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The Impact of Achievement Motivation on Project-Based Autonomous Learning

—— *An Empirical Study on the 2017 NBEPC*

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Abstract

In an era where information and knowledge are updated ever faster, learners' autonomous learning ability becomes more and more important and is even regarded as one of the key factors to pedagogical success and lifelong learning. While project-based learning is widely adopted in higher education worldwide, learners' motivation, especially achievement motivation, in adopting autonomous learning strategies to proceed with such kind of projects seems a field relatively less touched. To test the role of achievement motivation in the adoption of autonomous learning strategies in contests, the authors conducted an experiment to 70 participants in 10 contest teams who were involved in the preliminary contest of 2017 NBEPC. Questionnaire survey method was adopted and the result indicates that: 1) teams with high achievement motivation have better application of autonomous learning strategies in the contest; 2) students using more autonomous learning strategies score higher in the contest results; 3) all three phases of autonomous learning have significant relevance with the contest result; 4) all seven types of autonomous learning strategies show significant relevance with the contest result. Despite the limitation of the study, the result is quite significant in learning practice.

Keywords: achievement motivation, autonomous learning process, autonomous learning strategies, NBEPC, PBL (project-based learning)

1. Introduction

The National Long-term Education Reform and Development Plan for 2010-2020 in China states clearly that one of the criteria for examining the success of education reform is to see how it helps students form effective personal study methods and improve their autonomous learning ability. Meanwhile, the ability of defining problems and acquiring knowledge most wanted by proactive learning becomes one of the core competencies for individuals to cope with the demands proposed by the fast changing world and the developing information technology. Therefore, the focus on learner's autonomous learning ability is both theoretically feasible and practically in need.

There are many factors influencing the process of autonomous learning, among which motivation is the first and the most fundamental influential factor. The link joining motivational factors and autonomous learning has been discussed in several theories of motivation in the field of educational psychology. In most models, the motivation to reach a particular goal is assumed to trigger self-regulated learning behavior (Lens & Vansteenkiste, 2008; Sansone & Smith, 2000; Wigfield, Hoa, & Klauda, 2008). For example, in a series of questionnaire surveys, Noels, Clément, and Pelletier (1999, 2001) found a strong link between students' perceived autonomy (which was measured by questionnaire items assessing how supportive the students' learning environment was of autonomy) and intrinsic and integrative motivation in a number of language learning settings in Canada. Based on the interview data, Ushioda (2006) also argues that learners who take responsibility for their own learning tend to be more intrinsically motivated and are able to regulate their learning processes more effectively.

Another factor influencing autonomous learning activity is the learning environment. Previous research shows learning practice or environments which provide students with opportunities for exercising control over their

learning processes and for autonomy might also be conducive to the development of intrinsic motivation (Cleary & Zimmerman, 2004; Deci & Ryan, 1985; Ushioda, 2006). Project-based learning (PBL) is one such practice. Under the setting of PBL, teachers give a whole print of what the project is and which goals the learners are supposed to achieve, leaving students themselves to seek out materials needed to understand and solve the problem. As PBL encourages students to take an active role in planning and controlling the process of learning, it is believed that it will help bring out positive learning result.

Up till now, a considerable amount of research has been done on motivational factors and their influence on student autonomous learning result. Research on the effects of instructional environments such as PBL on student autonomous learning is less abundant. Research that links motivation for PBL with autonomous learning is particularly lacking. This paper therefore studies the relationship between intrinsic motivation and autonomous learning in fulfilling a specific learning project.

2. Literature Review

2.1 Review of Autonomous Learning Model

Autonomous learning was firstly put forward by Holec (1981) back in 1980s, who defined the term "autonomy" as "the ability to take charge of one's own learning in the process of learning" (p. 8). According to his definition, learners with autonomous learning ability can consciously use and apply the knowledge within and beyond the school education context. Wang and Peverly (1986) describes autonomous learning as to foster learners who are able to stay active and independent in the learning process; who can identify or formulate their goals; who can change goals to suit their own learning needs and interests; and who are able to use learning strategies to monitor their own learning (p. 43). This defines autonomous learning from the perspective of practice process and sees it as a group of strategies to guide students' autonomous learning process. Only with the help of effective autonomous learning strategies can learners learn more efficiently and gain more satisfaction.

