Engagement of Chinese EFL Learners in Problem-Based Learning: A Thematic Analysis

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Abstract

Academic engagement is crucial for student success, prompting educators to explore various methods to enhance engagement. This study examines the use of Problem-Based Learning (PBL) to enhance engagement among English as a Foreign Language (EFL) undergraduates in China. Employing a qualitative approach, the research incorporates classroom observations and field notes to assess the impact of PBL on learner engagement in EFL contexts. Through thematic analysis, the study finds that PBL significantly enhances engagement across behavioral, emotional, and cognitive dimensions. The results indicate that integrating PBL into EFL instruction could substantially increase student engagement. Recommendations include embedding PBL strategies in EFL courses and developing a PBL instructional model tailored to the specifics of Chinese education. Future research should investigate PBL's effectiveness with diverse learner populations to further elucidate its impact.

Keywords: EFL learning, problem-based learning, learner engagement, student-centered

1. Introduction

Learner engagement, often described as "energy in action," is essential in psychometrics as it reflects the psychological and physiological efforts individuals invest in learning activities. It encompasses three key dimensions: behavioral, cognitive, and emotional engagement (Fredricks et al., 2016). Recognizing and fostering these aspects of engagement is essential for educators and researchers, as they significantly impact academic performance and learning outcomes. By addressing the factors influencing engagement, educators can develop effective strategies to enhance students' learning experiences, fostering a positive environment that boosts motivation, participation, and academic achievement.

The importance of academic engagement is well-documented in academic literature, with studies highlighting its strong correlation with success in learning environments (Baralt et al., 2016; Kahu & Nelson, 2018). Despite ongoing efforts to improve learner engagement across various teaching settings, many educators, including those in EFL instruction, still face challenges in finding effective methods to boost engagement (Liu, 2022). This underscores the need for continued research into innovative pedagogical strategies that can effectively promote and sustain learner engagement in diverse educational contexts.

In the context of language learning, engagement correlates with the extent and quality of students' commitment to language-related tasks, impacting successful learning outcomes (Sang & Hiver, 2021). Active involvement in classroom activities enhances the likelihood of achieving desirable results (Yin & Wang, 2016), while enthusiastic engagement contributes to the successful completion of learning processes (Liem & Chong, 2017). These findings highlight the importance of designing instructional approaches that encourage active participation and sustained involvement in language learning.

The significance of learner engagement extends beyond language learning to broader academic experiences in higher education. Research shows that engagement influences students' commitment to learning, academic performance, satisfaction with their programs, and degree completion (Kuh, 2009; Ladd & Dinella, 2009). By understanding and fostering engagement, universities can create learning environments that enhance student achievement and well-being.

The PBL approach, which originated in Canadian medical schools in the 1960s, has emerged as a promising pedagogical method for enhancing learner engagement. Initially developed for medical education, PBL has since been adapted for use in diverse fields such as architecture, business, engineering, law, nursing, and the sciences (Barrows, 1996; Savery, 2006; Shin & Kim, 2013). Its constructivist principles, which emphasize active problem-solving and self-regulated learning, are particularly effective in fostering deep engagement among students. This adaptability makes PBL a valuable approach for enhancing learner engagement in EFL instruction as well.

This study aims to explore how PBL influences learner engagement among undergraduate students at a Chinese university. The primary research question is: How does the implementation of PBL impact the engagement levels of undergraduate students in a Chinese university classroom?

2. Literature Review

PBL has increasingly been recognized for its potential to enhance learner engagement and educational outcomes. This literature review examines recent research on PBL, with a focus on its impact on learner engagement within the context of EFL.

PBL is an instructional method that centers on student-centred learning through the exploration of complex, real-world problems. Recent studies have underscored its effectiveness in enhancing various dimensions of learner engagement, including behavioral, cognitive, and emotional aspects. Zhao et al. (2023) conducted a mixed-method study investigating the intersection of Blended Learning (BL) and PBL in a College English course for Chinese university sophomores. Their findings highlight the substantial positive effects of combining BL with PBL on learner engagement. Students demonstrated increased behavioral involvement, cognitive engagement, and emotional commitment, suggesting that integrating these approaches can create a more dynamic and immersive learning environment.

