



Original Article

A Study on the Effectiveness of Grammar Intervention PBL in Secondary School English Reading in China

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Abstract: This paper compares the effectiveness of grammar intervention problem-based learning (GIPBL) and problem-based learning (PBL). PBL is a constructivism-based popular teaching pedagogy previously used in medical education, then widely applied in other fields education, including junior high school English reading teaching. But, researchers of Scaffolding learning theory argue that grammar intervention PBL (GIPBL) is more suitable for Junior high students in English reading courses. For comparing the effect of GIPBL and PBL on satisfaction and learning process in junior high school Grade 3 students, this study does a quasi-experimental study in Jiang (2015) Foreign Language Experimental School in Sichuan Province, China. The participants include 120 students of grade 8 in two different classes in Junior High School. Experimental and control groups are designed. The experimental class is taught in GIPBL and the control class is taught in PBL. Both classes are learning English reading, an important part of the English course. Pre-test and post-test were applied. The instruments were a demographic questionnaire, reading test and satisfaction questionnaire. The result shows students' reading comprehension scores in GIPBL are better than those of the control group. GIPBL broadens the implementation of PBL in practice. There was more satisfaction with GIPBL. 82% of students thought GIPBL was a more acceptable and effective teaching method. The result shows that Grammar Intervention PBL suits junior high and middle school students in English reading courses.

Keywords: Grammar intervention; Problem-based learning; Comprehension; English reading.



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1. Introduction

According to the requirements of Education, English is one of the main subjects in China from elementary school until college level. According to the Ministry of China, students must acquire proficiency in four primary English learning skills: listening, speaking, reading, and writing. The proposition of standardised and fundamental competencies in educational levels, such as junior and senior high school levels, asserts that the purpose of learning English is to enable students to comprehend English texts. Additionally, reading is indispensable for students to obtain knowledge and novel information. Stone contends that reading is a fundamental objective that students must master to succeed academically

and personally (Sharpley & Stone, 2009). As such, the importance of reading extends beyond education, as students can also benefit from it by acquiring vital information for their future and real-life endeavours. Reading comprehension constitutes the subsequent stage of reading as it encompasses the contextual aspects of text, grammatical nuances, vocabulary, and other related components (Utomo & Syamsi, 2019).

According to Alyousef (2006), reading comprehension is a dynamic process in which the reader uses information from a given text to formulate meaning. Reading comprehension entails the utilisation of reasoning and memory recollection to locate and comprehend the conveyed information. The concept of reading comprehension also revolves around discovering and comprehending the information encapsulated within the reading texts. Furthermore, reading comprehension aims to capture key points for recollection, which subsequently impacts one's cognitive abilities and fosters a sense of satisfaction in comprehending the provided material. Reading comprehension is vital because failure occurs when one learns to listen or read but still has a problem understanding what is read and hearing the content that is both heard and read (Iskandar et al., 2021). To enhance middle school students' English reading comprehension, researchers did many quantitative researches in higher education, which show that PBL can be an effective way to improve comprehension. However, the adoption of PBL in middle school English reading courses, i.e. the PBL adoption heavily influences them in tertiary education in which teachers over-emphasise students' involvement but neglect students' real understanding of English articles, compared with the knowledge of students in a conventional learning environment (Dochy et al., 2003).

Middle school students are different from college students. Scaffolding is needed for students who experience problems in reading comprehension when they are reading. The modern construction theory believes that learning is a process of active construction learning based on knowledge and experience. The second problem is that influenced by communicative language teaching and PBL teaching model, many teachers neglect grammar teaching in English reading courses. Grammar becomes a barrier for reading comprehension. Grammar teaching is not contradictory to PBL. It is a misunderstanding of PBL to exclude grammar teaching. Although this phenomenon exists in English reading teaching practice, there is little research about grammar intervention PBL in English reading teaching. These papers compare the effectiveness of GIPBL and PBL and explore perception of teachers and students about grammar intervention PBL.

In implementing PBL in middle school, one problem still exists: students lack grammatical teaching in reading class. On one side, junior high school English teachers are heavily influenced by the PBL adoption in tertiary education in which teachers over-emphasise students' involvement but neglect students' real understanding of English articles (Dochy et al., 2003). Middle school students are different from college students. Scaffolding is needed for students who experience problems in reading comprehension when they are reading. For the students' self-discipline and good habits, junior high students often have limited access to mobile phones and the Internet. Furthermore, their school day is fully scheduled, leaving little time for teamwork information collection. Thus, a teacher's minimum lecture becomes necessary to facilitate student learning. Conversely, it is influenced by communicative language teaching and the misunderstanding of the PBL teaching model.