Previous experts propose many models of autonomous learning process, in which the most representative one is the autonomous learning model proposed by Zimmerman (2002). Zimmerman divides the autonomous learning process into three phases according to the order of learners' internal psychological process: forethought phase, performance phase and self-reflection phase. The process begins with the forethought phase, where students adopt strategies to analyze their tasks and motivate themselves. Then it comes to the performance phase, where they adopt and use strategies of self-regulation and self-cognition. After these, the autonomous learning process comes to the last phase of self-reflection, where they make self-judgment and give self-reaction. These three phases can be seen as an organically circular learning system as a whole. For each strategy at different phases, there are also more specific sub-strategies as shown in the follow figure.

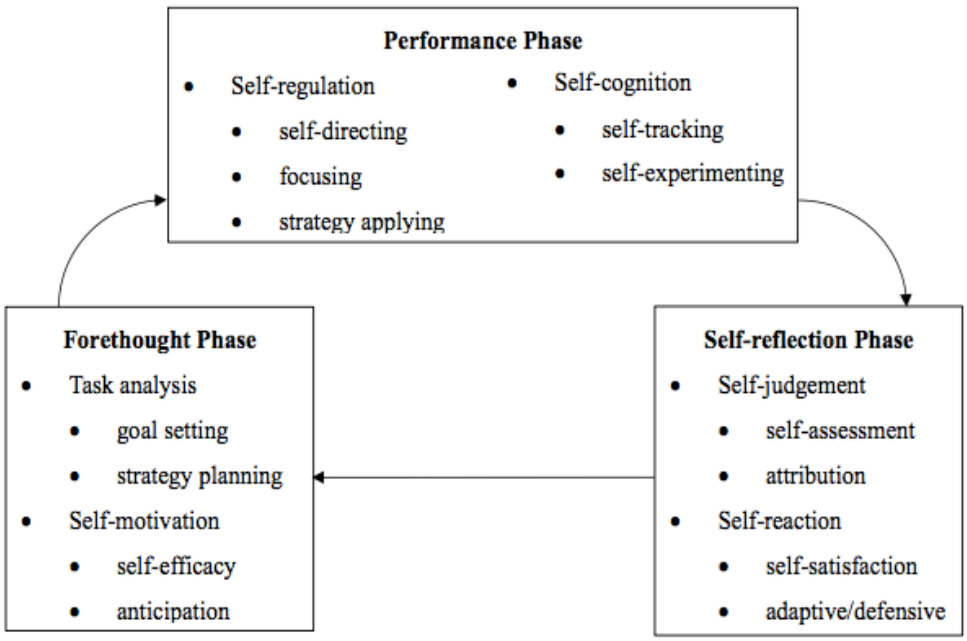

Figure 1. Zimmerman's model of autonomous learning process (Zimmerman, 2002, p. 23)

2.2 Review of Autonomous Learning Strategies

At different phases of a learning process, autonomous learning strategies are adopted and they vary from individual to individual. Pang (2003) divided these strategies into three groups, the cognitive autonomous learning strategy, the meta-cognitive autonomous learning strategy and knowledge application strategy, respectively.

1) Cognitive autonomous learning strategy

Cognitive autonomous learning strategy is the method that learners use to process the knowledge, helping them extract related information efficiently when the knowledge is needed. Its basic functions lie in two aspects. Firstly, it helps learners in effective information processing and sorting, and secondly, it helps learners to store and memorize the knowledge categorized. (Pang, 2003, p. 58) The related cognition involves how individual learners view their role in learning, how learners view tasks, and how learners view the autonomous learning strategies and the applications of them. Specifically, the cognitive autonomous learning strategies include the retelling strategy, the elaborative strategy, and the organizational strategy.

2) Meta-cognitive autonomous learning strategy

Meta-cognitive autonomous learning strategy refers to the method learners apply in their autonomous learning to effectively monitor and control their cognitive processes and results (Pang, 2003, p. 205). Meta-cognitive autonomous learning strategies help control the flow of information, monitor and guide the progress of cognitive processes. The common meta-cognitive autonomous learning strategies in autonomous learning are self-monitoring strategies, self-directing strategies and self-assessing strategies, which are employed by this essay, too.

3) Knowledge application strategy

Besides the above two strategies of autonomous learning from the perspectives of cognition and psychology, knowledge application strategy offers a solid backbone for the successful implementation of the autonomous learning. Strategies that assist students' management of the available resources and environment play an important role in stimulating students' inner motivation. It mainly includes time management strategy, learning environment management strategy, and seeking for support strategy (Pang, 2003, p. 223). Successful use of these strategies can help students adapt to the environment or turn the learning environment to suit their needs and achievement their goals of autonomous learning.