Similarly, Amerstorfer & Clara Freiin von Münster-Kistner (2021) examined students' perceptions of PBL and its role in creating a stimulating, self-regulated learning environment. Their research indicates that PBL empowers students to actively engage with course material and take ownership of their learning processes. However, the reliance on self-reported data in these studies warrants caution, as it may not fully capture the complexities of learner engagement. This limitation underscores the need for further research using diverse methodologies to provide a more comprehensive understanding of PBL's impact.

In the realm of language acquisition, PBL has shown benefits in enhancing both language proficiency and essential soft skills. Zuraimee et al. (2022) highlighted PBL's transformative potential in developing well-rounded learners. Their research suggests that PBL not only improves language acquisition but also fosters competencies crucial for success in academic and professional contexts. Similarly, Haque (2023) explored PBL's impact on student engagement within a specific classroom context. While their findings offer valuable insights, they also highlight the limitations of generalizing results from a confined scope to broader educational contexts. This points to the need for additional research to assess the scalability and transferability of PBL across diverse learning environments.

Despite advancements in ELT in China, traditional teacher-centered methods often persist, leading to lower learner engagement. Challenges such as large class sizes, limited educational resources, and uneven resource allocation contribute to the prevalence of passive learning approaches (Gui & Cheng, 2018; Wang et al., 2018; Wu & Zhang, 2016; J. Zhao, 2018). These challenges underscore the need for pedagogical reforms to foster more interactive, student-centered learning environments.

The literature indicates that PBL holds significant potential to enhance learner engagement across various dimensions and improve language acquisition and soft skills. However, the reliance on self-reported data and the need for broader research scopes highlight the necessity for further studies to validate and expand on these findings. In the context of Chinese higher education, adopting student-centered approaches like PBL could address the limitations of traditional methods and contribute to more engaging and effective learning environments.

3. Method

Research Design

This study employed a qualitative research design with a focus on classroom observation to investigate the effects of PBL on learner engagement. Observations served as both a primary data collection method and a complementary approach, enabling the identification of research topics and refinement of the research questions (Ciesielska et al., 2018).

Participants and Sampling

The study used purposive sampling to select participants, aligning with non-probability sampling methods as outlined by Teddlie & Yu (2007). The sample consisted of 101 first-year Chinese undergraduate students enrolled in international trade at ABC College during the 2023 academic term. Participants, aged 18 to 20, had a minimum of nine years of prior English language education. They were randomly assigned to two intact parallel classes, one receiving instruction through PBL (experimental group) and the other through traditional teaching methods (control group). Each class included approximately 50 students, with a greater representation of female students.

Research Setting and Procedure

The study was conducted over an eight-week period, with each group receiving 45-minute interventions weekly. The experimental group engaged in PBL activities, while the control group followed traditional pedagogical methods. To capture and document student engagement, the researcher employed non-participant observation using video recordings to minimize disruption to the classroom environment. The video recordings provided a comprehensive and unfiltered view of classroom activities, allowing for thorough and repeated analysis (Simpson & Tuson, 2008).

Data Collection

Classroom observations were guided by a standardized protocol, adapted from Delisle's (1997, p. 40) framework (see Table 1). This protocol focused on key aspects of engagement, such as interactions with teachers and peers and responses to instructional prompts. Two experts in English language education reviewed and validated the observation guidelines to ensure their relevance and alignment with the

study's objectives. Field notes were carefully recorded during observations, and critical events, such as significant interactions or unique incidents, were documented to enrich the analysis (Flanagan, 1959; Wragg, 1994).

