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Research on the Influence Dimensions of Project-Based Learning on College Students' English Learning Ability*

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***Abstract*—This paper aims to study whether project-based learning can have a significant influence on the English learning ability of college students and the influence dimensions through a combination of quantitative and qualitative analysis. To this end, 80 sophomores were randomly selected as the tracking respondents. They were given a questionnaire survey of the same content at the end of the freshman year (traditional English class) and the end of the sophomore year (project-based learning reform) respectively to obtain the significance of changes in their learning ability with paired sample t-test. Meanwhile, the research team also conducted random classroom interviews with the follow-up subjects, and asked them to write a personal summary to reflect on their one-year project-based learning. Through the analysis of the above data and information, it is believed that project-based learning promotes the comprehensive development of students' English learning ability. Specifically, four dimensions, i.e., students' teamwork ability, self-monitoring ability, language expression ability and network application ability, are significantly improved, while the enhancement of thinking ability approaches but does not reach a significant level, which may be due to its complicated nature. The feedback from most students shows that under the condition that traditional English classes can't mobilize students' learning initiative, project-based learning with the project group as the evaluation unit is indeed an effective means to "force" students to improve their learning ability.**

Keywords—project-based learning; traditional English class; English learning ability

I. INTRODUCTION

In view of the serious problems in traditional college English class teaching, National Medium- and Long-Term Education Reform and Development Plan (2010-2020) has clearly stated that education should "create a good environment for independent thinking, free exploration, and innovation", and "promote students' all-round development, focus on improving the innovative spirit of exploring and the practical ability to solve problems." As far as English teaching is concerned, the 2015 College English Curriculum Requirements (CECR) also clearly states that "College English is oriented towards the practical use of the language and focuses on cultivating students' practical application skills." Therefore, Professor Yu Weishen points out that "according to the CECR, the choice of teaching mode, whether it is to highlight special-purpose English, or to insist on the use of general English as the main teaching goal, must be based on language application ability." [1]

With the deepening of the teaching system reform in colleges and the enhancement of the requirements on English teaching from the Ministry of Education, the reform of college English teaching with the core of fostering application-oriented talents with high-quality language application ability has blossomed in many universities. In this context, Xuzhou University of Technology follows the "student-centered, project-led, application-oriented and ability-rooted" reform concept, and implements project-based learning (PBL) in sophomore college English extended courses, emphasizing the integration of language acquisition and content learning to cultivate the comprehensive ability of learners. The reform is fully in line with the guiding ideology of "college English teaching taking the practical use of English as the guideline and focusing on fostering the practical application ability of students" proposed by the 2015 CECR. This paper is designed to explore the influence of project-based learning reform on students' learning ability in college English extended courses through the combination of quantitative and qualitative researches.

II. THE CONNOTATION AND FUNCTION OF PROJECT-BASED LEARNING

Project-based Learning (PBL) is a teaching mode based on "project". It originated from Dewey's teaching concept of "learning by doing". John. W. Thomas believes that the so-called "project" is a complex task based on challenging issues that encourage students to participate in design, problem-solving, decisive and investigative activities, giving students the opportunity to learn relatively independently over a long period of time and ultimately produce viable results or reports.[2] At the same time, he also proposes that the "project" in project-based learning must have the

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following defining elements: first, being at the center of the course rather than on the periphery; second, driving students to face directly the central concept or principle of the subject; third, motivating students to conduct constructive investigations; fourth, having authenticity. Therefore, the American Bark Institute of Education (BIE) defines project-based learning as "a systematic approach to teaching, which is a process of exploring complex and real-world problems. It is also a process of carefully designing a project product, planning and implementing a project task in which students are able to acquire the knowledge and skills they need."[3] 4 Boss and others believe that in the process of completing the project, students can build their 21st century competences from four aspects (4C's): critical thinking, cooperation, communication and creativity, so that they can prepare for their academic, personal and career success and enable them to face the challenges of their lives and the world.[4] Because PBL is an innovative teaching mode, the Buck Institute of Education clearly states on its website that "in the process of project-based learning, teachers can revitalize students' learning." "As a result, students develop their deep content knowledge and improve critical thinking, creativity, and communication skills in the context of authentic and meaningful projects. Project-based learning frees the creative energy of students and teachers."[5]

As far as the application of PBL in language teaching is concerned, Professor Zhang Wenzhong believes that project-based learning emphasizes the communicative and functional attributes of language learning and the combination of language and content learning, so as to cultivate students' language skills prominently. [6] This is the advantage and the essence of PBL for language teaching, which is indeed the primary reason for adopting PBL in the teaching reform in Xuzhou University of Technology.

