total marks at three levels. Numbers of marks increase from "good" level to "poor" level. The least number of thirty five subjects obtained marks above 80; fifty nine of them belonged to the range of "average"; more than half of them were below the qualified level.

In order to investigate detailed mark distribution, we input marks of four constituents into Excel. TABLE III shows how marks of the four constituents distribute. We define marks above 20 as "good" marks, marks in the range from 10 to 20 as "average" marks and marks below 10 as "poor" marks.

TABLE III. MARKS OF CONSTITUENTS OF META-COGNITIVE MONITORING STRATEGIES

	Good (20-25)		*Average (10-20)*		*Poor (< 10)*	
	N	Pct	N	Pct	N	Pct.
Plan	86	44.1%	68	34.9%	41	21.0%
Monitor	20	10.3%	34	17.5%	141	72.3%
Check& Evaluate	38	19.5%	59	30.1%	98	50.1%
Remedy	19	9.7%	23	11.8%	153	78.5%

When data is compared horizontally, it shows only in the row of "plan", numbers decrease from "good" marks to "poor" marks. The greatest percentage gathers in the range of "good" marks and the lowest in the range of "poor" marks. In contrast, in rows of other strategies, the numbers increase from least to most. The fewest marks gathered in "good" range and the most of them in "poor" range. When data is vertically analyzed, numbers in the columns of "good" and "average" decrease while numbers in "poor" increase from top to bottom. In the column of "good" marks, Percentage dropped from 44.1% in planning to 9.7% in remedy. In the column of "poor" marks, Percentage increase from 20.0% in planning to 78.5% in remedy.

In autonomous learning questionnaire test, 151 questionnaires were collected valid. 35 of them obtaining marks above 80 formed group 1; 116 of them getting marks below 60 formed group 2. Result is shown in TABLE IV.

TABLE IV. AUTONOMOUS LEARNING SURVEY OF TWO GROUPS

	Good (80-100)		*Average (60–80)*		*Poor (< 60)*	
	N	Pct	N	Pct	N	Pct.
Group 1	29	82.9%	6	17,1%	0	0%
Group 2	0	0%	20	17.2%	96	82.8%

Data in TABLE IV suggests that for 35 subjects in group 1 who got high marks on meta-cognitive monitoring questionnaire, 29 of them obtained marks higher than 80; the rest 6 got marks in the range of 60-80; none of them got mark blow 60. For subjects group 2 whose meta-cognitive monitoring test marks were below 60, however, 96 of them again got marks lower than 60; 20 of them got marks between 60 and 80; none of them obtained high marks. This indicates that overall mark distribution showed a similar pattern to TABLE II. Among 35 subjects who got marked above 80, 82.9% of them got similar high marks in autonomous learning survey. Likely, among 116 subjects whose marks in meta-cognitive monitoring strategies questionnaire are below 60, 82.8% of them still got low marks in autonomous learning questionnaire.

29 marks above 80 and 96 marks below 60 in both questionnaires were sampled to conduct correlations analysis between these data. We input their total marks in both questionnaires and their separate marks in each strategy into SPSS20.0. Results are shown in TABLE V and TABLE IV.

TABLE V. BIVARIATE CORRELATION COEFFICIENTS BETWEEN AUTONOMOUS LEARNING AND META-COGNITIVE STRATEGIES OF GROUP 1

	Autonomous Learning		
	Pearson	***Sig.***	***N***
plan	.458	.000	29
Monitor	.965	.000	29
Check & Evaluate	.458	.000	29
Remedy	.801	.000	29
Meta-cognitive Monitoring Strategies	.850	.000	29

[b.] Note: * Correlation is significant at the 0.001 level (2-tailed)

TABLE V shows that for subjects whose marks were above 80 in both questionnaires, their meta-cognitive monitoring marks and autonomous learning marks are highly correlated with the value of r being 0.850. In addition, the correlation between autonomous learning and the three strategies of monitoring, checking & evaluating, and remedy are also significant. R value between planning and autonomous learning is 0.458, which is in the range of medium correlation.

TABLE VI. BIVARIATE CORRELATION COEFFICIENTS BETWEEN AUTONOMOUS LEARNING AND META-COGNITIVE STRATEGIES OF GROUP 2

	Autonomous Learning		
	Pearson	***Sig.***	***N***
plan	.516	.000	96
Monitor	.890	.000	96
Check & Evaluate	.853	.000	96
Remedy	.820	.000	96
Meta-cognitive Monitoring Strategies	.865	.000	96

[c.] Note: * Correlation is significant at the 0.001 level (2-tailed)

TABLE IV shows for subjects whose marks are below 60 in both questionnaires, their meta-cognitive monitoring marks and autonomous learning marks are also significantly correlated with value r being 0.865. Correlations between autonomous learning and each section of different strategies are equally significant. Correlation between planning and autonomous learning is 0.516, which is in the range of medium correlation.