Table 1. Classroom Observation Guidelines (Delisle, 1997, p. 40)

Classroom Observation guidelines
Setting the Climate:
What were students' responses to the teacher's less prominent role?
Connecting with the Problem:
How did the students respond to questions?
Setting up the Structure:
Did students volunteer to assign the task within their groups?
Visiting the Problem:
Did they generate ideas? Did they think of a variety of sources?
Revisiting the Problem:
Did they generate additional issues?
Producing a Performance:
Did all students participate? Did they produce a high-quality performance using their full effort?

Data Analysis

Field notes and video recordings were analyzed to identify patterns and themes related to student engagement. A second member check was conducted to validate the accuracy and reliability of the field notes. A Ph.D. candidate in TESL reviewed and coded the field notes, with codes cross-referenced against the video recordings to ensure consistency and accuracy. The analysis aimed to capture the dynamics of student engagement and assess the impact of PBL compared to traditional teaching methods. The qualitative data from classroom observations were analyzed using NVivo software.

Ethical Considerations

Ethical approval was obtained from the supervisory committee and the Ethics Board Committee at Universiti Putra Malaysia (approval letter No. JKEUPM-2024-278), as well as the Ethics Review Board at the participating institute. To ensure participant confidentiality, pseudonyms were used, and identifying information was kept secure. Participants were informed of their right to withdraw from the study at any time, and their well-being was prioritized throughout the research process. The study adhered to strict confidentiality measures, including the use of unique identifiers and secure data storage (Iltis & MacKay, 2024).

4. Findings and Discussion

The researcher analyzed word frequency in field notes to identify key themes. Figure 1 shows frequent terms like "student," "discussions," and "groups," emphasizing PBL's student-centered, collaborative nature. These findings align with PBL's core principles of active student involvement and peer interaction.

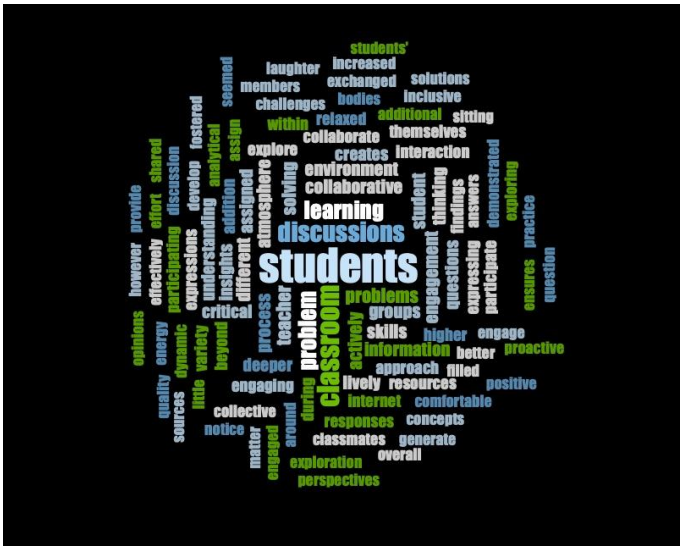

Figure 1. Word Cloud for Classroom Observation Fieldnotes

The frequent terms suggest that discussions and group activities were central to PBL, highlighting active student engagement in collaborative learning. The emphasis on teamwork-related words underscores PBL's problem-solving approach, where students exchange ideas and support each other. Additionally, recurring terms like "interaction" and "engagement" reflect PBL's dynamic environment, reinforcing its role in fostering meaningful participation and deeper understanding.

1) Open Coding

To examine PBL's impact on EFL learners' engagement in Chinese higher education, this study used NVIVO11 for sentence-by-sentence analysis. Initially, 50 codes were generated, then refined to 39 by grouping similar ones. Further sorting and resolving semantic contradictions led to member checking for accuracy. Ultimately, 33 key concepts emerged, categorized into 11 groups, as detailed in Table 2.