III. COGNITIVE RATIONALE OF THE APPLICATION OF PROJECT-BASED LEARNING IN COLLEGE ENGLISH EXTENDED COURSES

In terms of the reason why project-based learning can effectively promote the development of students' comprehensive ability, this paper believes that there are at least four pieces of cognitive evidence. This is also the basis for us to implement project-based learning reform.

A. Constructivist Learning Theory

Perkins points out that individuals can actively build understanding and recognition of the real world by interacting with the surroundings, experiencing things and reflecting on events.[7] Constructivism believes that knowledge is not from the subject, nor from the object, but is constructed in the process of interaction between the both. It is a proactive process of "doing", i.e., constructing new knowledge and experiences. In particular, social constructivism studies the process of foreign language acquisition from the perspective of social cognition, which emphasizes the initiative, sociality and context of learning, advocates ―putting the group before the individual and placing the interpersonal relationship in the first place.” It not only emphasizes social construction of meaning and social scenarios of learning, but also emphasizes social interaction, collaboration and activities.[8] In all, learning is essentially a social phenomenon, and true knowledge comes from the interaction between people and the environment. Social interaction can promote people's mastery of knowledge. The idea of ―learning by doing” emphasized in project-based learning is fully consistent with the cognitive rationale of constructivism.

B. Cognition-discovery Learning Theory

Bruner's Cognitive-Discovery Learning theory believes that learning is essentially a process in which learners actively form cognitive structures and actively link them to construct new knowledge. The best way to learn is to discover learning. The so-called discovery learning refers to the process in which students use their own textbooks or the conditions provided by teachers to think independently, discover knowledge on their own and master principles and laws. Bruner emphasizes that the purpose of teaching is to enable students to study independently and solve problems independently. Therefore, the task of instructors is to transform knowledge into a form that adapts to the developing students so as to characterize the order of the system development, and use it as a model of instructional design, allowing students to learn by discovery. Bruner proposes that discovery learning should follow six steps. Indeed, the implementation of project-based learning follows these steps to guide students to achieve progress and deep learning in continuous discovery.

C. Self-determination Cognitive Motivation Theory

Self-determination is a new cognitive motivation theory proposed by American psychologists Deci and Ryan. It emphasizes the degree of self-determination of human behavior. "The potential of self-determination can lead people to engage in activities that are of interest and beneficial to the development of their abilities. The pursuit of self-determination constitutes the intrinsic motivation of human behavior."[9] The theory regards motivation as a continuum from unmotivated, external motivation to internal motivation according to the degree of self-determination. The social environment can meet an individual’s three basic psychological needs (need for autonomy, need for capacity and need for belonging) to enhance his\her internal motivation, promote the internalization of external motivation, enable an individual to adhere to an activity for a longer period of time, and maintain a positive psychological state. Actually, project-based learning is aimed to mobilize the initiative of learners through real and interesting projects, stimulate their internal learning motivation, promote the internalization of their external motivation, and fully mobilize their learning initiative.

D. Language Acquisition Theory

Krashen distinguishes the language learning process into two different approaches: ―language learning” and ―language acquisition”. The former is conscious, formal learning, that is, explicit learning; the latter is unconscious, natural learning in a real environment, that is, implicit learning. He believes that people who master a language through "acquisition" can communicate more fluently in it.[10] The study by Swain et al. demonstrates that language acquisition cannot rely solely

on language input, but also need to force learners to perform much pushed output.[11] Further, Izumi states that language output can trigger deeper and finer processing of language forms, allowing learners to develop more lasting memory traces. In addition, learners will use their knowledge to reflect on their language output, thus deepening the understanding of the connection between the form, function and meaning of the language. This meta-language activity can promote learners' control and internalization of the knowledge of language, thus, improving the accuracy of language expression.[12] As discussed above, the essence of project-based learning is to "push" students to solve practical problems through continuous language output, and to achieve an upgrade in language learning from explicit to implicit.

Based on the above theoretical rationales, Xuzhou University of Technology has implemented project-based learning reform since 2015, aiming to organically integrate language skills and project themes to cultivate students' comprehensive qualities such as language communication skills, teamwork ability and thinking ability. The purpose of this paper is to investigate whether PBL can have a significant influence on the five dimensions of students' English learning ability.