Many teachers neglect grammar teaching in English reading courses. Teachers focus on thinking qualities such as reasoning, judging, and deduction so that students can find the answers to the questions in the reading passage and gain high marks. They consider it "dull" and "old-fashioned" or not PBL model if they transmit grammar knowledge directly in English class. Deng & Lin (2016) found that "teachers' grammar teaching tends to be communicative teaching" in China. The PBL model used just for high marks without real comprehension is a backwash effect of examination-oriented education. It violates the principles of PBL and constructivism. Without a real understanding of the reading passages, the reading course may fail to meet the content requirement of Compulsory Education English Curriculum Standards 2022 (CEECS) by the Education Ministry of China, violating the spirit of PBL teaching pedagogy. Thus, this study seeks to draw the PBL theory and Vogotsky's scaffolding theory. Accordingly, two research questions are proposed: Is the GIPBL model more effective than PBL in junior high school English reading classes, and how can grammar intervention PBL be implemented in high school English reading classes?.

These studies compare the effectiveness of GIPBL and PBL in junior high school English reading class. It has both theoretical and practical significance. As to the theoretical significance, it broadens the study of implementing strategies of PBL in English teaching. As to the practical significance, it meets the requirements of the CEECS (2022) on students' reading ability and scientifically applies PBL teaching method to the English reading teaching of junior middle school students in China. Therefore, it is an effective implementation of the requirements of contemporary reform. It forms an operable teaching reference model conducive to improving students' English reading comprehension and the practicability and effectiveness of English reading teaching.

2. Literature Review

In the 1960s, research on the PBL method appeared. But most of them were limited to medical education (Barrows, 1996), practice-based learning: PBL applied to medical education, that PBL was an essential method for medical students to explain the actual medical problems and to learn the reason for their patient problems (Barrows,

1996). As the PBL research extended into other fields, studies on the application of PBL appeared. Evensen et al. (2000) pointed out that "PBL teaching method has become a very popular teaching method for English reading". Stanovich et al. (2011) proposed applying the PBL method in reading teaching. He regarded reading as a text for interactive activities between students. Dahlgren et al. (1998) pointed out that PBL is a teaching method that emphasises problem situations. Ngeow & Kong (2001) pointed out that PBL pedagogy requires students to read reference materials and constantly relate the content of their reading materials to the problems they need to solve during the reading process. Anderson (2012) pointed out that in reading, especially in the face of reading ambiguous articles, readers need more relevant experience and understanding of the background knowledge of the articles. Othman & Ismail Ahmad Shah (2013) believed that problem-solving tasks include collecting information to solve problems in real situations, which involves many reading materials, and students will make use of various possible resources, such as readable books and library databases. It can enrich students' knowledge and broaden their horizons. Foreign scholars have applied and studied the PBL teaching method in the early stage of teaching model development. Although the number of literatures is very limited, the relevant personnel abroad have affirmed the important role of PBL teaching method in English teaching and the role of PBL teaching method in English reading teaching.

As the Ministry of Education in China demanded the PBL method in middle school English teaching, many scholars began to study the application of PBL in middle school English reading teaching. Bai et al. (2021) pointed out that students' ability to infer the author's intention, opinion and attitude can be learned through questions (Bai et al., 2021). Zhang (2017) found in her research on junior high School English reading teaching that the problem teaching method (PBL) can not only improve students' scores, but also reform the traditional junior middle school English reading class, and produce positive effect (Zhang, 2017). Liu (2023) proposed in his paper that to improve the enthusiasm of junior high school students in English reading and learning, we can try PBL problem teaching, which can activate the students divergent thinking, active participation and problem-solving (Liu, 2023). Yu et al. (2022) applied PBL teaching to cultivate students' critical thinking.

To sum up, there lies 2 gaps in the studies on PBL teaching method in English reading above done by Chinese scholars: (a) Most of the researches are mainly theoretical. Some specific application strategies need to be proposed. (b) Since PBL focuses on real life tasks to cultivate students' ability to communicate in English. Many researchers hold a misunderstanding of the application of PBL method. They regard PBL method as teaching-learning activities without any grammar teaching. That is PBL method and grammar teaching is zero-sum related. There is little research on applying the PBL method in middle school English reading teaching involving grammar teaching. Lonergan et al. (2022) argued that compared to tertiary students for whom PBL was developed, early adolescent learners, as found in Grade 8 in Australian schools, are developmentally less mature and have less experience as successful learner (Lonergan et al., 2022). Strom (1956) added that the nature of the instruction in grammar and syntax caused the relationship between reading and grammar and syntax.