V. DISCUSSIONS

Two findings are shown from questionnaires survey and data analysis. First, the majority of college learners does not adopt meta-cognitive monitoring strategies in their learning and are not competent with autonomous learning. Then, meta-cognitive monitoring strategies and the various constituents all have significant correlations with autonomous learning.

In meta-cognitive monitoring strategy questionnaire survey, data in "plan" shows a unique trend to other strategies with the most number of marks are in the range of above 20 and least of them are in the range of below 60. Most subjects got marks above 20 in "plan" means they made plans when they start

learning, but few of them proceeded to the actual stage of monitoring, then the next stage of checking & evaluating and the last stage of remedy. Only a small percentage of 9.7% of them stuck with their plans and preceded their strategies to the final stage. Autonomous learning survey in TABLE IV shows a similar pattern to meta-cognitive monitoring strategy survey in TABLE II. Most subjects getting high marks in meta-cognitive monitoring strategy questionnaire obtained high marks in autonomous learning questionnaire. Likely, most subjects whose marks in meta-cognitive monitoring strategy questionnaire were below 60 got low marks in autonomous learning questionnaire. For subjects who got high marks and the ones who got low marks in both questionnaires, correlation between meta-cognitive monitoring strategies and autonomous learning competence are significant. Compared with the correlation coefficients between autonomous learning competence and other three strategies which are significant, the coefficients between autonomous learning competence and panning strategy are both within the medium range. It means the adoption of planning strategy is not a certain indicator to guarantee whether a learner is a good autonomous learner. A considerable number of subjects planning well when start learning failed to implement their plans to the subsequent stages of meta-cognitive monitoring. They accordingly performed poorly in autonomous learning.

The poor adoption of meta-cognitive strategies and low autonomous learning competence of college students may cause by the traditional “teacher focus” teaching method. To guide college students to adopt meta-cognitive strategies will improve their autonomous learning. For college freshmen who graduated from high school where teachers took charge of their study, most lack the awareness and experiences of self-monitoring learning. It is the job of college teachers to teach and train them how to adopt meta-cognitive monitoring strategies and promote their autonomous learning competence.

College teachers may arrange courses in curriculum to teach students meta-cognitive monitoring strategy knowledge or in their regular teaching practice mix this knowledge in their teaching materials and train students in class in order to cultivate their self-monitoring and autonomous learning competence. Firstly, college teachers should assist students to establish short-term and long-term goals and accordingly make learning plans. In learning practice, they should encourage and help students to implement these plans. Secondly, teachers should remind students of monitoring their learning practice and adjusting their learning strategies. They may advice students to write diaries to record and reflect upon their learning activities during this period or design questionnaires for students to fulfill and then organize in-class discussion to achieve better understanding of themselves and their learning. This helps students to make timely adjustments of choosing proper learning strategies suitable for their individual learning features. Next, after a period of learning, teachers should help students check and evaluate their learning effect. They should maintain the learning strategies if the effect is satisfactory or make remedies if necessary when there found any problems. Finally, active in-class atmosphere help to create positive condition to improve self-monitoring competence and autonomous learning competence. Teachers should enrich their teaching materials, update their teaching methods, create lively in-class interaction, communicate more with students, know their ideas and relieve them of anxiety in learning. In this way, teachers supervise them to shoulder their own responsibility of learning and concentrate on monitoring their learning to become successful autonomous learners.

VI. CONCLUSIONS

In order to investigate the correlation between meta-cognitive monitoring strategies and autonomous learning, we conducted questionnaire survey among college students. Results of data analysis suggest that the majority of college students lack the competence of self-monitoring and autonomous learning. Meta-cognitive monitoring strategy and its various constituents all have significant correlations with autonomous learning. Students who are capable of meta-cognitive monitoring perform well in autonomous learning; students who lack self-monitoring competence are not successful autonomous learners. These findings inspire college teachers to develop the autonomous learning competence of students by cultivating their self-monitoring competence. In particular, teachers are supposed to assist students to set learning goals, make feasible learning plans, and adopt effective meta-cognitive monitoring strategies. When their self-monitoring competence improved, students will be more likely to become successful autonomous learners.

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