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Impact of Problem-based Learning on Students' Transactional Distance and Reading Comprehension Ability during Covid-19

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Abstract

Transactional distance as an instrumental concept affects the learning process, particularly in distant education. This quasi-experimental study aims to implement problem-based learning (PBL) in EFL online education and investigate its impact on transactional distance and comprehension ability. Two groups of participants from the basic level participated in this study. One participated as an experimental group (N = 40) and the other as a control group (N = 40). The participants' language proficiency was checked by the Ket English Test (KET). These two groups followed PBL and lecture-based methods respectively. These two groups accomplished pre-testing and post-testing on Transactional Distance Scale (RSTD) by Paul, Swart, Zhang, and MacLeod, (2015) and a reading comprehension test constructed by the researcher. Based on multivariate and one-way analysis of variance, the findings showed that the experimental group had a low level of transactional distance and a high level of comprehension ability. Practitioners should draw their attention to constructivists' methods of teaching if they want to provoke deep meaningful learning in EFL educational contexts. The results of this study can demonstrate that it is possible to bring about changes in EFL educational setting to promote language learning and class is the main place where the change can occur.

Keywords: Problem-Based-Learning; Reading Comprehension; Transactional Distance

INTRODUCTION

Facilitation of change and learning must be the goal in modern online educational settings (Lin, 2017) this goes beyond cognitive education and is in line with experiential learning that accounts for meaningful learning and low transactional distance in the process of knowledge construction(Lin, 2015). Unlike the lecture-based teaching method, a learning process that is meaningless and parrot-like, experiential learning does not run rigidly and is not limited to knowledge transfer on the part of the teacher, students' recall of transferred knowledge, and their passiveness. This learning procedure leads to deep meaningful learning by encouraging high engagement levelsand as a result decreasing transactional distance, the psychological and communicational distance psychological and communicational distance between the students and the teacher (M. Moore, 1993). Transactional distance is considered a main impediment in the learning process by many scholars including Ekwunife-Orakwue and Teng, (2014). Most Iranian online EFL educational settings follow lecture-based teaching methods, especially during Covid-19, which makes learners bored, increases transactional distance, and may lead to a lack of achievement (Lin, 2015).

Considering Iranian EFL courses especially, it becomes evident that although reading constitutes major part of the course, the majority of EFL learners do not have the required ability

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(Lin, 2018). This problem might stem from malfunctioning reading courses heavily loaded with teacher-centered methods. This method ignores the importance of learners' active participation, increases transactional distance, and prevents meaningful lifelong learning. To assist learners, and allow to their transactional distance in reading courses to cultivate deep meaningful learning, there is a growing demand for an effective experiential method. Little research has been done on the contributory role of PBL on transactional distance and comprehension ability especially in Iranian online EFL contexts. The present study, thus, intends to investigate the impact of PBL on transactional distance and reading comprehension ability in an online EFL setting.

Transactional Distance

The Education of learners all over the world has been directly influenced by the coronavirus (COVID-19) resulting in a rapid shift from traditional face-to-face instructional delivery to distance education.

Although distant education mostly relies on technology to transfer the content of learning, the dropout and low level of achievement rates are high in comparison to face-to-face instructional settings (P. Shea & Bidjerano, 2014). In regular and direct face-to-face classrooms, the learners' interaction with their classmates, the teacher and especially the instructional material can be maximized easily by implementing varieties of instructional scaffolds (Ekwunife-Orakwue & Teng, 2014).

However, Online distance learning, where learners and teachers are physically separated and educational delivery is accomplished by communication and information technology, increases transactional distance and as a result lowers commitments and academic performance (Kara, 2021). These results point to the need for the original distance learning theory to find a solution to the problems of distance learning. Transactional distance (TD) is one of them.

