



An Innovative Investigation into English Autonomous Learning in Flipped and Traditional Classrooms Based on Multimedia Technology

Yu Liu(✉)

Institute of Linguistics, Shanghai International Studies University, Shanghai, China
liuyu_26@163.com

Abstract. The application of multimedia technology in the teaching field has accelerated the development of teaching modernization. Given the increased use of ‘flipped classrooms’ based on multimedia technology, it is worth asking how the autonomous learning of university non-English majors can be improved. This paper investigates the differences between traditional and ‘flipped’ classroom teaching methods. Specifically, it investigates how the effects of the flipped approach on learning motivation, content, method, process, results and environment may in turn influence students’ autonomous learning abilities. A questionnaire was conducted with 200 participants from a university in China. All results were analysed by SPSS20.0 software. The analysis showed a strong correlation between independent and the flipped classroom. It is concluded that this teaching method can effectively improve the ability of non-English majors in university to learn English autonomously. We suggest that teachers should stimulate students’ learning motivation, design reasonable learning content, use diversified learning methods, monitor the learning process and learning results of students, improve their learning environment and, finally, improve their independent learning ability.

Keywords: Flipped Classroom · Autonomous Learning Ability · University · Non-English Major Students

1 Introduction

The rise of the “flipped” classroom based on multimedia technology has been accompanied by a sharp increase in autonomous learning ability issues among students. The flipped classroom method is a type of blended learning where students are introduced to content at home and practice working through it at school, compared with a traditional teaching mode, where students encounter the content at school and are set homework. Under this change, students themselves become the main body of classroom teaching. The flipped classroom reverses the teaching process of the traditional classroom, adjusting from the traditional “teaching first before learning” to the “learning before teaching”, supported by information technology Song and Yang (2018). Students can not only flexibly grasp concepts of learning time and content, but can also remember better and

learn repeatedly. In addition, the flipped method can cultivate students' enthusiasm and initiative in learning, and enhance their learning interaction and communication.

This correlation has received significant academic attention: some investigations have already been conducted into the method, strategy, and process of autonomous English learning (Guo and He 2015; Lv 2016; Song and Yang 2018; Zhou and Xu 2014). These studies have consistently found that the flipped classroom teaching mode can effectively improve the ability to learn English autonomously. Despite this, the differences between flipped and traditional classroom approaches for students' self-regulated English learning have yet to be researched robustly.

In 2020, China's Ministry of Education published the University English Teaching Guide. It proposed that the goal of college English teaching is to cultivate students' English application ability, to enhance their cross-cultural communication awareness and communication ability, to develop their English learning autonomous, to improve their comprehensive cultural quality, and to enhance their humanistic spirit and speculative ability. Therefore, it is important to study how flipped classrooms may influence non-English majors in China's universities.

This paper investigates the difference between flipped and traditional classrooms based on multimedia technology and their effects on students' independent learning ability, especially on learning motivation, content, methods, process, results and environment. Its aim is to verify whether the flipped classroom teaching mode can effectively improve English independent learning ability at a university level, and to put forward some reasonable and effective suggestions accordingly.

2 Literature Review

2.1 Autonomous Learning Ability

Research into independent learning ability began in international educational psychology circles in the 1950s.

In the 1980s, Holec took the lead in introducing the study of independent learning theory into the field of foreign language teaching, mainly focusing on defining concepts and practical aspects. Holec (1981) believed that from a learners' perspective, autonomous learning means access to defined learning goals, content, materials, methods, time, place, schedule and evaluation.

Some scholars have proposed teaching strategies that promote the autonomy of foreign language learners. Bound (1988) divides this approach into three parts. First is an individual-centered strategy centered on the specific needs of learners. Second is a group-focused strategy. The third is a project-centered teaching approach.

Other scholars have discussed the process of cultivating self-directed learning. Little (1991) believes that independent learning requires first establishing a positive and correct learning attitude and motivation to learn, then nurturing a certain learning ability, and finally forming an independent learning style. Pintrich et al. (2000) defines autonomous learning as an active, constructive learning process in which students first identify learning goals for themselves, then monitor, regulate, and control their cognitive, motivational and other behaviours, guided and constrained by a target.

China's research on independent study began in the 1990s. Experts in the education field, such as He (2003), Pang (2001, 2003) and Xu (2004, 2020) have all made preliminary theoretical explorations.

He (2003) believes that college students' English independent learning ability should cover five aspects: (a) understanding the objectives and requirements of the teacher; (b) establishing learning objectives and formulating learning plans; (c) effective use of learning strategies; (d) monitoring the use of learning strategies; and (e) monitoring and evaluating the English learning process.