Table 2. Category of Initial Concept for Fieldnotes

encode	category	Initial concept
B1	Enhance team cohesion	A1 Enhance teamwork ability; A2 Enhance team communication skills.
B2	Improve English reading comprehension ability	A3 Effectively master vocabulary and phrases; A4 Effectively master different writing styles; A5 Effectively identify key content; A6 Good feedback mechanism positively promotes reading ability; A7 Deepen the understanding and memory of classroom materials; A8 Using Critical Thinking to Improve Effective Reading
B3	Improve the ability of autonomous learning	A9 Clear objectives; A10 Improve execution; A11 Improve the ability of logical analysis; A12 Promote critical thinking; A13 Promote multi-angle view of problems.
B4	Improve the ability to solve practical problems	A14 Enhance the ability to apply what you have learned; A15 Improve the ability to decompose problems; A16 Improve the debating ability.
B5	Improve learners' participation	A17 Improve self-expression; A18 Improve learning motivation and enthusiasm; A19 Improve the desire to explore; A20 to stimulate interest in learning; A21 Keep the discussion focused.
B6	Teamwork challenge	A22 language barrier; A23 Team members have different opinions; A24 Unequal participation of team members
B7	Establish a support system	A25 provides a regular mutual evaluation mechanism among members; A26 Teachers provide organized guidance.
B8	Structured discussion to reach consensus	A27 Ensure the balance of roles and tasks among members; A28 Respect individuals to share opinions and reasons; A29 collective questions and comments; A30 voting system decision; A31 Comprehensive viewpoints reach consensus.
B9	Establish clear evaluation criteria	A32 Assess individual contributions; A33 Evaluate teamwork; A34 evaluation process; A35 evaluation solution
B10	B10 Implementation Time Management	A36 team implements time management plan; A37 Implementation Time Supervision Mechanism
B11	Improve interactivity and attractiveness	A38 provides personalized support; A39 increases the problem of diversification; A40 introduces multimedia resources

2) Spindle Coding

This study refined open coding by re-evaluating and reclassifying conceptual categories for clarity. This process identified three core dimensions of engagement: cognitive, emotional, and behavioral, as shown in Table 3.

Table 3. Main Categories by Spindle Coding for Fieldnotes

encode	Principal category	Corresponding category	Relationship connotation
C1	Cognitive participation	B1 Innovative thinking B2 Understanding and Application B3 Active thinking B4 knowledge integration	Refers to the depth and quality of students' thinking activities and cognitive processes in the process of PBL classroom learning. It emphasizes how students actively think, understand and apply knowledge, and how to integrate and innovate their thinking. Cognitive participation is an important indicator of learning effect, because it reflects the degree of students' deep processing and internalization of learning materials.
C2	Emotional participation	B5 positive emotion B6 Emotional connection B7 learning motivation B8 Confidence	Refers to students' emotions and attitudes in the process of PBL classroom learning. These emotions and attitudes include interest in learning, enthusiasm, self-confidence, and emotional connection with learning content, teachers and classmates. Emotional participation is an important factor in learning motivation and learning effect. Positive emotional experience can stimulate students' learning motivation and enhance their learning experience and sense of accomplishment.
C3	Behavioral participation	B9 continuous investment B10 classroom interaction B11 Self-study to complete the task	Refers to students' specific behaviors and actions in the process of learning PBL classroom. These behaviors and actions reflect students' devotion and participation in learning activities. Behavioral participation usually includes classroom participation and homework completion.

Table 3 outlines student engagement in PBL across emotional, behavioral, and cognitive dimensions. Emotionally, students express curiosity and joy, creating a supportive environment. Behaviorally, they collaborate, discuss, and use mobile devices for research, aiding peers. Cognitively, they explore resources, analyze insights, and engage in discussions, enhancing retention and critical thinking. This framework highlights PBL's role in fostering a well-rounded learning experience.

3) Selective coding

Through open and main category coding, the core theme identified was PBL's effectiveness in enhancing EFL learners' classroom engagement in higher education in China, focusing on cognitive, emotional, and behavioral engagement. PBL promotes cognitive engagement through higher-order thinking tasks, emotional engagement by increasing student interest, and behavioral engagement through practical, active participation. These interconnected forms of engagement reinforce each other, leading to improved classroom involvement and learning outcomes. Overall, PBL enhances cognitive, emotional, and behavioral engagement, fostering a deeper learning experience for EFL learners.