Therefore, the researcher examines the effectiveness of GIPBL to enhance students' comprehension in English reading class. Grammar is a systematic set of regulations that dictate the customary organisation and correlation of words within a sentence (DeCapua, 2017). The Structural Deficit Hypothesis (SDH) holds that trouble acquiring reading is caused by syntactic deficiencies (Bowey, 1986; Stein et al., 1984). Some scholars contend for the "repositioning of grammar instruction to achieve deep reading comprehension (Yan et al., 2019). "Communicative competence" should encompass "linguistic performance" during language application. Both sides of communication need to know the accuracy of communication words in the structure and the practicability, suitability, and intention behind the communication words in the specific linguistic setting (Hymes, 2011). Kobayashi contends that a specific level of proficiency is requisite to establish a comprehensive comprehension of the text. This level, in turn, may validate the notion of a linguistic threshold (Rinnert et al., 2015). As stated by Shiotsu & Weir (2007), the understanding of syntax plays a crucial role in comprehending written texts, particularly for learners up to a certain proficiency level. So, a good command of grammar is beneficial for language learners to construct effective and meaningful sentences (Gao et al., 2020). Hence, in PBL classes without grammar instruction, middle school students' self-confidence and interest gradually decreased in PBL English classrooms.

3. Materials and Methods

This paper applied a mixed method and a quasi-experiment, with a control group of n=60 students and an experimental group of n=60 students. Scientific pre-tests and post-tests were performed. The instruments used include a self-assessment questionnaire, reading performance test and interview. The instruments' validity and reliability were analysed. SPSS 26 was used to analyse the data.

3.1. Population and Sampling

The population of this paper was junior high middle school students in grade 3 who are taking English reading courses. The population criterion includes a) students in Grade 2 in junior high school. b) Already taken an English

reading class in PBL. c) Students in Grade 2 in junior high school. d) Students in Sichuan Province because Sichuan has the largest number of students in China, it is somehow representative. This study is quasi-experimental, containing control and experimental groups, each including 60 students. This paper conducted a quasi-experimental study and chose two groups 2 parallel and intact classes from [Atwood \(2000\)](#) Foreign Language School. The participants are students from two parallel classes (class 5 and class 6) in Grade 2 in [Jiang \(2015\)](#) Foreign Language Laboratory School, a middle school. Students from these two classes had the same English basis, and the same English teacher taught them. They learn English reading within the same class hour, sharing the same reading material but with different teaching methods. Grammar Intervention PBL taught one group while Pure PBL teaches the other group.

3.2. Data Collection Technique

The English course took 4 hours a week and the reading course lasted 3 weeks. The course taught 3 major types of English reading materials: expository writing, narration writing and argumentative writing. The difficulties of all these reading materials are equal to the senior high school entrance examination, which Grade 9 students from junior high school need to take in the future. According to the China Standard English Ability Scale, students who have learned these reading materials and finished the exercises can develop their 3 reading abilities, including reading ability, detailed comprehension ability and theoretical generalisation ability. The two groups were taught using two different teaching methods. The students from the control group were asked to form a learning sub-group, and they were given some guiding questions and asked to find the answer by reading through the passages. They learned the articles together, and when they encountered problems, they had to search for documents themselves and try to find the solution. Their problems may be vocabulary, grammar, or knowledge gaps. The students from the experimental group took part in the same activities as students from (control group) PBL. In addition, they were given some scaffolding or help from teachers. Considering some grammar may be barriers affecting their comprehension, the teacher gave them minimal grammatical lectures on the passage they were reading, like sentence structure, vocabulary and knowledge, which may help them construct meaning smoothly.