IV. RESEARCH DESIGN AND IMPLEMENTATION PLAN

A. Research Purpose

This paper focuses on the changes to the students' English learning ability brought about by the project-based learning reform in college English extended courses. It attempts to analyze the degree and dimensions of PBL's influence on the development of college students' English learning ability through the combination of quantitative research and qualitative research. The research conclusions are to be used as reference in improving teaching, promoting teaching efficiency, and propelling students' comprehensive ability.

B. Research Questions

This paper intends to answer two questions through the follow-up survey of the research objects:

- Whether the influence of project-based learning and traditional English classes on students' learning ability is significantly different? If so, in what aspects.
- What are the reasons for significant or insignificant differences in learning ability between the two teaching modes?

C. Research Sample

This research was designed to explore the influence of PBL on students' learning ability. In order to make the research results more convincing, the research team randomly selected 80 sophomore students, 43 males and 37 females, as tracking respondents who attended different college English extended courses. They came from different majors, and participated in project-based learning for 2 semesters.

D. Research Methods

This research conducted a questionnaire survey about English learning ability to the same tracking respondents at the end of the freshman and sophomore year respectively. The questionnaire was a five-point Likert scale (Strongly Disagree=1, Disagree=2, Undecided=3, Agree=4, Strongly Agree=5). It was divided into five dimensions referring to the 21st century competences: teamwork ability, self-monitoring ability, language application ability, thinking ability and network application ability, totaling 21 items ("Table I"). A paired sample t-test was then performed with SPSS 26 to decide whether the effects of the two different teaching modes on students' learning ability were significant. In addition to the questionnaire survey, this study was supplemented by exploratory classes interviews and individual summaries. Quantitative analysis and qualitative analysis were combined to determine the influence dimensions and degrees of PBL on students' learning ability.

TABLE I. FIVE-POINT LIKERT SCALE FOR ENGLISH LEARNING ABILITY

English Learning Ability	***Teamwork Ability***	I like to discuss problems with my classmates.
		I am happy to share my learning resources with my classmates.
		I can volunteer to help my classmates solve difficulties in learning.
		I can actively cooperate with others to complete classroom tasks.
	Self-monitoring Ability	I can make my study plan and arrange reasonable English study time.
		I can self-monitor and supervise my progress in English learning.
		I can actively participate in class activities.
		I can actively ask my classmates for help with difficulties in learning.
		I can actively improve my English in various ways.
		I am eager to show myself in class.
	Language Expression Ability	The fluency of my verbal expression is significantly improved.
		The correctness of my verbal expression is significantly improved.
		The accuracy of my speech intonation is significantly improved.
		The correctness of my written expression is significantly improved.
	Thinking Ability	My critical thinking ability is significantly improved.
		My self-exploration ability is significantly improved.
		My learning reflective ability is significantly improved.
	Network Application Ability	My computer operation ability is significantly improved.
		My information retrieval ability is significantly improved.
		My multimedia production ability is significantly improved.
		My network interaction ability is significantly improved.

E. Implementation Plan

The research spanned 2 semesters. First, after all the freshmen entered the sophomore year and completed the selection of the extended courses, 80 students were randomly chosen for the research (In order to ensure the objectivity of the research results, the teachers did not inform them of that during the research process to avoid the Pygmalion effect), and conducted a questionnaire survey to grasp the degrees and dimensions of the influence of traditional English classes in the freshman year on their learning ability (In this paper, traditional classes referred to the teacher-centered, syllabus-centered and classes-centered teaching mode.). The data was retained for comparison. Then, in the process of conducting project-based learning, random exploratory class interviews were conducted from time to time to decide the potential changes of their learning ability, as a reference for qualitative research. Furthermore, at the end of the two-semester PBL extended courses, we did the same questionnaire survey on the same subjects of the research, obtaining the influence dimensions and degrees of PBL on students' English learning ability, and made a longitudinal comparison analysis with the data obtained at the beginning of the reform. In addition, each tracking respondent was asked to write a summary of his\her feeling of PBL. Finally, all the data and texts obtained were analyzed comprehensively to draw the conclusions of the research.

V. RESULTS AND DISCUSSION

A. Comparative Analysis of the Influence of Two Teaching Modes on English Learning Ability

In order to ensure the reliability of the research data, the research team first conducted a reliability analysis of the questionnaire with SPSS 26. The Cronbach α coefficients of the subscales of the five dimensions involved in the questionnaire were: α=0.803 (teamwork ability), α=0.790 (self-monitoring ability), α=0.880 (language application ability), α=0.816 (thinking ability), and α=0.815 (network application ability). The Cronbach alpha coefficient of the overall reliability of the learning ability survey scale was 0.901. This indicated that the scale was highly consistent internally and suitable for data surveys.