4) Saturation test

To verify whether the open and spindle coding processes were saturated, it was necessary to analyze the remaining fieldnotes. As outlined in Table 4, this process helped confirm saturation.

Table 4. Saturation Test for Fieldnotes

encode	category	Initial concept	Examples of original data
B1	Enhance team cohesion	A1 Enhance teamwork ability	PBL emphasizes teamwork and collaboration. Working with my peers has exposed me to different viewpoints and solutions to problems. In this collaborative environment, we will jointly evaluate and improve our ideas.
B1	Enhance team cohesion	A2 Enhance team communication skills.	This helps to develop my communication skills and learn from different angles. Teamwork also taught me how to cooperate effectively with others, which is an important skill for my future.
B2	Improve English reading comprehension ability	A3 Effectively master vocabulary and phrases.	Encountering new words in the process of solving problems can help me learn and remember words more effectively. Discussing these words with my peers and using them in our solutions can further strengthen my understanding and use of these words.
B2	Improve English reading comprehension ability	A7 Deepen the understanding and memory of classroom materials.	When I actively participate in learning by discussing and solving problems, I find that I can better remember knowledge and greatly improve my learning efficiency.
B2	Improve English reading comprehension ability	A8 Using Critical Thinking to Improve Effective Reading	In addition, PBL encourages critical thinking, including analyzing and synthesizing information from different sources. This process helps me to become a more thoughtful and efficient reader.

B3	Improve the ability of autonomous learning	A11 Improve the ability of logical analysis	In PBL, I will study the topic more deeply, so as to improve my analytical skills and understanding ability.
B4	Improve the ability to solve practical problems	A14 Enhance the ability to apply what you have learned.	By participating in the learning content, I can relate different concepts and apply what I have learned to practical situations.
B5	Improve learners' participation	A18 Improve learning motivation and enthusiasm.	As a person who has difficulty in English reading, I find it difficult to stay focused if learning is passive. However, when I participate in group discussions, I find it easier to maintain my sense of participation and enthusiasm. This makes me feel that the learning process is more vivid and interesting.
B5	Improve learners' participation	A20 Stimulate interest in learning	However, in the problem-based classroom, participating in group discussions makes the teaching materials more interesting and attractive.
B6	Teamwork challenge	A23 Team members have different opinions.	One of the main challenges is how to deal with the different opinions and viewpoints in the group.
B8	Structured discussion to reach consensus	A28 Respect individuals to share opinions and reasons.	Sometimes, we disagree on the best way to solve the problem. We learned to listen with mutual respect and consider all viewpoints.

After coding the remaining classroom fieldnotes, no new coding nodes emerged, indicating that the coding process had reached saturation. According to Pandit's (1996) viewpoint, this confirms that the coding analysis results are saturated and no further categories need to be developed.

Thematic Analysis of Fieldnotes

This section explores the thematic analysis of field notes, focusing on emotional, behavioral, and cognitive engagement to understand how these dimensions manifest in the classroom.

1) Emotional Engagement

In PBL-based EFL classrooms, emotional engagement includes positive emotions, connections, motivation, and self-confidence. As shown in Figure 2, PBL fosters joy, curiosity, and optimism, enhancing emotional well-being and deepening learning engagement.