3.3. Intervention

3.3.1. PBL group

According to constructivism, meaning is constructed by students themselves when reading. Students in this group are given some triggering problems. Then, students are divided into several sub-groups; they read through the passages and search the answers to the question in group work. When they encounter new vocabulary or sentence structures, they learn this knowledge by themselves. PBL group works as in Figure 1 below:



Figure 1. PBL Method Work

Source: [Spence \(2004\)](#)

3.3.2. GIPBL group

In GIPBL, when problems were given to students, the teacher / the tutor did a survey and provided scaffolding by giving a minimal lecture on complex sentence structure, grammar barriers and new vocabulary. Then, students formed sub-groups. After each sub-group read through the passage, they discussed the problem, shared information and searched for the solution of the problem. Upon completion of the problems, each sub-group shared their answers. Then, the tutor gave a short feedback on the passage's information and the grammar errors students had made. The grammar intervention PBL involved redistribution of reading exercise elements: content, learning activity, time allocation and assessment. First, the learning content focused on students' thinking skills like summarising, inferring, and reasoning, and language knowledge like sentence structure, tense, active/passive voice, sentence component, subject-verb agreement, etc. According to Wikipedia, reading comprehension pertains to analysing written text, grasping its significance, and merging it with the reader's existing knowledge. According to the CEECS, discourse receptive skill includes a) analysing the basic syntactical features and the content relationship of a discourse. b) to understand the explicit and implicit logic relationship in discourse. In grammar intervention PBL in reading exercises, teachers should give lectures or organise learning activities concerning grammar.

Second was the modification and redistribution of activity. Grammatical lecture or scaffolding was offered, emphasising interaction between teachers and students through content discussion and knowledge sharing. It is aligned with Vygotsky's scaffolding theory. Scaffolding is used to visualise a teaching mode in which the teacher guides

the teaching process, enabling the students to grasp, construct and internalise the acquired knowledge and skills, thus enabling them to perform higher-level cognitive activities (Slavin, 2011). Because of junior students' age, cognitive level, limited learning time and limited access to resources like the library and the Internet, junior high students in China need help and scaffolding. Third was the reallocation of time for different activities. The grammatical teaching time was added and expanded to 15 minutes or 1/4 (total of 60 minutes). The reading exercise contextualised the grammar It echoes the discipline of PBL and constructivism in grammar teaching to contextualise students in the real-life problem.

Fourth was the modification and redistribution of assessment. The assessment tool presently in use is the test containing several multiple-choice questions. Students choose the right answer from the four multiple-choice choices to prove their mastery of the passage. However, the test result can't reflect students' real comprehension level. The accuracy of multiple-choice questions is equal to comprehension ability. The author draws on the requirements and sample questions for the academic proficiency test from CEECS by the Education Ministry of China and adds subjective questions about passage comprehension to the test. As for the second modification, when problems were given to students, the teacher / the tutor did a survey and provided scaffolding by giving a minimal lecture on complex sentence structure, grammar barriers, and new vocabulary. Then, students formed sub-groups. After each sub-group read through the passage, they discussed the problem, shared information and searched for the solution to the problem. Upon completion of the problems, each sub-group shared their answers. Then, the tutor gave a short feedback on the passage's information and the grammar errors students had made. The grammar intervention PBL worked as shown below (Figure 2):

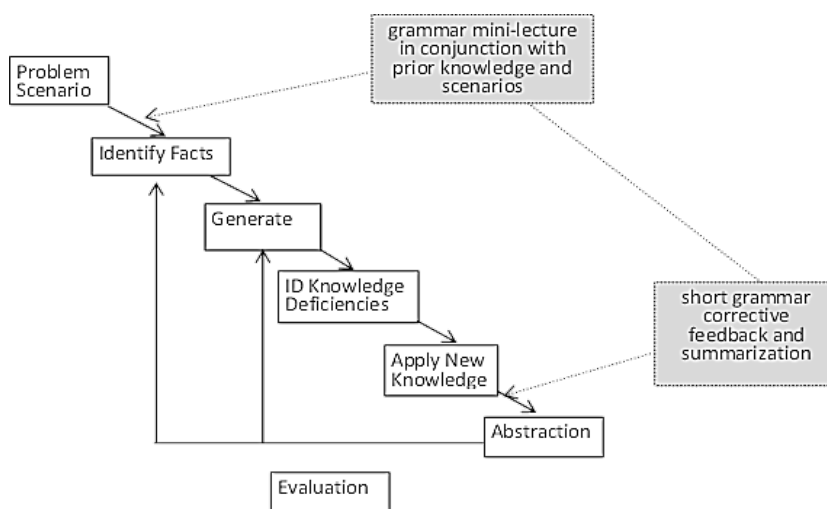


Figure 2. Grammar Intervention PBL

3.3.3. Measurements

Three instruments used for data collection were as table 1 below:

Table 1. Three Instruments Used in the Paper

No.	Instruments	Methods	Objectives
1	Demographic Data Form	Chi-square, Independent sample t-test	To analyse demographic characteristic
2	Pre-test and Post-test of reading test	Paired t-test, ANOVA	To control the effects
3	Satisfaction of teaching method	Sample t-test	To compare students' satisfaction, mean score

The "Demographic data form" includes students' age, gender, family education background, and graduate primary school (located in a city or town). It is designed on the basis of the demographic data form of Safari et al. (2006). The reading test: two parallel multiple-choice questions pre-and post-tests. They are developed according to the content of the reading passages to measure students' achievement in reasoning ability, detailed comprehension ability, and thematic summarisation ability. The scores of pre-test and post-test distribution were as shown in Table 2:

Table 2. Pretest and Post-test of GIPBL and PBL

Teaching Method	Reading Test	Unaccepted	Medium	Good	Perfect
Grammar Intervention PBL	Pre-test score				
	Post-test score	0-4	5-6	7-8	9-10
Pure PBL	Pre-test score				
	Post-test score	0-4	5-6	7-8	9-10

The satisfaction questionnaire is about student' satisfaction on teaching method. It is designed based on Likert scale, ranging from "strongly disagree" (0) to "strongly agree" (4). It consists of 22 questions, thus the score ranging from 0 to 88. It was finished by both grammar intervention PBL group and Pure PBL group at end of experiment. The score distribution is as Table 3 below:

Table 3. Students' Satisfaction Questionnaire Analysis

Teaching Method	Strongly Disagree	Disagree	Medium	Agree	Strongly Agree
Grammar Intervention PBL	=<0.8	=>0.8-1.6	=>1.6-2.4	=>2.4-3.2	=>3.2-4
Pure PBL	=<0.8	=>0.8-1.6	=>1.6-2.4	=>2.4-3.2	=>3.2-4

4. Results

4.1. Students' Demographic Characteristics

Mean (SD) age of both groups were 15.2(\pm 1.02) and 15.5(\pm 1.03) years. The mean total scores in the final exams were 16.07(\pm 0.72) in GIPBL, while the mean score of the PBL group was 16.02 (\pm 0.89), with 20 being the highest possible mean total score. These two groups' differences were insignificant (p >0.05).

4.2. Students' Reading Test

The control group's pre-test means score was 4.96 \pm 1.48, while the experimental group was 5.17 \pm 1.5. The difference between the two groups has no significance. The mean post-test scores for the GIPBL group were 9.63 \pm 0.55, and for the PBL group were 6.87 \pm 1.06, as shown in Table 1. It demonstrates that, during this term, GIPBL was higher than PBL. (p <0.001, t = -11.072). As illustrated in Figure 1, the experimental group's mean degree of changes in the students' pre- and post-test total scores, which showed the learning process, was 12.31 \pm 1.72 points higher than the control group's (10.11 \pm 1.6) points (F =23.55, p <0.001).

4.3. Students' Satisfaction

Even though both groups' student satisfaction ratings with the instructional strategies were high, in comparison to the PBL group, the GIPBL group's [2.863(\pm 0.58)] showed significantly higher levels of interaction among students in the classroom (t = -10, p <0.05), more profound learning (t = -3.9, p <0.001), and preparation for final exams (t = -3.9, p <0.001). In contrast, the control group's learning of the course material was more challenging (t = -3.15, p <0.01). A substantial association (p >0.05) between satisfaction levels and learning progress was found in both groups, according to the Pearson correlation analysis (r =.4 in the GIPBL group and r =.32 in the PBL group). According to Table 4 and Figure 1 below, students in the GIPBL group were more satisfied with the teaching approach, even when academic success was not considered.

Table 4. Mean (and standard deviation) pre-and post-test scores in GIPBL and PBL groups

Topics	Groups	n	Pre-test scores		Post-test scores	
			Mean	Std.Dev	Mean	Std.Dev
GIPBL	Control	60	2.09	.99	6.88	1.07
	Experimental	60	2.25	.99	9.64	.56
PBL	Control	60	2.09	.99	8.24	1.02
	Experimental	60	3.00	.86	7.86	1.30