Pang (2001, 2003) advocates the definition of autonomous learning from both horizontal and vertical perspectives. A horizontal perspective refers to the comprehensive definition of autonomous learning from all aspects or dimensions of learning. If the students themselves can consciously make a choice and control over all aspects of learning, their learning is fully independent. From a vertical perspective, the essence of independent learning is considered from all aspects or dimensions of learning.

Xu (2020) proposed that the independent learning ability of Chinese students studying English covers four aspects, which are: self-planning; self-exploration and effective learning strategy; self-emotion management; and multiple interactive learning. The first two, relating to self-planning and learning strategy, are the core abilities usually emphasized by autonomous learning research. The others, self-emotion management ability and multiple interactive learning ability, can be considered the newly identified characteristics of the autonomic learning in the new era.

2.2 Flipped Classrooms

The oldest research on flipped classrooms or inverted classrooms was conducted in the US. First proposed the flipped classroom education model. Bergman and Sams jointly published the book *Flip Your Classroom: Always Benefit Every Student in the Classroom*, which divided it into two stages: the traditional flipped classroom and the sophisticated-learning flipped class.

It can be seen that the research into Western flipped classrooms mainly focus on the application of the flipped classroom method to teaching practice. It also compares it with traditional teaching modes, and explores the effects of combining the flipped classroom techniques with other teaching methods or technologies. In some parts of the world, where flipped classroom teaching experiments have been carried out for several years, the method is relatively mature and has formed some fixed models.

In China, research into the flipped classroom method and its practice started comparatively late. Zhang et al. (2012) proposed that the flipped classroom can also be called the "inverted" classroom. In other words, through the inverted arrangement of knowledge transfer and knowledge internalization, the role of teachers and students in the traditional teaching was changed and the use of classroom time was re-planned.

Ma (2013) developed this concept further with the successful application of the flipped classroom teaching model to information technology classes at university. Based on this model, Ma built an effective learning support system, adopted certain process control means, and organized the teaching practice.

Jin (2015) analyses the connotations of the flipped classroom, clarifying the concept, investigating the internal reasons for its success, and elaborating on the theory, methods and results of a local innovation: the micro-course flipped classroom teaching method.

Hou (2021) proposes that the biggest difference between a flipped classroom teaching mode and the original teaching method is the support of information technology, particularly mobile equipment. Using technology, students can now gain knowledge in advance, interact with teachers and other students, deepen their knowledge through further processing and better grasp concepts.

In general, the literature in China on the flipped classroom is more introductory than research-based, includes more theoretical analysis than practical application, and mostly focuses on the discussion of classroom teaching in primary and secondary schools. It tends to refer less to the application of the method in university teaching and research.

2.3 Autonomous Learning in Flipped Classroom Based on Multimedia Technology

Many recent studies have focused on the problem of autonomous learning under the flipped classroom method in China.

Zhou and Xu (2014) has constructed three independent learning modes: (a) teacher-guided learning; (b) group cooperative learning; and (c) parent participation in learning. It is proposed that successful flipped classroom teaching depends on students' strong independent learning ability and information literacy. We should therefore pay attention, Zhou argues, to the cultivation of students' independent learning ability in the process of implementing flipped approaches.

Guo and He (2015) proposes that the flipped classroom subverts the traditional classroom teaching mode, breaking the disadvantages of the single traditional classroom teaching subject and presenting the subject in a more diversified form. In the flipped classroom, the main parties to the teaching process are not only teachers and students, but also parents, schools, societies and countries. The flipped classroom becomes a multi-polar subject classroom.

Lv (2016) concludes that it is conducive to greatly improve the level of English comprehension and independent learning ability. College students' attitudes to English learning can help lay the foundation for the realization of intelligent learning, based on university-level English independent learning mode construction and the effectiveness of the in-depth study on flipped classrooms.

Yang et al. (2016) discusses the influence of flipped classrooms on college students' independent English learning ability through empirical research. He finds that the flipped classroom method can indeed promote the development and improvement of students' independent learning ability, especially in terms of learning methods, results and environment.

Li (2017) has investigated the current situation of college students participating in independent learning. Li analysed and demonstrated the problems and deficiencies in college students in the process of independent learning in flipped classrooms. Based on the Budui field-habitual theory, he puts forward solutions for cultivating students' awareness of independent learning.