As an instrumental concept that affects the learning and instructing process in distant educational contexts, transactional distance has been proposed and defined as the amount of psychological and communicational distance between the students and the teacher (M. Moore, 1993). Three key components determine the degree of transactional distance: Structure (S), Dialogue (D), and Learner Autonomy (LA) (M. Moore, 1993). Structure (S) refers to the degree of flexibility in educational goals, teaching, and assessment methods, and the extent, to which a teaching method is responsive to the learners' needs. Dialogue is a purposeful and constructive interaction between the teacher and the learners that positively affects the degree of understanding (M. G. Moore, 2013; J. Shea, Joaquin, & Wang, 2016). Autonomy is perceived as a significant feature of learning and teaching methods, based on the degree of control and independence (M. G. Moore, 2013). The theory of transactional distance necessitates a balance between the three constructs of structure, dialogue, and learner autonomy (, J. Shea et al., 2016). When there is less structure, more dialogue and more learner autonomy, transactional distance is decreased and this positively affects learning and understanding (Ekwunife-Orakwue & Teng, 2014; M. G. Moore, 2013).

Problem-Based Learning

In most traditional face-to-face EFL instructional settings, teaching is mostly based on an instructor-centered method (Lin, 2015). COVID 19 directly affected instructional settings and caused a quick shift from explicit face-to-face teaching to distant online education. Persisting in teaching with the same method of teaching in distant online education makes learners bored and increases transactional distance, which eventually can lead to less academic achievement.

Taking Iranian EFL distant education into account, most of the students do not acquaint an acceptable level of academic achievement (Derakhshan, Kruk, Mehdizadeh, & Pawlak, 2021). The problem might stem from malfunctioning in EFL distant education heavily loaded with the traditional teacher-centered method of teaching. Appling this unstimulating and non-provocative method with instructors as the top of things and the sole active participants during the teaching and learning process, la ack of students' engagement and

inclusion of non-authentic tasks reflects the combination of attention loss, dissatisfaction, and disengagement which finally results in the high transactional distance (Derakhshan et al., 2021; Lewinski, 2015). Effective teaching methods are essential to reduce structure, increase dialogue, and create educational contexts that provide a high degree of autonomy to develop deep and meaningful learning (Kohonen, Jaatinen, Kaikkonen, & Lehtovaara, 2014). Accordingly, problem-based learning (PBL), as a pedagogical method anchored in constructivism, may provide a good solution for the stated problems in online distant education (Lin, 2017).

Problem-based learning as an innovative teaching method in English language learning contexts is aimed at making learners ready for real-life (Hmelo-Silver, 2013). This method encourages learners to solve real-life problems, which makes learners challenge their current knowledge and assists them to recognize new learning needs. Learners move to deeper and more meaningful learning by emphasizing prior knowledge and implementation of knowledge from different sources and facilitating collaboration, self-study, and reflection in self-learning and peer learning (Hung, 2013). This teaching method helps cope with modern educational prerequisites; it rises the amount of dialogue between the learners and the instructor and enhances the level of engagement (T.-H. Lee, Shen, & Tsai, 2010; O'Grady, Yew, Goh, & Schmidt, 2012; Yew & Goh, 2016).

Reading Comprehension Ability

Reading comprehension is considered an important skill to implement materials and acquire professional knowledge in a variety of subject fields (Lin, 2017). It can be broadly defined as a leaning construction process that integrates several coordinated processes during which the reader gets textual information and then relates it to his/her background knowledge to comprehend the text (Lin, 2018). This instruction implies higher-order processing.

Teaching reading comprehension, in most EFL educational settings, is mainly based on a lecture-based method that makes learners bored, increases transactional distance and as a result decreases academic achievement (Lin, 2015). To turn EFL learners into successful readers, there is a growing demand for an effective teaching method.

Related Empirical Studies

There have been several related types of research in a variety of disciplines. In the non-ELT context, for example, Wosinski et al., (2018) investigated undergraduate nursing students` viewpoints on PBL to identify the factors which brought about their success in an academic context. Based on a meta-aggregative methodology, a qualitative systematic literature review was implemented. The findings showed that a high level of interaction, leadership skills, and analytic reasoning were the main elements that led to academic achievement.