In the research, two different teaching modes were implemented among the same research subjects to study the difference between the teaching effects. Therefore, a paired sample t-test was conducted. The results are shown in "Table II" and "Table III". "Table II" shows the paired samples statistics for the average changes of student's English learning ability as a whole (Pair 1) and of the five dimensions (Pairs 2-6) between traditional teaching mode and PBL. It can be seen that the mean of English learning ability in traditional classes (3.0481) was improved to 3.6829 in project-based learning, which indicates that PBL is an effective teaching mode in improving students' learning ability. More specifically, all the five dimensions of learning ability in PBL mode were improved to certain degrees compared with traditional classes. What is most striking and unexpected in "Table I" is that students' language application ability gets the lowest mean of 2.7450 in traditional English classes; next to self-monitoring, which is 2.9950. This shows that traditional classes are very unfavorable to the progress of students' English expression ability (whether oral or written) and the cultivation of learning autonomy, which completely contradicts the original intention of English teaching. The results of this study are consistent with the reality. The lack of students' autonomy in traditional classes directly leads to the relatively low mean of other dimensions of learning ability. In contrast, the PBL mode does promote students' development in all dimensions of learning ability, and is therefore conducive to cultivating students' 21st century competences.

TABLE II. PAIRED SAMPLES STATISTICS OF ENGLISH LEARNING ABILITY

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	**English Learning ability (Tr.)**	3.0481	21	.27770	.06060
	English Learning ability (PBL)	3.6829	21	.36649	.07997
Pair 2	Teamwork ability (Tr.)	3.3650	4	.17597	.08799
	Teamwork ability (PBL)	3.8750	4	.41637	.20819
Pair 3	Self-monitoring ability (Tr.)	2.9950	6	.32605	.13311
	Self-monitoring ability (PBL)	3.4567	6	.40786	.16651
Pair 4	Langugage application ability (Tr.)	2.7450	4	.15155	.07577
	Language application ability (PBL)	3.2975	4	.14614	.07307
Pair 5	Thinking ability (Tr.)	3.0167	3	.10408	.06009
	Thinking ability (PBL)	3.6400	3	.20664	.11930
Pair 6	Network application ability (Tr.)	3.1375	4	.04573	.02287
	Network application ability (PBL)	3.9725	4	.16581	.08290

TABLE III. PAIRED SAMPLES T-TEST OF ENGLISH LEARNING ABILITY

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	**English Learning ability (Tr.) - English Learning ability (PBL)**	-.63476	.30748	.06710	-.77473	-.49480	-9.460	20	.000
Pair 2	Teamwork ability (Tr.) - Teamwork ability (PBL)	-.51000	.29698	.14849	-.98257	-.03743	-3.435	3	.041
Pair 3	Self-monitoring ability (Tr.) - Self-monitoring ability (PBL)	-.46167	.29342	.11979	-.76959	-.15374	-3.854	5	.012
Pair 4	Language application ability (Tr.) - Language application ability (PBL)	-.55250	.15414	.07707	-.79777	-.30723	-7.169	3	.006
Pair 5	Thinking ability (Tr.) - Thinking ability (PBL)	-.62333	.31070	.17938	-1.39515	.14848	-3.475	2	.074
Pair 6	Network application ability (Tr.) - Network application ability (PBL)	-.83500	.19841	.09921	-1.15072	-.51928	-8.417	3	.004

The paired sample t-test results in "Table III" show that students' English learning ability in PBL is significantly higher than that in traditional classes (p=0.000) (Pair 1). In the five dimensions of learning ability studied in this paper, the changes in teamwork ability(Pair 2), self-monitoring ability(Pair 3), language application ability(Pair 4) and network application ability(Pair 6) have all reached significant degrees ($p \leq 0.05$), and the change of thinking ability(Pair 5) is also close to , although does not reach, significance (p=0.074). In addition, both the t-value and the two-tailed significance test show that the network application ability and language application ability have changed most significantly. This is exactly the result of the implementation of project-based learning in college English classes. The implementation of the project and the class report of the project works "forced" students to conduct actively online search, information retrieval and integration to produce the best multimedia works, and meanwhile, improve their language expression (both oral and written) actively to make a perfect class report. During the process, their skills were both significantly improved.

