Applied & Educational Psychology (2024)
Clausius Scientific Press, Canada

DOI: 10.23977/appep.2024.050605
ISSN 2523-5842 Vol. 5 Num. 6

The Effects of Problem-Based Learning (PBL) on English Reading Strategy Use among College Students

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Keywords: Problem-Based Learning (PBL); Reading strategy use; College Students

Abstract: This study aimed to examine the effects of problem-based learning (PBL) on college students' English reading strategy use. A mixed research method was employed to achieve this objective. Ninety-six sophomores from a local university in Changchun were invited to participate in this study. The results showed that PBL reading instruction significantly influences college students' application of reading strategies, because it can promote students' reading strategy awareness and provide students with sufficient opportunities to practice and use reading strategies, especially meta-cognitive and cognitive ones.

1. Introduction

As proposed by Alderson, EFL reading is both a language and reading issue when the reader reaches a certain language level.[1] Some researchers held similar views that both L1 and L2 reading are underpinned by two major factors: language-specific knowledge, including vocabulary, phrases, and grammar; and general reading knowledge, referring to reading strategies.[2] However, Chinese EFL reading instruction continues to focus excessively on teaching English linguistic knowledge.[3] In this case, EFL reading instruction primarily concerns linguistic training, which has created some barriers to develop EFL learners' reading proficiency, seeing that linguistic instruction is essential but insufficient for developing reading proficiency in a foreign language. The development of learners' reading strategies plays an important role in their reading comprehension, engagement level, and performance in reading tasks.[4]

Problem-based learning (PBL) is a learner-centered teaching model that stresses meaning construction, inquiry, and authentic learning activities and that allows learners to collaborate with their peers, think critically, and solve ill-structured complex problems.[5] Many educational researchers have suggested that PBL can serve as a practical means to improve language learning.[6] However, sufficient amount of empirical evidence supporting its superiority in teaching English is still lacking, especially regarding its effectiveness in reading instruction. Therefore, this study aims to answer the following research question: Does PBL reading instruction influence college students' reading strategy use?

2. Literature Review

Many scholars have suggested PBL, a learner-centered teaching model, as a practical means to improve language learning. For example, Qiao and Guo incorporated the PBL method into college English reading instruction and proposed three principles of PBL reading instruction based on the constructivist theory, which provides an illuminating perspective to researchers in this field.[7] They argued that PBL reading instruction is beneficial for learners, allowing them to acquire more knowledge and information, improve their reading motivation and interest, and develop skills such as problem-solving, self-directed learning, collaborative learning, and critical thinking. In addition, Wang conducted a mixed methods study to investigate the effect of PBL reading instruction on college students' reading motivation and interest using instruments such as reading motivation questionnaires, reading comprehension tests, and semi-structured interviews to support the study. The results indicated that incorporating PBL into college English reading instruction could help learners improve their reading motivation and comprehension. [8]

Overall, PBL reading instruction has positively influenced college students' reading proficiency. However, most relevant studies have focused on the effects of PBL reading instruction on their reading motivation, engagement, interest, and skills. Accordingly, investigation into the effects of such instruction on college students' reading strategy use is needed to increase instructors' and learners' awareness of the effectiveness of PBL reading instruction.

3. Method

This study employed the mixed methods design to collect both quantitative and qualitative data, merge them, and use the results to understand the research problem. The researcher followed the *sequential explanatory model*, a type of mixed methods design where the researcher first collects quantitative data and subsequently qualitative data to help explain or elaborate on the quantitative results. In this study, the 96 participants were randomly divided into experimental and control groups, each comprising 48 students. The participants who had enrolled in the PBL course constituted the experimental group, while those in the LBL course belonged to the control group. The content in each class was equivalent and was delivered by the two instructors. Before the treatment, the participants completed a SORS pre-test. The treatment lasted 14 weeks (September 8, 2023 ~ December 10, 2023), after which the experimental and control groups completed the same questionnaires as used in the pre-test. In addition, nine PBL participants were interviewed in a comfortable lounge to investigate their perceptions of the PBL reading experience. The specific research methods are as follows.

3.1 Research Instruments

To obtain rich and detailed data sources, the following two research instruments were used in this study: the SORS questionnaire and semi-structured interview protocols.

The SORS questionnaire was used to investigate the subjects' reading strategy use. It includes 30 items with a 5-point Likert scale to measure three broad categories of reading strategies: metacognitive, cognitive, and support reading strategies (MRS, CRS, and SRS, respectively). To measure the frequency of reading strategy use, Mokhtari and Sheorey employed three levels and outlined a scale range of 1–5: high-frequency (3.5 and above), medium-frequency (2.5 to 3.4), and low-frequency (2.4 and below) strategy use.[9] In this study, the participants were given 10–12 minutes to complete this inventory, both before and after exposure to the treatment, to test the possible differences and changes in their perceived reading strategy use.

After the treatment, the researcher conducted face-to-face individual interviews with some

subjects in the experimental group to elicit information from them regarding how they felt about the semester-long PBL reading experience. The interview protocols were designed based on the research question, and the relevant questions were open-ended. The interviews were conducted with nine respondents who had previously indicated a willingness to be interviewed for this study.

3.2 Data Collection

The data collection was completed in the fall of 2023, starting on August 30 and running through to December 22. Data for the quantitative research phase were collected through SORS and data for the qualitative research phase were gathered through semi-structured interviews. The data collection timeline is shown in Table 1.

Table 1: Data Collection Timeline

Date	Instrument	Participants
Aug 30	SORS (Pre-test)	96
Dec 19	SORS (Post-test)	96
Dec 20-22	Semi-structured interview	9 of the experimental group

3.3 Data Analysis

The quantitative data analysis was conducted for the SORS pre-test/post-test scores using the SPSS statistical package for Windows 10. The quantitative data were summarized using descriptive statistics: means, standard deviations, and ranges were used to describe the data collected from each group. The data analyses were subsequently performed using a series of t-tests. In addition, the qualitative data were analyzed using a version of the ground theory approach, where multiple themes emerged through the repeated reading of the data to explain the advantages of the quantitative data.