Savin-Baden (2016) has considered many studies over the last 15 years. Savin- Baden believed that in PBL, scaffolding, content knowledge associated with an academic course, liminality, and pedagogical stance are four transdisciplinary threshold concepts, which positively affect the learners` engagement and class participation. Undergraduate business learners' perceptions of the lecture-based method of teaching and PBL were researched in a study by Garnjost and Brown (2018). As data-gathering instruments, rubrics and scales were used and students' perceptions were investigated considering group working knowledge acquisition, problem-solving, and self-directed learning. The results of the study indicated that based on learners' opinions, there is no such big difference between lecture-based pedagogy and PBL inefficiency.

As far as the researchers know, little research has been done on PBL in the EFL context; however, as an innovative method of teaching, it had helpful effects on language learning. As an example, in a study (Lin, 2015), PBL was followed in an elementary-level English course to investigate its impact on vocabulary learning and use. The findings of the research showed that the learners in the PBL group could acquire new vocabulary in

high amounts. In addition, the PBL group acquired productive knowledge while the control group obtained receptive knowledge.

Within the MA TESOL program in teacher education, PBL was implemented (Caswell, 2017). The results of this mixed-method study showed that PBL is beneficial for professional development by providing new roles for both teachers and learners, including lead teachers, co-teachers, and learners as peer teachers.

PBL was used in an English reading class conducted on the web to probe its effect on the perceptions and comprehension ability of intermediate-level learners (Lin, 2017). To gather data, pre-, and post-test, an instructional questionnaire and self-reports were implemented. The results revealed that from two classes, which were assigned into PBL and NON-PBL groups, the PBL learners could enhance their comprehension ability to a high extent, and were able to achieve cognitive processing integrated with active learning. Lin also demonstrated the PBL method`s efficiency on EFL learners reading ability, strategy use, and positive perceptions toward language learning (Lin, 2018).

Hybrid PBL was followed in an undergraduate English speaking course to study its impact on learners' speaking ability (Baresh, Ali, & Darmi, 2019). Semi-structured interviews and observation were used to collect data. The findings indicated PBL learners' autonomy and their ability to speak fluently.

As part of PBL's recursive reading and writing course in the EFL context, sophomore English students participated in the analysis of multimodal resources and the creation of multimodal texts to arouse the interest of their target audience (S.-Y. Lee, Lo, & Chin, 2021). Corpus and qualitative analysis indicated that PBL increased the learners' ability the use vocabularies in different contexts, expressive fluency, and complexity in writing sentences. EFL students' perceptions of transactional distance and the relation of those perceptions with learners' academic achievements in a distant English class were investigated by Kara (2021). Data were collected both quantitatively and qualitatively implementing the scale of transactional distance, semi-structured interview, observation, and open-ended questions. The results represented learners' positive perceptions toward transactional distance and academic achievement. The findings also indicated that the constituents of transactional distance foretell the learners' learning outcomes and satisfaction.

Transaction distances for online language courses were examined using learning analytics (Agudo-Peregrina, Iglesias-Pradas, Conde-González, & Hernández-García, 2014). It was found that a low level of transactional distance results in a high amount of interaction within the learning context and therefore, leads to high academic performance.

Learners' perceptions of transactional distance, engagement, and learning outcomes were investigated by Bolliger and Halupa (2018). The participants in this study were learners from different fields of study and at different levels of proficiency. As data collection tools, the Online Learning Scale for Student Engagement and the Revised Transaction Distance Scale (RSTD) have been implemented. The results showed a high engagement level, medium level of transactional distance, and a high level of learning outcomes. Online Students Engagement Scale and the Revised Scale of Transactional Distance (RSTD) were implemented as data-gathering instruments. The results indicated a high level of engagement, a moderate level of transactional distance, and a high level of learning outcomes. The transactional distance was a valid factor that had a positive impact on engagement and learning outcomes.

In an online bachelor's degree completion program, the relationship between course structure and interaction which are two dimensions of transactional distance, social presence, and satisfaction was investigated (Horzum, 2017). Three data gathering instruments including the perception of online courses (POCS), social presence scale (SPS), and satisfaction scale (SS) were implemented. The results of the study indicated a negative correlation of course structure with social presence and interaction and showed a positive correlation between interaction and social presence.

In addition, learning satisfaction was positively predicted by social presence.