Although the application of these strategies varies due to the changes of time and place, and has different modeling focuses from individual to individual, they are the commonly-accepted and widely-used autonomous learning strategies in the field of autonomous learning.

2.3 Review of Achievement Motivation

Motivation explains why people select a particular activity, how long they are willing to persist in it, and what effort they invest in it (Dörnyei, 2001). Motivation can be intrinsic as well as extrinsic. The concept of achievement motivation lies in the belief that learners have the desire for participating in a certain activity due to the drive of inner cause; therefore, achievement motivation can be defined as an intrinsic motive that calls for the learners' experience and interaction with the elements and environment surrounded (Bandura, 1986, p. 21).

Achievement motivation in autonomous learning refers to the inner drive and inner joy felt by completing a certain activity. The importance of achievement motivation is that it acts as a sustained resource for learners to control, manage and assess themselves during the whole process of autonomous learning. The term "motive" refers to the internal conditions stimulating the individual to fill the deficiency or biological, psychological or social need, and therefore, motivation from inside, achievement motivation, associates internal and external environment and equilibrates these two elements (Nashawati, 2003).

Achievement motivation is a changing element which develops as learners enter into different stages of their life. Also, the level of achievement motivation varies from individual to individual. Individuals with high level of achievement motivation are characterized by unique features including: discrimination, decision-making and personal responsibility, setting goals carefully, and independence, enthusiasm, ambition, perseverance and self-confidence (Hassan, 1998).

2.4 Review of Project-Based Learning (PBL)

The concept of project-based learning (PBL) derived from the concept of "learning by doing" can be dated back to the late 1960s and 1970s, but it has not gained the popularity in the field of teaching and learning until 1990s.

Sarwar (2000) gives an operational definition of PBL from language learning perspective, which claims that PBL is a voluntary cooperative or individual educational process initiated by a teacher to provide learners a context for meaningful use of target language outside the classroom (p. 27). According to his definition, the project may not be related to the curriculum design of school education, but rather it is to provide opportunities for learners to manage and control the process of the study by themselves.

Liu (2002) states that "PBL focuses on the concepts and principles of a research subject, which allows students to investigate and research for problem-solving by participating in a project. With it, students have the opportunities to construct their own knowledge system and apply it in the real world." (p. 11) According to him, PBL is regarded as the process in which students take the full responsibility for their study in participating a project. In order to accomplish the goal of the project, they review literature to find the knowledge needed, carry out the research and analyze the collected data, and finally present their project study in the form of a thesis, a report or an oral presentation.

PBL in institutional education usually shows the characteristics of learning cooperatively, self-reflection, the flexible use of various instruments and the integration of available knowledge (Thomas & Mergendoller, 2000). This has been well illustrated in the following model of PBL in autonomous learning proposed by Wang (2007).

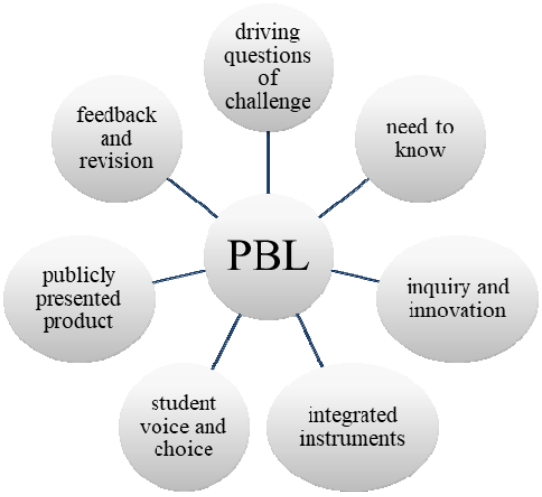

Figure 2. Model of PBL (Wang, 2007, p. 36)

In the above model, the PBL activity starts with "driving questions of challenge", which means that students are given a project and are expected to get involved in the process of a PBL activity. Then, "need to know" is related to the self-motivation of students. At this stage, students should stimulate their inner motivation, build the belief in learning for themselves and develop their sense of self-responsibility. When it comes to the stages of "inquiry and innovation" and "presenting students' voice and choices", autonomous learning strategies are applied. And the "integrated instruments" act as a helper in instrumental way, offering more choices and resources for students to decide how to get information and how to effectively use it. A "publicly presented product" is a solid proof of the whole PBL activity, by which the project result is presented. The stage of "feedback and revision" asks the student to re-think his act during the PBL activity and to do self-assessment and self-improvement.