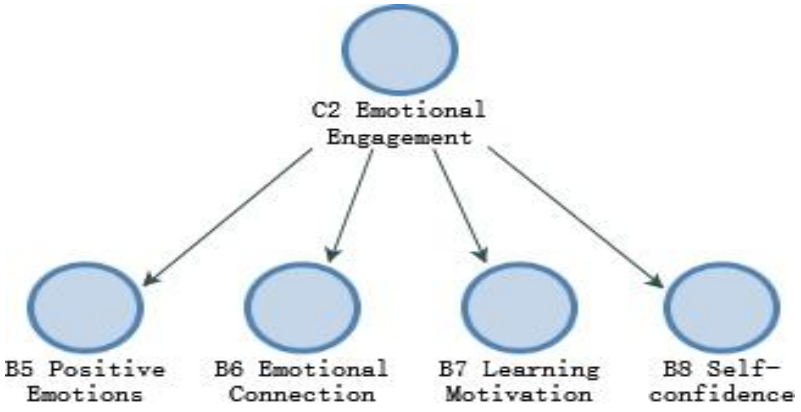

Figure 2. C2 Dimensions of Emotional Engagement

Positive emotional engagement boosts participation in discussions, information searches, and analysis, helping students immerse fully in their studies and improve learning outcomes. As mentioned in the original text, "*In the problem-based learning (PBL) class, students can often be seen using mobile phones to search for information online. They often explore various Internet resources and collect data related to the problems they are studying. This proactive approach can not only deepen their understanding, but also enable them to put forward valuable insights in group discussions.*" In PBL, group collaboration creates a supportive learning atmosphere, where students help each other, enhancing the overall learning experience (Mercer & Dörnyei, 2020).

Students also develop a sense of belonging and responsibility through teamwork, with each member taking on specific roles, strengthening emotional bonds within the group. As mentioned in the original text, "*Students often help each other, understand complex concepts, clarify doubts, and form a mutually supportive learning community. This kind of peer-to-peer learning can not only strengthen the mastery of teaching materials, but also cultivate friendship and cooperation ability*. "

The PBL teaching method stimulates various student motivations, including meaning, interest, and achievement motivation, which in turn

drives their autonomous learning behaviors in the classroom. Moreover, students' learning motivations often reflect their emotional states, indicating their emotional engagement. As mentioned in the original text, "*This proactive learning method extends beyond the classroom, and students will continue to discuss and solve problems after class, which shows their real interest in the subject and their commitment to the educational journey.*"

Throughout the course, the open and inclusive discussion environment fosters a strong sense of self-efficacy among students. Their ability to effectively express their views and solve practical problems in English gradually builds their self-confidence. As mentioned in the original text, "*By actively participating in discussions and organizing answers to questions in English, students have developed self-confidence to express their ideas and opinions effectively*."

2) Behavioral Engagement

Behavioral engagement—continuous involvement, interaction, and autonomous learning—is key to assessing PBL's impact on EFL learners. As shown in Figure 3, PBL's problem-driven approach, teamwork, and practical application sustain student focus and engagement.

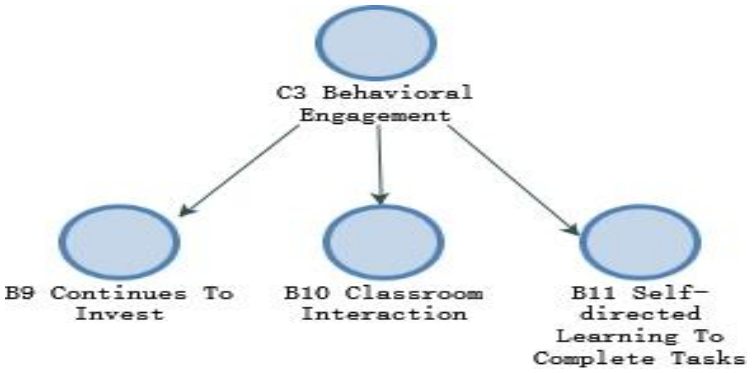

Figure 3. C3 Dimensions of Behavioral Engagement

The PBL classroom fosters a dynamic and interactive atmosphere. As highlighted in the original text, " *In the PBL classroom, the interaction between students is much higher than that in the traditional classroom. The dynamic nature of PBL creates an environment for students to actively participate in collaborative activities, discuss and solve problems*." Unlike traditional lectures, PBL fosters deeper engagement with content and peers, leading to more meaningful exchanges of ideas (Mercer & Dörnyei, 2020). Students actively participate by speaking up, discussing, sharing knowledge, and collaborating in teams.