Song and Yang (2018) proposes that knowledge teaching and knowledge internalization are the two main aspects of traditional teaching. The flipped classroom reverses the order of these links, aiming to optimize the way students can obtain knowledge, explains Song. The flipped classroom consists of at least four key elements. First, students should be able to learn independently. Second, classroom teaching should be more effective. Third, the teaching resources need to be fully prepared. Fourth, there should be a network teaching platform and a student-learning terminal support system.

Across these studies, there is consistent evidence that the flipped classroom method does indeed have some influence on students' independent learning ability. Nonetheless, there is a lack of robust research on the investigation on the difference between flipped and traditional classrooms for university-level, non-English-major students in China.

3 Research Design

3.1 Research Questions

This study aims to investigate how the flipped classroom teaching mode differs from traditional types of non-English autonomous learning for professional students through questionnaires. It also analyses the influence of the flipped classroom teaching mode on students' independent learning ability, and finally gives some suggestions.

- (1) What is the difference between flipped and traditional classroom teaching modes for the English learn autonomy of non-English-major students?
- (2) What is the influence of the flipped classroom teaching mode on the independent learning ability of non-English major students?
- (3) How is it possible to improve the self-directed learning of non-English majors under the flipped classroom teaching method?

3.2 Participants and Context

This study includes 100 students using the traditional classroom mode for non-English majors and 100 students in an applied undergraduate university in China, all of whom have studied college English courses for one year.

3.3 Research Methodology

In this study, the questionnaire was designed according to the university English independent learning scale and investigated for both traditional and flipped styles of classes. It compares the differences between students' independent learning ability under the two teaching modes and analyses how the flipped classroom mode affects students' independent learning ability. A total of 200 questionnaires were issued, and 200 questionnaires were recovered, with a recovery rate of 100%.

3.4 Research Instruments

3.4.1 Questionnaire

According to the independent learning scale proposed by Pang (2001), the research group members formulated the ‘Questionnaire on the Self-learning Ability of Non-English Major Students’.

The questionnaire consists of two parts. The first is basic information. The second has 20 questions covering six areas, which include: learning motivation (active awareness, value awareness, self-efficacy and learning interest); learning content (content selection, target setting); learning method (preview strategy, understanding strategy, review strategy, organizational strategy, refinement strategy and general strategy); learning process (overcoming physical and mental barriers and self-monitoring); learning results (self-examination, self-evaluation, self-reflection and feedback); and learning environment (material and social environment). The questionnaire options use the Likert Scale and require students to choose between five grade options, ranging from “totally not like me” to “extremely like me”.

3.4.2 Reliability and Validity

The author conducted a pre-test among some students, and used SPSS20.0 software to analysed its reliability. The reliability coefficient (Cronbach α value) is above 0.8, which shows that the credibility of this questionnaire is high. This questionnaire refers to Professor Pang’s independent learning scale design. The researchers also consulted the expert opinions of several independent learning scales and believe accordingly that there is a certain validity.

3.5 Data Collection and Analysis

This survey was implemented in September 2021, with questionnaire recovery of 100%. All results were analysed by SPSS20.0 software to derive the mean and standard deviation and compared and analysed.

4 Results and Discussion

This chapter comprises eight sections. The first section makes an overall comparison of students’ independent learning ability under the two teaching modes. The second to seventh sections compare the differences between students’ independent learning ability in the two modes, that is in terms of learning motivation, content, method, process, results and environment. The final part summarizes the data analysis results.

4.1 Overall Analysis

The mean difference (M) of independent learning ability in the traditional classroom teaching mode is 75.24, and the standard deviation is 20.78. By comparison, the mean difference in the flipped classroom teaching mode is 125.29, and the standard deviation

Table 1. Mean difference and standard deviation of overall analysis

Traditional classroom		Flipped classroom	
M	SD	M	SD
75.24	20.78	125.29	13.09

Table 2. Mean difference and standard deviation of learning motivation

Dimension	Mode			
	Traditional classroom		Flipped classroom	
	M	SD	M	SD
Active awareness	3.88	0.54	7.23	0.27
Value awareness	3.83	0.64	5.17	0.47
Self-efficacy	3.81	0.66	5.38	0.59
Learning interest	3.92	0.56	7.32	0.31
Total score	15.54	2.22	25.17	1.50

(SD) is 13.09. The overall difference between these values was therefore 50.05 points, with a standard deviation gap of 7.69.

It can be seen, as a result, that there is a large disparity between students' independent learning ability under the two teaching modes. Under the flipped classroom teaching mode, students' independent learning ability is obviously better than the traditional classroom mode.