Ekwunife-Orakwue and Teng (2014) measured how the learners' transactional dialogic interactions in online and blending learning contexts affect academic achievement. Learners with different levels of proficiency in part-time and full-time synchronous and asynchronous courses and different fields of studies participated in the research. A student satisfaction survey labeled General Satisfaction (GSAT) was implemented as the survey instrument. The findings demonstrated the high positive impact of dialogic interactions including student-student interaction, student-technology interaction, student-teacher interaction, and student-content interaction on learning outcomes.

As can be seen from the research literature, some studies on PBL, reading comprehension and transactional distance have been done in an academic context (Bolliger & Halupa, 2018; Lin, 2017; Wosinski et al., 2018). Studies (Caswell, 2017; Lin, 2017) have illuminated the important role of the innovative method of PBL in encouraging the learners to personally construct knowledge through collaboration and self-directed learning to achieve deep meaningful learning in EFL contexts. Lin (2017) demonstrated the positive impact of PBL on meaningful knowledge construction in reading comprehension. Taking transactional distance into account, researchers (Bolliger & Halupa, 2018; Kara, 2021) have focused on the point that reducing transactional distance can positively affect the learners' academic achievement and satisfaction. In other words, less structure, and more autonomy and dialogue in an educational context can bring about successful and satisfied learners (M. Moore, 1993). What is lacking in all of these studies is that, to the best of our knowledge, little research has been done to probe the effect of PBL on transactional distance and reading comprehension, especially in Iranian EFL settings. To obtain enough experiential proof of PBL superiority, more studies are needed to research how PBL can be effective in reading courses by reducing the transactional distance which is considered an instrumental concept, especially in online education, and can positively impact the learning and teaching process (Kara, 2021).

To discern the instructional efficacy of PBL, and to fill the literature gap, this study aims to explore the impact of PBL on transactional distance and comprehension ability of EFL learners in an English online reading course. It is expected that the transactional distance can be diminished by creating less structure within the course, enhancing autonomy and dialogue among learners; and as a result, comprehension ability can be enhanced. To do the study, the research questions and null hypotheses were presented:

Research Questions

1. *Does PBL have any significant impact on EFL learners' transactional distance in online education?*
2. *Does PBL have any significant impact on EFL learners' reading comprehension ability in online education?*

Null Hypotheses

1. PBL has no statistically important impact on EFL learners' transactional distance.
2. PBL has no statistically important impact on EFL learners' comprehension ability.

METHOD

Participants

The initial target population in this research was 123 undergraduate EFL learners majoring in different fields of studies including computer, electronic, and mechanic engineering. The participants were both male and female with the age range of 18-40. The analysis of results in the Key English Test (KEY), and ESOL proficiency exam suitable for elementary level English learners, showed that 104 learners met one standard deviation (SD = 12.05) criterion below and above the mean (M = 29.30). The technique of Convenience sampling was implemented in this research. Three groups were comprised of the main participants, including pilot (N = 24), control (N = 40), and experi-

mental (N = 40). Due to the coronavirus, the online PBL method was followed in the experimental group and the online lecture-based method was implemented in the control group.

Instruments

Key English Test, an elementary level Cambridge ESOL exam, was implemented to measure learners' level of proficiency. KET includes four parts listening, speaking, reading, and writing; however, only the reading and writing parts were used in this research because of the existence of some problems regarding practicality. There were nine parts in the reading and writing sections with 60 possible marks. Consulting four experienced teachers at the university, the content validity of this test was ensured. The test's reliability was also calculated to be .75 through Kuder-Richardson's formula.

The Revised Scale of Transactional Distance (RSTD) was implemented in this research. This test has been developed by Paul, Swart, Zhang, and MacLeod (2015) by making changes to the original one by Zhang, (2003) and included 15 items. The first 12 items measure perceived transactional distance between students and teacher (TDST), students and students (TDSS), and students and content (TDSC). The next three items measure students' satisfaction, level of learning, and learning goals. The students were required to rate all the items on the given 5 Point-Likert type scale ranging from "strongly agree" to "strongly disagree". As the focus of this paper was on transactional distance, only the first 12 items were used. The Persian translation of the questionnaire was implemented. Its content validity was analyzed by consulting four knowledgeable teachers in EFL at the university and then, through Cronbach's alpha formula, its reliability was calculated to be .90.