As for this paper, the authors attempts to integrate Zimmerman's model of autonomous learning process with the model of PBL. In the model of PBL, "driving questions of challenge" and the "need to know" stage are stages concerning the preparation for the project and thus can be related to the "forethought phase" of Zimmerman's model. These two stages of PBL are about how to analyze the assigned task and generate motivation from students themselves. "Driving questions" means that students learn to know what project they should accomplish and what abilities they should acquire to accomplish it. "Need to know" concerns with students' desire and inner motivation to solve the project. The stage of "inquiry and innovation", "integrated instruments" and "students' voice and choice" in PBL model are related to the "performance phase" of Zimmerman's model. In general, these three stages of PBL are about students' performance during the learning process. Students integrate different innovative instruments for their autonomous learning, and choose the strategies that best suit them to solve the problems purposed by the project and achieve their goals. As in Zimmerman's model, the "performance

phase" deals with the application of specific autonomous learning strategies, and can be seen as the process of students' adaptation of different strategies and instruments to achieve their goals and make their voice heard. The "feedback and revision" stage of PBL model is in line with the "self-reflection phase" in Zimmerman's model of autonomous learning process, as they both stress the judgment and reaction by students themselves after the process of autonomous learning. Thus, since both models share the similar structure, Zimmerman's autonomous learning model and its sub-strategies are adaptable to PBL model and thus also to the purpose of this essay.

2.5 Theoretical Framework

As students are at different levels of achievement motivation, their application of types of autonomous learning strategies are supposed to be different. To study student's effectiveness in applying different autonomous learning strategies at different phases of the PBL learning process, the authors have tried to work out a more complete list of strategies by integrating Pang's autonomous learning strategies with those in Zimmerman's autonomous learning model. As they are categorized from different perspectives, it's impossible to group one type of Pang's strategies under a specific phase in Zimmerman's model. For example, sub-strategies falling under cognitive strategies in Pang's classification may be sub-strategies at both forethought or performance stage of Zimmerman's model. However, knowledge application strategies in Pang's classification which refer to the strategies that assist students' management of the available resources and environment are not covered in Zimmerman's model of autonomous learning. Considering that they are very important in the autonomous learning process and result and that they are adopted largely at the performance stage of a project, the authors add them to the sub-strategy category at Performance Phase in Zimmerman's model. Below is the table showing a revised classification of autonomous learning strategies in relation to Zimmerman's model.

Table 1. Revised classification of autonomous learning strategies

At Forethought phase	At Performance phase	At Self-reflection phase
● Task analysis strategies	● Self-regulation strategies	● Self-judgement strategies
- Goal setting strategy	- Self-directing strategy	- Self-assessment strategy
- Strategy planning	- Focusing strategy	- Attribution strategy
● Self-motivation strategies	● Self-cognition strategies	● Self-reaction strategies
- Anticipation strategies	- Self-tracking strategy	- Self-satisfaction strategy
	- Self-experimenting strategy	
	● Management strategies	
	- Time management	
	- Cooperation	
	- Seeking for help	
	- Source collection	

According to the theoretical framework for this research proposed in Figure 3 below, students involved in the preliminary 2017 NBEPC are expected to have different achievement motivation for the task. Those with high achievement motivation are supposed to adopt more effective autonomous learning strategies throughout the whole process of task fulfillment at forethought phase, performance phase and self-reflection phase. As a result, because of the autonomous learning strategies adopted, students with high achievement motivation will achieve more favorable result in the contest. On the contrary, students with low achievement motivation for the task are deemed to adopt fewer autonomous learning strategies at the three different phases of the learning process, thus will achieve less favorable result in the contest.