4. Results

The quantitative and qualitative results indicated that exposing college students to PBL reading instruction significantly influences their application of reading strategies.

4.1 Findings of the SORS Questionnaires

All participants took the SORS pre- and post-tests before and after the treatment. Paired sample t-tests were performed on the experimental and control group data to examine whether significant mean differences existed in the participants' frequency of reading strategy use before and after the intervention. Table 2 presents the descriptive statistics regarding the participants' SORS scores before and after the treatment.

Table 2: Descriptive Statistics of SORS Scores on the Pre- and Post-tests

	Experimental group (N=48)		Control group (N=48)	
Variable	Mean	SD	Mean	SD
Pre-test	3.292	.6321	3.260	.6287
Post-test	3.813	.6622	3.306	.6359

Note: SD = standard deviation.

According to the descriptive results, in both groups, the participants' reading strategy use after the PBL and LBL treatments was enhanced. However, the mean of the learners' frequency of

reading strategy use in the experimental group was considerably higher than that in the control group; the mean score of the experimental group improved from 3.292 in the pre-test to 3.813 in the post-test, while that of the control group improved from 3.260 to 3.306.

In addition, the results of the paired sample t-tests (see Tables 3 and 4) indicated that there was a statistically significant difference between the pre- and post-treatment data in the experimental group ($t [47] = -18.652$, $p < .001$). However, the data from the control group were not statistically significant before and after the treatment ($t [47] = -5.836$, $p = .07 > .05$). The findings indicated that PBL reading instruction positively influences participants' reading strategy use.

Table 3: Paired Sample t-test of SORS Scores of the Experimental Group on the Pre-and Post-tests

Mean	SD	SE	Lower	Upper	t	df	Sig.(2-Tailed)
-.5208	.1935	.0279	-.5770	-.4647	-18.652	47	.000*

Note: *p < .001, SD = standard deviation, SE = standard error mean, df = degree of freedom.

Table 4: Paired Sample t-test of SORS Scores of the Control Group on the Pre-and Post-tests

Mean	SD	SE	Lower	Upper	t	df	Sig.(2-Tailed)
-.0458	.0544	.0079	-.0616	-.0300	-5.836	47	.070

Note: SD = standard deviation, SE = standard error mean, df = degree of freedom.

4.2 Interview Findings

This section of the qualitative research study discusses the interview findings by presenting the two emergent themes among nine participants from the experimental group: PBL reading instruction 1) promoted students' reading strategy awareness and 2) provided students with sufficient opportunities to practice and use reading strategies, especially metacognitive and cognitive ones.

Theme 1: PBL reading instruction promoted students' reading strategy awareness. Metacognitive awareness of reading strategies refers to readers' capacity to apply these strategies to plan and monitor the reading process and adapt them to the context.[10] Flavel claimed that it comprises two components: one involves general reading strategies referring to prediction, questioning, and clarification, and the other encompasses the regulation of reading strategies. The latter refers to the fact that when readers become familiar with a range of reading strategies, they understand how to use them strategically. In other words, readers continuously monitor their reading process, and if their understanding falters, they then take corrective action. Therefore, simply knowing the reading strategies is not sufficient for reading comprehension. In the PBL reading instruction in this study, college students' were first familiarized with general reading strategies. The instructor then modeled how these strategies operate during the reading process and later gave the learners several opportunities to practice using them to comprehend the texts and solve the given complex problems. In addition, the teacher required the participants to share their methods and strategies with their team members to exchange information.

Theme 2: PBL reading instruction provided students with sufficient opportunities to practice and use reading strategies, especially metacognitive and cognitive ones. All the participants agreed that PBL reading instruction increased their frequency of reading strategy use. In traditional reading classes, learners might assimilate reading strategies but may not have sufficient opportunities to put them into practice. Traditional college English reading instruction has focused excessively on teaching linguistic knowledge and ignored the development of reading strategies. However, in this study, integrating the PBL approach within the reading environment helped the participants learn the reading strategies and provided opportunities to apply them. First, in the PBL reading classes,

the learners needed to analyze the given problems to identify their learning needs and plan their learning process accordingly. The participants indicated that a basic understanding of the text was the key to planning, which required them to gain an overall idea of the text, set some goals, consider their previous knowledge, focus on the critical information, and ignore the secondary information. Second, the PBL reading classes required the learners to monitor their reading process and reflect on their reading content, strategies, and methods. The participants explained that they had sufficient opportunities to learn and use some "monitoring" reading strategies, such as considering whether the content of the text fit the reading purposes and critically analyzing and evaluating the information presented in the text. In addition, in the PBL reading environment, the learners needed to adjust their reading content, strategies, and methods according to the reflection and evaluation results to timeously meet the reading goals.

5. Conclusion

PBL reading instruction could increase college students' frequency of reading strategy use. According to the responses of the PBL participants, PBL reading instruction provided them with sufficient opportunities to learn and apply reading strategies, especially metacognitive and cognitive ones. Before the treatment, the students' frequency of reading strategy use fell within the "medium" range; moreover, they preferred supportive reading strategies to metacognitive or cognitive ones, which could be explained by college students' lack of metacognitive awareness in reading comprehension.[11] PBL reading classes require learners to monitor and direct their problem-solving process, bringing in prior knowledge to bear upon the current reading problem. They provide an opportunity for learners to apply metacognitive knowledge to real-world problems, which helps them consciously apply one or more reading strategies to correct their comprehension.

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