Students' comprehension ability was assessed by a pre-and post-test. As reading comprehension constitutes a major part of the course in General EFL courses, the pre-and post-test focused on comprehension in terms of vocabulary, grammar, and text structure.

Considering the learner's proficiency level determined as the beginner level based on the results in KET, "Cover to Cover: Reading Comprehension and Fluency" (Harsch & Kocienda, 2008) was used. This is an elementary-level textbook suitable to implement in EFL courses. The source of instruction and assessment was this book in this research. Both pre-and post-tests included 60 questions and the total mark was out of 20. Consulting four knowledgeable teachers at the university, content validity was ensured, and reliability was calculated through Kuder-Richardson's formula to be 0.97.

As scaffolds, worksheets and Problem Definition Template (PDT) was implemented in the PBL group to enhance learning. PDT, described by scholars as a cognitive template, helped learners to recognize their new learning needs and their previous knowledge. To solve problems in comprehension, PDT encouraged learners to propose a plan. By implementing worksheets, learners engaged in doing various learning tasks to both recognize important components in comprehension and solve their learning problems.

Procedure

Before the main treatment, KET was presented online to the students to measure their degree of homogeneity in proficiency. To identify and ensure the learner's comprehension problems and to make the treatment procedures easy considering the time and stages, pilot research was conducted by implementing worksheets and problem definition templates. The results of the pilot study indicated that the students had comprehension problems in terms of vocabulary, grammar, and text structure. After considering the findings, some comprehension questions were changed by the researcher. The reliability and content validity of tests were also determined.

During the main treatment, RSTD and comprehension pretests were administered online to all the learners in both the control and experimental groups. All information regarding the PBL method was presented to the PBL group for one session of the main study. After the treatment, RSTD and comprehension posttests were administered online in both groups.

The treatment and Administering tests continued for 18 sessions covering six lessons from

the coursebook. The researcher conducted instruction in both groups. In the PBL group, before starting to read texts, one authentic problem regarding the texts was presented online to the learners. To solve the stated problem, the learners ought to read the text. A sample of the problem can be given like the following:

"Nowadays, stress is considered a big problem in daily life. Can you express the reasons for stress? How can you reduce stress?"

The students were supposed to read the problem online in class to understand it. They were expected to read the text to solve the stated problem; however, they had to overcome their comprehension problems in the first step. For this purpose, PDT was presented to them. PDT, helped them, first, identify what they knew about the texts including vocabulary, grammar, and text structure; second, notice what they did not know considering vocabulary, grammar, and text structure; third, establish what they needed to know. Generally speaking, this part of the treatment assisted them to contextualize comprehension problems and putting forward a plan to prioritize their learning needs. At the end of the first session, the teacher guided PBL learners toward self-directed studying at home. To assist them, the teacher introduced different sources of study. The learners needed to study PDTs again at home to organize their thoughts. To facilitate and pace their learning, a worksheet was also given to them to accomplish. Posing varieties of questions and cues within the worksheet smoothly helped learners identify comprehension problems. The learners were asked to have worksheets and PDTs with themselves in the online class. In the next online class, the problems were presented and discussed. The students presented their solutions, first, to comprehension problems and then to the stated authentic problem. The teacher helped the learners in presenting their findings. In the last phase, the learners assessed the learning process by completing peer and self-evaluation reports.

The traditional lecture-based teaching method was followed in the non-PBL or control group. To start reading and comprehending texts, first learners were required to look at the topic to guess what it meant and what the text could be about. The instructor asked some contextual and textual questions regarding the pictures, captions, heading, and sub-headings. The learners, in this way, we're able to get a general idea of the topic. The instructor, then, began reading the text, translated it, provided the necessary explanation regarding new vocabularies, synonyms, and antonyms, and clarified the text structures implemented within the text. After reading the text, the learners were required to ask their questions. The students were, then, asked to do all exercises at home. The answers were checked in the class and the teacher provided essential explanations in the next session.