4.2 Learning Motivation

The mean difference of students' independent learning motivation in the flipped classroom teaching mode is 9.63 points higher than the students in the traditional classroom teaching mode. Compared with the traditional classroom mode, the mean difference gap between students' active consciousness and learning interest in the flipped classroom teaching mode is significant, at 3.42 points and 3.4 points, respectively. The gap between value awareness and self-efficacy is slightly smaller, at 1.34 points and 1.5 points, respectively. At the same time, the increase in mean difference of students' active consciousness (7.23 points) and learning interest (7.32 points) are higher than value awareness (5.17 points) and self-efficacy (5.38 points).

It can be seen that the flipped classroom teaching mode has a major impact on students' active awareness and interest in learning, as well as a slightly smaller impact on value awareness and self-efficacy.

Table 3. Mean difference and standard deviation of learning contents

Dimension	Mode			
	Traditional classroom		Flipped classroom	
	M	SD	M	SD
Choice	6.39	1.62	18.55	0.78
Setting	5.94	1.74	11.97	1.19
Total score	12.33	3.36	30.52	1.97

4.3 Learning Contents

The mean difference of students' learning content in the flipped classroom teaching mode is significantly higher than in traditional classrooms. In the flipped classroom mode, students have more autonomy in choosing learning content than the target setting, equivalent to an increase of 6.58 points. The choice and setting in the traditional classroom mode do not differ much, with 6.39 points and 5.94 points, respectively. Under the two teaching modes, the gap between students in choosing learning content is higher than the target setting.

Therefore, the flipped classroom mode has a significant impact on the choice of students' independent learning content, and the target setting is closely followed.

4.4 Learning Method

The mean difference of the learning method is higher under the flipped method than the traditional classroom teaching mode. In the flipped classroom teaching mode, students' preview strategy (5.02), understanding strategy (4.89), organizational strategy (4.92) and general strategy (6.55) scores are all higher than the review strategy and finishing strategy. When compared with the traditional classroom setting, the general strategy score shows the largest improvement, of 3.61 points. In a traditional classroom, students are familiar with general strategies (2.94), but other strategies show little difference.

It can therefore be seen that the flipped classroom teaching mode has the greatest impact on students' use of general strategies, with a marked improvement under the flipped method, followed by the preview strategy, understanding strategy and organizational strategy. The influence on the review strategy and fine processing strategy is more general.

4.5 Learning Process

The learning process of a flipped classroom is still slightly improved compared with the traditional classroom teaching mode, with a gap of 3.75. In the traditional classroom, students' scores for self-monitoring and ability to overcome physical and mental barriers is small, while the flipped classroom score is relatively large, with a gap of 4.57 points.

It can be seen that although the flipped classroom teaching mode has a limited impact on the students' independent learning process overall, its improvement of their self-monitoring ability is still very obvious.

Table 4. Mean difference and standard deviation of learning method

Dimension	Mode			
	Traditional classroom		Flipped classroom	
	M	SD	M	SD
Preview strategy	2.10	0.65	5.02	0.33
Understanding strategy	2.33	0.78	4.89	0.41
Review strategy	1.92	0.54	3.77	0.50
Organizational strategy	2.24	0.76	4.92	0.43
Refinement strategy	1.98	0.57	3.51	0.53
General strategy	2.94	0.29	6.55	0.29
Total score	15.69	3.59	28.66	1.53

Table 5. Mean difference and standard deviation of learning process

Dimension	Mode			
	Traditional classroom		Flipped classroom	
	M	SD	M	SD
Overcoming physical and mental barriers	5.67	2.07	5.54	1.67
Self-monitoring	6.22	1.83	10.11	0.88
Total score	11.89	3.90	15.64	2.55

4.6 Learning Effect

The learning results for a traditional classroom are 3.22 points lower than those for a flipped classroom. In terms of flipped classes, students' self-evaluation (4.35) and reflection ability (4.19) are better than self-examination (3.12) and self-feedback ability (2.86), and a marked improvement on the traditional classroom, where the scores for all four aspects are minimal.

It can be seen that the flipped classroom has a significant impact on students' self-evaluation and self-reflection abilities, and has a slightly milder influence on self-examination and self-feedback ability.