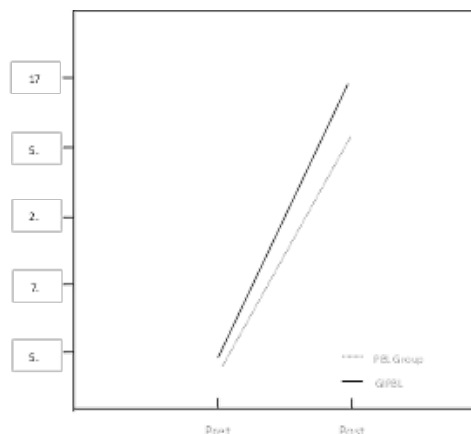


Figure 3. Comparing Learning Progress in GIPBL and PBL

5. Discussion

This paper proposes that grammar teaching intervention in PBL can enhance students' comprehension ability in English reading class more than pure PBL by comparing the effectiveness of grammar intervention in PBL. In the USA, [Tausch \(2012\)](#) at Louisiana State University compared the performance of experimental and control classes and found significant effectiveness of grammar intervention in her doctoral dissertation titled *A Syntax-based Reading Intervention for English a Second-Language Learners*. Kersey University in the USA proved the effectiveness of grammar intervention in reading comprehension in her doctoral dissertation titled *Grammar in the Classroom: An Exploratory Study of Teaching Practice and Perception of Grammar and Reading Comprehension* ([Bodine-Landis, 2023](#)). The relationship between grammar and reading comprehension has also shown high correlations ([Catts, 1993](#); [Catts et al., 1999](#)). [Straw & Schreiner \(1982\)](#) analysed the effectiveness of grammar instruction on reading comprehension. They found that students engaged in sentence combination got high scores on a reading cloze task, while the students in a control group got average scores. [Neville & Searls \(1991\)](#) compared students in a sentence combination (96 lessons) group with students in a control group who only finished their reading in class. They took treatment for a considerable long time.

After the treatment, students' comprehension in the sentence combination group improved significantly. In China, similar studies guide technical routes for this study. For example, [Wei \(2019\)](#) from Shaanxi Normal University found the effectiveness of grammar intervention pedagogy in English reading by comparing the pre-test and post-test scores of EC and CC. Similarly, [Hou & Xue \(2023\)](#) at Haerbin Normal University assessed the effectiveness of an instructional method by analysing questionnaires, tests, and interviews. So, a good command of grammar is beneficial for language learners to construct effective and meaningful sentences ([Gao et al., 2020](#)). Hence, in PBL classes without grammar instruction, middle school students' self-confidence and interest gradually decreased in PBL English classrooms. This paper has done a reading test and satisfaction questionnaire on 120 students in a middle school. The reading test result indicates that, as illustrated in Figure 1, the experimental group's mean level of changes in the students' pre-war and post-test mean scores (12.31 ± 1.72), which showed the learning process, was significantly higher than that of the control group (10.11 ± 1.6) ($F=23.55$, $p,0.001$). Additionally, the satisfaction survey reveals that students in the GIPBL group were more content with the mode of instruction.

6. Conclusions

Vygotsky proposed the Scaffolding Theory on the basis of constructivism. Scaffolding theory emphasises that teachers guide the learning process to help students comprehend, construct and internalise knowledge and skills to help students finish high-order learning activities. In short, teachers' provision of scaffolding helps students take learning activities gradually. Scaffolding theory is developed on the basis of Vygotsky's "assisted learning", which argues that people's higher psychological functions, such as the regulation of attention and symbolic thinking, are often regulated by external culture at first and then gradually internalised into the mental tools in the mind of learners by [Salan-Ballesteros et al. \(2011\)](#). We found students in the GIPBL group made more progress than students in the PBL group. Early adolescent learners, as found in Grade 8 in Australian schools, are less developmentally mature and have less experience as successful learners than tertiary students in the PBL teaching mode.

Also, the relationship between reading and grammar and syntax was caused by the nature of the instruction in grammar and syntax. This paper shows that the satisfaction scores of the two groups were both high, but participant's with the GIPBL teaching method expressed higher satisfaction than the ones with the PBL teaching method. This higher satisfaction in GIPBL may be because students have fewer grammatical barriers to comprehension and difficult

sentence structure, deeper understanding of sentences, more effectiveness in constructing the passage's underlying meaning, and more communication between tutor and students. In addition, this paper shows that regardless of performance score, GIPBL students are more satisfied with the GIPBL method, which can prove GIPBL's effectiveness in English reading class. However, there are still some limitations in this study. For example, the tutor's intention could have affected students' satisfaction. In addition, the sample size was limited, and if the study duration had been longer, a more scientific generalisation could have been drawn. The effect of GIPBL is recommended to be further studied.

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