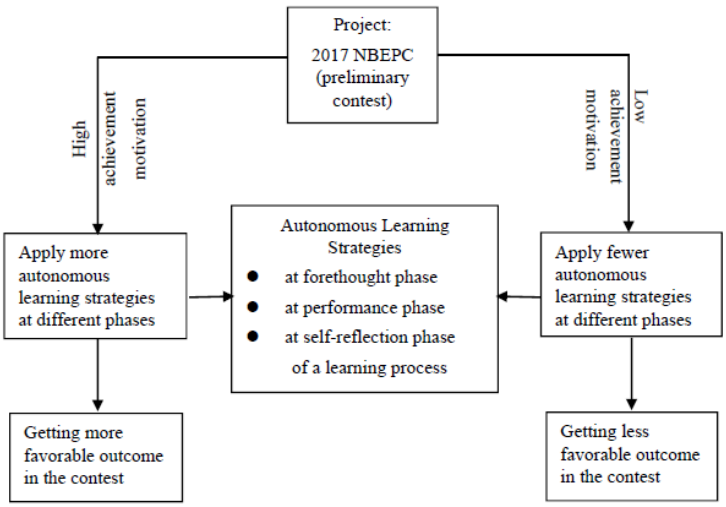

Figure 3. Framework for the present research

3. Research Design

3.1 Project in This Research

The term 'project-based learning' is used here to include a wide range of learning experiences from small 'project options' or exercises, to a 'project orientation' which forms the basis of an entire university education. (Morgan, 1983, p. 66） PBL in this paper is the preliminary contest of the National Business English Practice Contest (NBEPC) in 2017. As a nation-wide contest for Business English majors in China, NBEPC provides a comparably comprehensive platform for students to test and develop their ability of autonomous learning. Held annually with the competition language in English, students are expected to choose a particular company as their subject to collect and analyze its data, find out existing problems, and propose suggestions to better situations for this company. By studying the operation status of a company, it is expected that students can work as a team to find out its dilemmas and propose their innovative ideas for resolution, during which the ability of initiative studying and problem-solving ability by oneself are encouraged and emphasized.

3.2 Research Questions

This study aims to explore the impact of achievement motivation of Business English majors on their autonomous learning strategies for taking the preliminary contest of NBEPC and accordingly, it tries to provide answers to the following research questions:

1) Will students with high achievement motivation make more use of autonomous learning strategies in the contest than those with relatively low achievement motivation?

2) Will students using more autonomous learning strategies score higher in the contest than those adopting fewer autonomous learning strategies?

3) Which phase or phases in the process of autonomous learning are more decisive in generating favorable contest results?

4) Which specific type of autonomous learning strategies are more effective to their contest results?

3.3 Investigation Subjects

The subjects investigated in this experimental study are the third-year students from School of English for International Business (SEIB) in Guangdong University of Foreign Studies (GDUFS). All third-year students in this school are required to group themselves in a team of 5-8 students to attend the preliminary contest of NBEPC and those who outperform the others will be given the opportunity to enter the second round of the contest. The participation in the preliminary is compulsory in SEIB and to make it compulsory, the result of the preliminary test will be entered as a part of their final mark for a required course "Advanced English Reading and Writing 1". The total number of students involved in the preliminary test in 2017 is 385 in 62 teams. All students are invited to the Achievement Motivation questionnaire for the identification of their level of achievement motivation for the contest after they have formed their teams. Later, based on the result of the

achievement motivation questionnaire survey, 5 teams with 35 students of high achievement motivation and 5 teams with 35 students of low achievement motivation are invited in the second questionnaire investigation. The following table illustrates the information of the subjects involved in the part of the autonomous learning effect of this research.

Table 2. Subjects involved in the research of the study

Achievement motivation	Teams	Score in achievement motivation	Number of male (M)/ female (F) subjects
High	Team 1	75.15	5 F
	Team 2	74.86	4F+1M
	Team 3	77.14	4F+1M
	Team 4	76.43	5F
	Team 5	75.57	3M+2F
Low	Team 1	43	5F
	Team 2	36.29	5F
	Team 3	41.71	3F+2M
	Team 4	33.14	4F+1M
	Team5	35.29	3F+2M

3.4 Investigation Tools

1) Questionnaire for identifying achievement motivation

In this study, an adapted Achievement Motivation Scale (AMS) is used to investigate into the degree of students' achievement motivation for the 2017 NBEPC. The AMS was originally made by Gjesme. T. and Nygard. R in 1970, and the Chinese version was translated by Ye Renmin and Hegtvet, K.A. in 1988. (Cited in Tang & Lu, 2013) The Chinese version is lately revised in 1992 after being adopted in researches in college and high school students. The internal consistency reliability of the questionnaire is 0.83, thus it has a relatively high level of referential scale. Questions of odd numbers are designed to study the motivation of achieve success, marked as MS, while questions of even numbers are to study the fear of failure, marked as MF. Each question has four choices differentiated by the degree of agreement, rating from 1 to 4. The final score is reached by the difference between MS and MF, expressed as MA=MS-MF. When MA is bigger than zero, the outcome states a high level of achievement motivation and when it is smaller than zero, a low level of achievement motivation.