The PBL environment is also characterized by a relaxed yet productive atmosphere where students feel comfortable expressing their thoughts and communicating openly. As mentioned in the original text, " *A relaxed and fruitful learning environment has been created, so that students can freely express their ideas and communicate with their classmates*." This openness and mutual support make the learning process more enjoyable and effective, encouraging students to contribute confidently knowing their ideas are valued, thus strengthening their commitment to learning.

Furthermore, the problem-centered nature of PBL encourages students to take ownership of their learning, promoting critical thinking and independent problem-solving. It stimulates discussions, motivates students to set meaningful learning goals, and supports self-directed learning (Amerstorfer, 2020).

This drive for autonomous learning is evident in students who exceed classroom expectations. As noted in the original text, "*Some students are keen to use textbooks, online databases, or other supplementary materials to study and collect relevant information. These students are often good at screening information and finding key insights and discoveries*." This proactive approach not only enhances classroom performance but also equips students with valuable skills for their future academic and professional endeavors.

PBL fosters independent information-seeking and collaborative teamwork, building a foundation for future success. It enhances critical thinking, problem-solving, and communication skills, while promoting behavioral engagement through interaction, self-directed learning, and teamwork, preparing students for future challenges.

3) Cognitive Engagement

Cognitive engagement in PBL involves innovative thinking, application, active thinking, and knowledge integration. As shown in Figure 4, PBL enhances cognitive engagement by fostering creative problem-solving, knowledge application, and the integration of diverse ideas, leading to deeper understanding and active involvement.

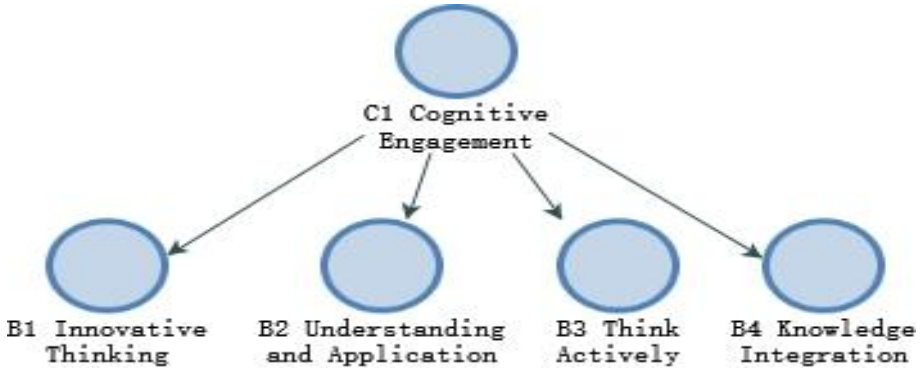

Figure 4. C1 Dimensions of Cognitive Engagement

The development of innovative thinking significantly enhances students' cognitive engagement, making them more actively involved in the learning process. This encourages critical thinking and a deeper understanding of the material. As mentioned in the original text, "*They study the subject deeply and explore more sources and viewpoints in order to understand the current problems more comprehensively.*"

The PBL method deepens students' understanding and enables them to apply solutions to new situations (Savery, 2006). As their comprehension improves, their confidence grows, leading to increased cognitive engagement. This encourages active participation, critical analysis, and flexible application of knowledge. As one student expressed, "*I enriched my answer through detailed explanation and elaboration, and also applied rich answers to new scenes.*" This statement highlights how PBL fosters not only the acquisition of knowledge but also the ability to apply it effectively in different contexts, a key aspect of cognitive engagement.

Furthermore, PBL creates an open, inclusive environment that encourages questioning, reflection, and challenging assumptions. This fosters cognitive engagement, critical thinking, and analytical skills (Rahmadani, 2017). The original text emphasizes this by stating, "*This cooperative atmosphere creates an environment for free exchange, debate, and the improvement of opinions*." In such an environment, students are active participants in the learning process, engaging in discussions that challenge their thinking and push them to refine their ideas.