RESULTS

Language skill uniformity in three groups was determined by one-way ANOVA. First, the results conducting One-Sample Kolmogorov-Smirnov revealed normal distribution in pilot D = .12, P = .19 > .05, the PBL D = .12, P= .08 >.05 and the control groups D = .12, P = .07 > .05. The mean scores were, then, calculated (Table 1).

Table1

Descriptive Statistics in KET

	N	Mean	Std. Deviation	Std.Error
Pilot	24	28.30	4.93	1.25
Experimental	40	30.50	6.05	1.10
Control	40	28.22	5.05	.94
Total	104	29.00	5.34	.62

According to Table 1, the mean scores in the three groups are close to one another. To probe the significance of the difference between mean scores, a one-way analysis of variance was applied (Table 2). As Table 2 shows, there is no meaningful difference in proficiency level between groups, F (2, 99) = .87, P = .40 > 0.05. The effect size was small (eta squared = .01) designating that the three groups were homogeneous. Considering the

first research question, One-Sample Kolmogorov-Smirnov was conducted to examine the normality of scores distribution in both RSTD pre-and post-test.

Table 2
Results in One-Way ANOVA

	Sum of Square	df	Mean Square	F	Sig.	Effect Size
Between Groups	73.60	2	36.79	.87	.40	.01
Within Groups	4120.30	99	41.60			
Total	4194.00	101				

The findings indicated normal distribution in both pre- D = .81, P= .5 >.05 and posttest D = .93, P = .32 >.05 in the PBL group and normal distribution in both pretest D = .92, P = .33 >.05 and posttest D = .83, P= .44 > .05 in the control group. In the second step, learners' total scores and their scores in three subscales in RSTD were calculated in both groups. The possible minimum and maximum scores were 12 and 60. To probe the impact of PBL on learners' transactional distance, a multivariate analysis of variance was used (Table 3).

Table 3
Multivariate Test box: Mean Difference between Experimental and Control groups in Transactional Distance

	Value	Sig.	F
Wilks' Lambda	.20	0.000	86.64

According to Table 3, the result represented meaningful differences in learners' transactional distance in both groups, F= 86/64, P > 0.05, and Wilks' L= 0.20 indicating that the PBL group had a low level of transactional distance compared to the control group. F test was implemented to examine the significance of the difference in learners' level of transactional distance in three components of RSTD as Table 4 indicates.

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Table 4
F-test to Compare Transactional Distance in Three Sub-Scales

Three sub-scales	df	F	sig
TDST	1	97.26	0.000
TDSS	1	16.20	0.000
TDSC	1	20.60	0.000

Table 4 indicates that there is a significant difference between the two groups considering transactional distance components, TDST, F = 97.26, P < 0/05; TDSS, F = 16.20, P < 0/05 and TDSC, F = 20.60, P < 0/05, showing that the PBL group had high interactional level in comparison to the control group. Based on the descriptive statistics presented in Table 5, two groups can be compared in detail. Considering the mean scores (Table 5), it was clear that PBL students had high interaction or in other words, low transactional distance in comparison to the control group. The first null hypothesis, thus, was rejected.

Table 5
Means and Standard Deviation in the PBL and Control Groups Considering Transactional Distance

Dependent Variable	Group	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
TDST Posttest	PBL	4.94	.99	4.50	4.98
	Control	3.15	.99	3.23	4.17
TDSS Posttes	PBL	4.23	.99	4.30	4.80
	Control	2.87	.99	3.64	4.07
TDSC Posttest	PBL	4.05	.99	4.00	4.33
	Control	3.00	.99	3.86	4.02

A Covariates appearing in the model are evaluated at the following values: TDST-pre= 2.80, TDSS- Pre= 2.00, TDSC-pre= 2.18.

With regard to the second research question, the results of One-Sample Kolmogorov-Smirnov test indicated normal distribution of scores both in pretest D = 82, P = 51 > .05 and posttest D = .93, p = .34 > .05 in the PBL group and pretest D = 92, P = 34 > .05 and posttest D = 84, P = 44 > .05 in the control group.