For the research purpose of this essay, modifications are made to the questionnaire before it is used in the present study. Firstly, the number of the questions reduces from 30 to 24. Six questions are excluded from the questionnaire for this research as they are regarded as irrelevant to the present research. Secondly, the linguistic expressions of some questions are also adapted to make the meaning of the questions clearer. For example, ambiguous expressions of time and frequency are changed into more specific ways of expression, e.g.: expressions like "sometimes", "at times" are replaced by more specific expressions such as "before the contest", "after the contest" and so on.

2) Questionnaire for autonomous learning strategies

The questionnaire for autonomous learning strategies used in this essay is adapted from the questionnaire of Lin and Jiang (2004). Lin and Jiang originally designed the questionnaire of the autonomous learning strategies with the aim to study the relationship between the learning motivation and academic achievement of college nursing students.

Lin and Jiang's questionnaire involves the impact of various elements of learning motivation on the academic scores of college nursing students. Specifically, the independent variables in their study are elements of learning motivation, such as the belief in self-control, the anxiety, and the intrinsic and extrinsic-orientated motivation, and the dependent variables are the scores of three courses of these students. The original questionnaire contains 31 questions, and was made largely based on Zimmerman's autonomous learning theory with the inclusion of management strategies, which consists with the theory employed in this essay and in line with the revised

classification of autonomous learning strategies proposed in Table 1 above. The retest reliability of his questionnaire is 0.73, and the homogeneity reliability is 0.85, having a relatively high reliability for experimental use.

Modifications are needed because Lin and Jiang used the questionnaire in the field of nursing teaching, which differs from the research field of this essay. To better suit the need of this essay in language teaching field, the modifications are made by the authors of this essay. First the modification is made by changing the wording related to the courses of nursing to expressions linked with Business English contest. The second modification lies in the sequential order of each question. The original questionnaire ranks questions based on the field of courses, which means it attributes questions into the categories of different courses to study the factors of learning motivation on different courses. For this essay, the questions are firstly divided based on the Zimmerman's model of three phases of autonomous learning, and each part have 7 questions, and then these 7 questions of each phase are ranked in time order to study how students' achievement motivation is involved before, during and after the preliminary 2017 NBEPC.

Several questions and response modes can be employed, such as multiple choice questions, rank order, rating scales, open-ended questions and so on (Cohen, 2011). For the present study, the rating scale is adopted. Grades are given to each choice, when grade 5 to 1 are given to item 1 to 5, and the score of the questionnaire is the sum of all the independent items.

These two questionnaires are made in Chinese to decrease the possibility of misunderstanding in language with a view to avoiding deviation in research result.

3) The marking guideline of the preliminary contest

The competition result is measured by the score of the preliminary 2017 NBEPC. The marking guideline of the NBEPC consist of three parts: written material, video clip and communication skills respectively, each taking different proportion on the contest score. The standard of written material takes a 40% of the score of the NBEPC and is made up of the executive summary (10%) and the written report (30%) handed in by the participants. The standard of video clip takes a 30% of the contest score, and consists of the perspective of the project overview (5%), business analysis (20%) and the project findings and solutions (5%). The part of communication skills, which takes 30% of the contest score, is to judge the participants in terms of their English pronunciation, grammar and language use (15%) and their persuasiveness and appearance (15%).

3.5 Procedures of the Research

A pilot study has been conducted to 25 students who have participated in the 2016 NBEPC to test the reliability of these questionnaires. As a result, the retest reliability of AMS and the autonomous learning strategies is 0.75 and 0.73 respectively, and the homogeneity reliability is 0.79 and 0.81 respectively, showing that the adapted questionnaires of this essay are applicable and have their reliability for the purpose of this experimental study respectively.

In October 2017, Questionnaire of AMS was first sent out to 385 students in 62 contest teams to study the level of achievement motivation after they have all finished their preliminary round of the contest. 70 students who have much higher or lower achievement results are selected for the investigation of the relationship between achievement motivation and autonomous learning effect. 35 students in 5 groups with high achievement motivation are assigned as Group 1 and another 35 students in another 5 groups with low achievement motivation are assigned as Group 2. All 70 subjects were involved in the autonomous learning strategy questionnaire and the mean score of each group was entered as the dependable variant score for the present research. The questionnaire-reclaiming efficiency is 100%. With this relatively high level of questionnaire-reclaiming efficiency, the result of the data collection can be regarded as valid and further analysis and investigation can be proceeded.