Table 6. Mean difference and standard deviation of learning effect

Dimension	Mode			
	Traditional classroom		Flipped classroom	
	M	SD	M	SD
Self-examination	2.83	1.05	3.12	0.87
Self-evaluation	3.02	0.83	4.35	0.47
Self-reflection	2.86	0.89	4.19	0.51
Self-feedback	2.59	1.09	2.86	0.78
Total score	11.30	4.06	14.52	2.63

Table 7. Mean difference and standard deviation of learning environment

Dimension	Mode			
	Traditional classroom		Flipped classroom	
	M	SD	M	SD
Material environment	4.11	2.01	4.96	1.56
Social environment	4.58	2.14	5.82	1.22
Total score	8.69	4.15	10.78	2.78

4.7 Learning Environment

According to Table 7, the mean difference in the flipped classroom mode is 2.09 points higher than the traditional classroom. The traditional classroom shows little difference between the material and social environment (0.47 points). Under the flipped classroom teaching mode, the social environment for students’ independent learning (5.82) is marked, followed by the material environment (4.96).

It can be seen that the flipped classroom teaching mode has a significant impact on the students’ learning environment.

4.8 Summary

From analysis of Tables 1, 2, 3, 4, 5, 6, and 7, we can see that, compared with the traditional classroom teaching mode, flipped classroom teaching has a significant impact on the students’ independent learning ability.

That is to say, it has several different degrees of positive impact on students’ six aspects of independent learning, namely motivation, content, method, process, results and environment.

First, the effect on students’ learning motivation and methods is the most obvious, with a mean difference of 15.54 and 13.49. Second, students’ independent learning content, process and results are also significantly improved, with a mean difference

of 12.33 points, 11.89 points and 11.30 points, respectively. Finally, the effect on the learning environment is marked but to a lesser degree.

In general, this study verifies that the flipped classroom teaching mode is more conducive to improving students' independent learning ability than the traditional classroom, with all dimensions of students' independent learning ability being improved to a certain extent.

5 Recommendations

The following suggestions are proposed in this study regarding the six aspects of English learn autonomy.

First, teachers should stimulate students' internal learning motivation and external learning motivation at the same time, give students more independent opportunities to choose their own field of interest in learning, and slowly establish students' sense of autonomy, self-efficacy and value consciousness.

Second, teachers need to teach students learning methods according to their individual needs and differences, and help students become familiar with and use the six strategies. This will enable students to internalize them into their learning ability, which can be used in a timely manner in the process of independent learning.

Third, it is suggested that the choice of learning content and the setting of the classroom teaching mode are flipped, with the students as the main body. Teachers can, according to the students' different professional or English abilities, provide a variety of learning content, can allow students to independently set near-term goals and long-term goals for learning, and let students master the initiative of learning.

Fourth, in the process of independent learning, teachers need to help students develop the habit of self-monitoring. By monitoring their own learning situation in real time, they can gain a relatively clear understanding of their own strengths and weaknesses, and can make up for their weaknesses. They should overcome all kinds of difficulties encountered in the process of learning, and constantly hone their own willpower and endurance.

Fifth, for the learning results, the teachers should always remind students to self-check, to objectively and correctly evaluate themselves, to find out their own shortcomings in a timely manner, and to then reflect on the causes of their deficiencies, with self-feedback and timely correction.

Sixth, teachers should be required to make certain efforts to create a beneficial learning environment for students.

Finally, teachers should ask students to record the above six dimensions and form personal learning files, which is not only conducive to teachers' understanding and supervision of students' independent learning process, but also conducive to the continuous progress of students.

6 Conclusions

As the flipped classroom based on multimedia technology becomes increasingly central to the independent learning experience of students, it is important to understand how it affects their learning motivation, content, method, process, results and environment.

This study aimed to investigate the independent learning ability of students under both the traditional and the flipped classroom teaching approaches. Based on a quantitative analysis of both methods, it can be concluded that their ability to learn independently under the flipped classroom method is greatly improved after one year of learning.

Students' independent learning motivation, content, method, process, results and environment have all improved to varying degrees. By comparing and analysing these factors in the context of the flipped classroom, the results indicate that the students' independent learning motivation and their ability to use learning methods improved the most significantly.

We can see that students have greater awareness of the roles of initiative and interest in learning compared with value awareness and self-efficacy. Under the learning method, the greatest improvements in skills were evident in terms of general strategy, while preview, understanding and organizational strategies are also somewhat improved. By contrast, the results for the review strategy and finishing strategy are slightly weak.

The students' independent learning content, process and results have also been significantly improved. Under the flipped classroom teaching mode, students can independently choose the learning content and set learning goals. They can self-monitor and overcome psychological obstacles, better evaluate and reflect on the learning evaluation, and also conduct appropriate self-examination and feedback. The effect of the flipped classroom teaching model on the learning environment itself is slightly weak, especially in terms of the material environment.

Based on these findings, practitioners should consider different types of university students, to further verify whether the flipped classroom has an influence on autonomic learning, and to what extent.

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