In the teaching reform, project-based learning is assessed in the form of project group, so cooperation with other students and teachers is very important. Individual students must have strong self-monitoring ability in order to complete the cooperative project on time. As a result, students' abilities to cooperate with others and control himself/herself were also "forced" to be improved significantly. Professor Wang Boran's research also showed similar results. Through factor analysis, he found that the PBL mode could bring students satisfaction in four dimensions: language skills, individual abilities, interpersonal skills and subject knowledge.[13]

During the whole process of PBL, students were continually "forced" to think hard and reflect over and over. However, considering the complicated nature of thinking ability, its development is a gradual process that requires a long-term training. This may be the root cause that project-based learning can't raise students' thinking ability to a significant level in just two semesters.

B. Analysis of Class Interviews and Individual Summaries

In the research process, the research team conducted several random class interviews and asked all the research subjects to write about PBL at the end of the semester, which involved the evaluation of PBL, whether PBL contributed to the improvement of their comprehensive ability and their requirements towards the teacher, etc. The research team finally received and analyzed 57 valid individual summaries. Student feedback indicates that the PBL mode gets a support rate of 84.2%. Generally, the proponents thought that it was a huge challenge for them, and pushed them to keep up with the pace of the group because the project needed to be completed within the specified time and PBL took the project group as the evaluation unit. In the process of group work, their conscious learning and teamwork spirit had been greatly improved. 73.68% of the students believed that class report was the biggest challenge, as it put high demands on the fluency of oral expression and the accuracy of written expression. This was the root cause why they actively improved their language ability. Most students suggested that this was exactly what lacked in traditional classes. In an interview, one student said, "I was most afraid of speaking in public from my young age, not to mention speaking English, but after two semesters of project-based learning, I became more outgoing and bolder. I speak English more and more fluently now." Brown said, when learners participated in purposeful projects, they could "really accept and produce language meaningfully."[14] Up to 86.2% of students acknowledged that project implementation promoted their multimedia production competence. 75.4% of the students believed that their thinking ability was improved in the process of conducting project. One student wrote in his summary, "PBL forced me to constantly think about how to make more unique project works. I feel that my innovation ability has been greatly developed."

However, the comprehensive analysis of students' personal summaries and interviews also suggested that most students had a certain degree of fear towards project-based learning, although they affirmed the teaching effect of PBL. It was mainly reflected in the following aspects: firstly, It was rather difficult to decide an appropriate and scientific project theme, sometimes it took some time to reach an

agreement among the team members; secondly, the project works took too much time, which was the common reaction of all the survey participants; thirdly, project-based learning was a challenge to their comprehensive ability, it was not so easy to produce excellent project works; fourthly, the class report of the project works required a high level of language proficiency. If they wanted to do the project report successfully, they needed to rehearse it several times.

VI. CONCLUSION

The cultivation of application-oriented talents with high-level language application ability is the fundamental purpose of college English teaching reform. Project-based learning is an effective means to achieve this goal. The research team implemented a two-semester PBL reform and conducted a full-track follow-up survey in order to study whether PBL can significantly outperform the traditional classes, and further, in which dimensions it promotes students' comprehensive development. Through the paired sample t-test of the statistics and the comprehensive analysis of the students' personal feedback, this paper argues that PBL can indeed promote students' development to varying degrees in five dimensions of English learning ability, namely, teamwork ability, self-monitoring ability, language ability, thinking ability and network application ability. As Professor Wang Boran said, "Project learning is free from the three centers of traditional method – teacher-centered, curriculum-centered, classes-centered, and can promote the acquisition of language, content and skills simultaneously. It is a new and effective teaching method."[13] Although this study shows that the development of thinking ability is comparatively slow, the research results indicates that if PBL persists for a longer period of time, students' thinking ability will definitely develop significantly.

On the other hand, the class interviews and students' feedback also indicate that since the PBL is based on project production and needs to be completed in cooperation with many students, this is undoubtedly a pressure and challenge for all the students, making them anxious and uncomfortable in the learning process, which may ultimately impair their enthusiasm for learning and the effectiveness of PBL. Therefore, teachers should encourage the students to confront challenges boldly, enhance their internal learning motivation to enjoy the pleasure of deep learning, guide them to maintain a positive state to lay a good psychological foundation for sustained implementation of PBL. If possible and necessary, project-based learning and the traditional teaching method can be alternately implemented and organically combined to alleviate the psychological pressure of the students. Thus, the negative impact of PBL on students' emotions will be reduced to the lowest level, so as to obtain the best teaching effect and promote the sustainable development of students' English learning ability.

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