4. Results and Discussions

4.1 Achievement Motivation and Autonomous Learning Strategies

We hypothesize that students with high achievement motivation for NBEPC will apply more autonomous learning strategies while those with low achievement motivation will adopt fewer autonomous learning strategies. Mann Whitney's u-test is employed for the analysis.

Table 3. Result of the Mann Whitney's u-test of achievement motivation and the adoption of autonomous learning strategies

Group	Achievement motivation	N	Mean Rank	Rank Sum	Mann-Whitney U	Sig (2-tailed)
1	High	5	5.43	35	10.000	.023*
2	Low	5	10.3	72		

* Significance at 0.05 level.

Table 3 shows that there is a significant difference between groups with high achievement motivation and those with low achievement motivation in their application of autonomous learning strategies, significant at 0.05 level ($p= 0.023 < 0.05$). The hypothesis is verified that teams with high achievement motivation make significantly more use of autonomous learning strategies than those with low achievement motivation.

This result lends great support to the findings of many previous studies which emphasize the importance of triggering students' intrinsic achievement motivation and its positive relationship with the autonomous learning strategies. (Landine & Stewart, 1998; Lens & Vansteenkiste, 2008; Dickinson, 1995b; Kormos & Csizé, 2014; Sansone & Smith, 2000; Stroet et al., 2013; Wigfield, Hoa, & Klauda, 2008; Noels, Clément, & Pelletier, 1999, 2001; Ushioda, 2006). As one of the most deciding inner drives, achievement motivation acts as the fundamental factor for driving students' lasting autonomous learning. (Dörynei & Otto, 1998) Dickenson (1995a) claims that success in autonomous learning occurs at the time when the leaner controls more aspects of his study and is sustainably motivated by his longing desire of learning for himself and self-improvement (p. 69). Being the center of teaching and learning, students themselves should first generate the willingness and desire of learning for themselves. Only in this way can they possess sustained motive for their study and learn more autonomously.

4.2 Autonomous learning Strategies and Contest Result

We also hypothesize that students adopting more autonomous learning strategies will achieve more favorable contest results for NEPBC while those adopting fewer autonomous learning strategies will result in less favorable contest results. Independent T-test method is adopted to process the data.

Table 4. Result of Independent T-test of the impact of autonomous learning strategies on the team score of the contest

Group	Achievement motivation	Team No.	Mean	Std. deviation	T	P
1	High	5	72.58	5.89	1.032	.014*
2	Low	5	40.39	4.46		

* Significance at 0.05 level.

Table 4 shows the effect of the application of autonomous learning strategies on the contest result. As $p = 0.014 < 0.05$, it can be concluded that there exists significant difference between the different application of autonomous learning strategies and the team score of the contest. In other words, teams adopting more autonomous learning strategies getting significantly higher contest score than those applying fewer autonomous learning strategies, which verifies the second hypothesis.

This result accords with the theory of Pang (2003) which emphasizes the effectiveness of autonomous learning strategies in the autonomous learning process. Little (1996) also states that greater learner autonomy can correlate with more successful, sustained learning result (p. 5). It also verifies the findings of many empirical studies in the past that the application of autonomous learning strategies can help achievement better learning result. (Scharle & Szabo, 2002; Chang, 2007) This indicates that students should cultivate awareness of developing autonomous learning strategies in the learning process, decide what ~~the~~ effective autonomous learning strategies are beneficial to their study and how to apply these strategies for better autonomous learning effect. As Zimmerman proposes that students with experienced knowledge of autonomous learning are at the high level of self-regulation and they have intensive self-motivation and are highly responsible for the process of goal setting, strategy planning and implementing, and self-assessing, it is thus very important for students to gain the overall recognition of effective autonomous learning strategies and understand relevant approaches to these strategies.

4.3 Autonomous Learning Phases and Contest Result

To find out whether there exists certain autonomous learning phase that is more decisive in generating favorable contest result, the score of each phase in autonomous learning process of each team is calculated first, and then by using the Pearson correlation analysis, the correlation coefficient between each phase and the contest result is to be unveiled.