Next, the total scores in reading comprehension pre- and posttest were computed. To investigate the impact of the PBL method on students' academic achievement, Ancova was conducted (Table 6).

Table 6

ANCOVA Results in Comprehension Pre- and Posttest

	Sum of Squares	df	Mean Square	F	Sig	Eta
Pre	131.98	1	131.98	27.96	0.000	.25
Group	432.90	1	432.90	90.28	0.000	.52
Error	356.02	77	4.74			

Acording to Table 6, the influence of pretest scores as covariates was statistically controlled in the PBL and control groups. The results, F = 90.28, P = .000 < .05, ηp2 = .52, indicate that there is a meaningful and important difference in both groups considering comprehension ability. Table 7 shows descriptive statistics in the control and PBL posttests (Table 7).

Table 7

Means and Standard Deviation in the PBL and Control Groups Considering Comprehension

Group	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
PBL	17.50	.33	16.02	17.80
Control	12.37	.33	11.68	12.80

According to Table 7, considering the mean scores, the PBL group could enhance their academic achievement to a high extent in comparison to the control group. Therefore, the second null hypothesis was also rejected.

DISCUSSION

This study an endeavor investigated the impact of the PBL method on EFL students' transactional distance and comprehension ability. Regarding the first research question, the findings manifested that PBL reduced EFL learners' transactional distance and enhanced their interactional level. This result is in line with the studies, which denoted that applying a suitable method of teaching with a particular course structure that includes demanding academic principles, and encourages collaborative learning context and self-governing learning skills could decrease transactional distance (Baber, 2020; Derakhshan et al., 2021; Kara, 2021; Knapp, 2018; Pawlak, Kruk, Zawodniak, & Pasikowski, 2020). The findings regarding the second research question also showed that the PBL learners could enhance their reading comprehension to a high extent in comparison to the learners in the control group. This result is in accord with prior findings, which indicated that PBL had a positive impact on academic achievement (Baresh et al., 2019; Lin, 2015, 2017; Wosinski et al., 2018; Yukselturk & Yildirim, 2008). The PBL theory justifies the findings in this study in this way that transactional distance is decreased and knowledge acquisition is boosted by stimu-

lating the learners to work out real life-like problems by acquiring and implementing knowledge through self-directed studying, and reflecting on learning (Hung, 2013).

The low level of transactional distance and highly improved comprehension ability in the experimental group can be clarified by the paramount status of PBL as the constructivist method of teaching which focuses on the acquisition and application of knowledge through experiential learning (Keegan, Losardo, & McCullough, 2017). The progression of knowledge that is achieved through experiential learning and begun by presenting real life-like problems and goes on with collaboration and self-directed learning to set and pursue learning goals decreases learners' transactional distance and enhances deep and meaningful learning (Abu-aisheh et al., 2016). In this research, specifying authentic learning ends encouraged learners in the PBL group to use various sources of knowledge and their background knowledge, take part in group working and self-directed studying and use PDT and worksheet as scaffolds. They, as a result, could actively take part in interactions and in this regard, they could decrease their transactional distance and enhance their academic achievement.

The main factor for success in PBL is a high level of interaction between students-student, teacher-students, and students-content. Parrot-like repetitiveness in lecture-based learning results in students' boredom and disengagement and as a result, increases transactional distance (Pawlak et al., 2020). In PBL, however, enhanced level of interaction among teacher, students, and learning content by pursuing self-construction of knowledge through identifying new learning needs and finding ways to solve learning problems acted as a motivational tool, decreased stress levels, and helped them to decrease transactional distance and enhanced academic achievement (Mercer & Dörnyei, 2020; Michaelsen, Davidson, & Major, 2014).

Implementing scaffolds is the second main factor. Presenting the right types of scaffolding is an indispensable aspect of PBL and acts as-needed support for learners, especially in educational courses with many low-achievers to increase their level of interaction, especially with the learning content (Haruehansawasin & Kiattikomol, 2018). In this study, scaffolds assisted learners in both actively and independently working in class and at home. Implementing cognitive templates such as PDT acted as a motivating factor and persuaded learners to notice the significance of their prior knowledge, identify new knowledge areas and present an action plan to not only solve comprehension problems but also search for ways to acquire new learning needs. Worksheets also supplied a smooth way for learners and moved them along several steps to clear their reading problems up and obtain new knowledge areas in reading easily. The learners, then, could enhance their interaction, especially with learning content that otherwise would be impossible due to a low level of language proficiency in class.