PBL also fosters critical, systematic, and interdisciplinary thinking, essential for knowledge integration . Through collaboration and problem-solving, students synthesize information from various sources, developing holistic solutions. This process enhances cognitive engagement by encouraging deeper analysis and understanding from multiple perspectives. This integration of knowledge and active participation is vividly illustrated in the original text, which states, "*In this process, each group has demonstrated a higher level of analytical and comprehensive skills, transcending superficial phenomena and revealing potential complexity and meaning. This deeper exploration not only enhanced their understanding of the theme, but also promoted their more comprehensive and meaningful participation in the process of solving problems.*"

A deeper exploration of the subject matter enhances students' understanding and fosters meaningful engagement. By addressing complexities, students become more actively involved, boosting cognitive engagement. This is vital for long-term success in EFL, promoting critical thinking, problem-solving, and knowledge application in real-world situations.

5. Conclusions

The findings derived from the field notes suggest that the PBL approach has positively influenced student engagement across three key dimensions: emotional, behavioral, and cognitive.

Firstly, analysis of classroom videos showed that students in the PBL setting exhibited a broader range of emotions—such as surprise, curiosity, happiness, and laughter—compared to their peers in traditional classrooms. This enhanced emotional engagement indicates that students were more actively involved and invested in their learning process within the PBL framework.

Behavioral observations further supported these findings, as students demonstrated increased engagement during PBL sessions. They participated more actively in group discussions, proactively gathered information, and sought assistance from the teacher. These behaviors reflect a higher level of interaction with the learning material, which is crucial for language learning as it provides more opportunities for language production and interaction (Philp & Duchesne, 2016).

Although cognitive engagement is inherently more challenging to measure directly, evidence from the field notes suggests that students in the PBL context displayed greater self-directed learning and critical thinking. This was evident in their spontaneous task allocation within groups and the organization of their responses, indicating a deliberate effort to engage with the material and extract meaningful insights.

These observations align with previous research by Tang et al. (2020), which highlighted the positive impact of emotional and behavioral engagement on academic achievement, particularly in English language skills among tertiary students in China. However, it is crucial to recognize the importance of cognitive engagement, as it significantly contributes to deeper learning and comprehension (Rotgans & Schmidt, 2011). The overall findings underscore the effectiveness of the PBL approach in fostering comprehensive student engagement and enhancing the learning experience.

The findings from this study also suggest several implications for educators and policymakers in the domain of EFL. For educators, the positive impact of PBL on emotional, behavioral, and cognitive engagement highlights the need to integrate more PBL approaches into the curriculum. Educators should consider designing learning experiences that foster active participation, emotional investment, and critical thinking. By incorporating PBL, educators can create a more dynamic and engaging classroom environment that encourages deeper learning and enhances students' overall academic experience. In addition, policymakers should support the adoption of PBL methodologies by providing professional development opportunities for teachers, as well as resources and training to implement PBL effectively. Additionally, policies should promote flexibility in curriculum design to allow for the integration of PBL and other innovative teaching strategies that have been shown to enhance learner engagement. Investing in these areas is more likely lead to improved educational outcomes and prepare students with the skills needed for success in a rapidly changing world.

In conclusion, integrating PBL strategies into EFL courses presents a promising approach to enhancing language acquisition. It is crucial to develop a PBL instructional model that is specifically adapted to Chinese education. Future research should focus on evaluating the effectiveness of PBL across various learner populations to provide a deeper understanding of its impact and refine its implementation.

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Authors' contributions

Dr Qian Guo was responsible for the study design, manuscript writing and revision. Associate Professor Dr. Lilliati Ismail and Dr Halimah Jamil were responsible for advising and supervising. Dr Shujie Luo was responsible for validation and visualization. Zhubin Sun was responsible for the experiment.

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The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

Data sharing statement

No additional data are available.

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