Table 5. Result of Pearson Correlation between autonomous learning phases and the contest result

		Forethought phase	**Performance phase**	**Self-reflection phase**
Contest score	Pearson correlation	.721**	.883**	.757**
	Sig. (2-tailed)	.000	.000	.000

** Significance at 0.01 level.

Table 5 shows the correlation of three autonomous learning phases and the contest result. The Pearson correlation coefficient values of each autonomous learning phase are .721, .883 and .757 respectively, which indicates that all three phases in the autonomous learning process are significantly related to the contest result at 0.01 significant level.

There are few studies in the previous literature that endeavored to test the link between autonomous learning phases and learning result. Our research has shed a new insight in the field of autonomous learning by showing that all phases in an autonomous learning process exert their influence on autonomous learning behavior. The result hints us that the process of students' autonomous learning should be seen an organic whole, and each phase of the process values, which confirms what Wang and Peverly (1986) have stated that autonomous learning is a process which helps foster learners who have the capacity for being active and independent in the learning process; who can identify goals; who formulate their goals; who can change goals to suit their own learning needs and interests; and who are able to use learning strategies to monitor their own learning. It is by combining all these abilities together in the learning process that learners can achieve favorable learning result.

4.4 Specific Type of Autonomous Learning Strategies and Contest Result

The fourth research question aims to study whether there exists any specific type of autonomous learning strategies which are significantly effective to the teams' contest result. The scores of each team's different autonomous learning strategy are calculated first. Then Pearson correlation analysis is employed to test the effectiveness of each type of autonomous learning strategy.

Table 6. Result of Pearson Correlation between specific types of autonomous learning strategy and the contest result

	Task analysis strategies	Self-motivation strategies	Self-regulation strategies	Self-cognition strategies	Manage-ment strategies	Self-judgement strategies	Self-reaction strategies
Pearson correlation	.798**	.813**	.793**	.805**	.827**	.804**	.785**
Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000

** Significance at 0.01 level.

Table 6 shows the correlation of seven types of autonomous learning strategy and the contest result. As the Pearson correlation coefficient of each type of autonomous learning strategy is .798, .813, .793, .805, .827, .804, and .785 respectively with significance all at 0.01 level, we can safely conclude that there exists significant relevance among all type of autonomous learning strategies and the contest result and that no single type of autonomous strategies is significantly more decisive to generate the contest result.

This result is not supportive to the result of previous studies in which some strategies are valued more important in driving higher autonomy support and better learning result than the others. (Stefanou et al., 2017; Vandiver &

Walsh, 2010) However, it highlights the importance of focusing on all types of autonomous learning strategies in relation to good learning result. The seven types of autonomous learning strategies are adopted at different phases of the PBL learning process. As has been found in 4.3, all phases have been proved to be important to the effectiveness of strategies applied, the high relevance of different types of strategies with the contest result is logically accepted. We as learners must learn that no good result is reached by one single type of strategies and learning is a process where every phase and every strategy counts in getting the most favorable result.

5. Conclusion

5.1 Major Findings of the Research

The research has come to the following findings: 1) achievement motivation plays a decisive role in the application of autonomous learning strategies; 2) the more autonomous learning strategies adopted, the better learning result achieved; 3) all three phases of the PBL learning process have significantly positive correlations with the contest result; 4) all types of autonomous learning strategies should work effectively together in order to get better contest result.

5.2 Limitations of the Research

As with any other studies, the present study has its own limitations. These limitations are discussed and recommendations for further research are offered.

First, the conclusions of the present study were drawn on the completing of one single contest. However, project purpose, project nature and the way it is completed are also considered important factors in applying strategies and generating results. As these factors may affect learners' choice of autonomous learning strategies and their final performance in the task, future studies are expected to study autonomous learning strategies in more projects with different purposes and features.

Secondly, the subjects involved in the present research are only 10 teams with 70 students, so the size of the subjects is not large enough for the generalization of the research result. Also, this research has deliberately chosen the teams with extremely high or low achievement motivation, which may make the result not so reliable by ignoring those on relatively high or low end. Therefore, it is recommended that more subjects with a larger range of high or low motivation are involved so as to get a more precise picture of project based autonomous learning.

Finally, the contest scores for different teams are given by different markers, the inconsistency between different markers may be high which will influence the findings of the research to a certain degree. Future studies are suggested that inter-consistency between different markers and internal consistency on the same marker be tested so that the effectiveness of findings can be guaranteed.

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