An autonomy-supported context resulting from self-directed learning was the third main factor that positively affected transactional distance. Independency in self-directed learning moved learners towards thinking and acting autonomously and managing their learning process (Fukuda, Sakata, & Pope, 2019; Hamed, Al Masri, Smadi, & Maharmah,

2015; Rashid & Asghar, 2016). In this study, introducing varieties of sources and implementing scaffolds enhanced learners' involvement in acquiring new knowledge areas and doing tasks, which decreased transactional distance and encouraged deep active learning.

Reflection and self-evaluation as the fourth factor raise learners' meta-comprehension and lead to learning regulation and performance enhancement (Reid, Morrison, & Bol, 2017). In this research, reflection assisted learners to realize their weaknesses and strengths in comprehension and assess their level of progress.

It enhanced learners' satisfaction and self-confidence and as a result, brought about low

transactional distance and high academic performance (Ekwunife-Orakwue & Teng, 2014).

Following the lecture-based method was the main impediment in the control group, which resulted in the high transactional distance and low comprehension ability. The main elements of constructivism including scaffolding, reflection, and self-construction of knowledge were absent in this method. Implementing this method, learners followed parrot-like learning, were passive, and relied on the teacher as the sole active participant in the class, which prevented deep active learning.

Transactional distance as a psychological and communicational distance is a function of learner autonomy, course structure, and level of interaction (Kara, 2021).

Therefore, generally speaking, in traditional methods, lack of flexibility in course structure, low level of interaction, and loss of learners' independence resulted in the high transactional distance and low academic performance (Bolliger & Halupa, 2018). The limitations of this research should not be overlooked. Participants in this study were in non-English majors, so the results cannot be generalized to English majors. Since the sample size was small**,** the results of this study need to be carefully generalized.

The instructor acted as both the researcher and the teacher. Although this ensured the carefulness of procedures but acted as a bias to generalize the findings.

CONCLUSION

Due to the inefficiency of the lecture-based method to cultivate deep meaningful learning, this study attempted to implement PBL. The findings proved that by focusing on the acquisition and implementation of knowledge through experiential learning, PBL could decrease transactional distance which is considered the main learning obstacle by many scholars (Goertler & Gacs, 2018; González- Lloret, 2020) and could enhance reading comprehension ability, an important skill in EFL contexts to acquire professional knowledge in different subject fields (Lin, 2017). This study, then, provides support for following the constructivist teaching method in EFL courses with many low-achievers to decrease transactional distance and enhance comprehension ability. Since there is not enough empirical testimony, the significance of this research stems from the fact that it probed the impact of one constructivist teaching method named PBL in the Iranian EFL educational setting. The results of this study can demonstrate that it is possible to bring about changes in educational settings to promote language learning and class is the main place where the change can occur.

This study yields useful pedagogical implications in EFL instructional settings. PBL could enhance the learning experience of students, especially in Iranian EFL contexts; therefore, there is a need to draw the teachers and practitioners' attention to this efficient method and encourages them to implement this student-centered method in EFL context especially in reading classes if they want to decrease learners` transactional distance and activate deep life-long learning. Teachers should apply experiential learning methods like PBL to encourage learners' active participation and independence. Success on PBL depends on effective scaffolding (Haruehansawasin & Kiattikomol, 2018). Teachers, then, must apply suitable scaffolds to help low-achieving learners reach threshold levels of proficiency.

To open some potential new areas of research, this study can present some fruitful recommendations. For future research, it is suggested to study PBL in EFL major classes. Hard scaffolding was used in this study because of its effectiveness (Haruehansawasin & Kiattikomol, 2018). It is, thus, recommended to probe it in classes with English majors, too. To remove the teacher as the bias in generalizing the findings, the instructor and the researcher can be different individuals.

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Biodata

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