

Effects of AI-Mediated Response Tools on Student Motivation and Engagement in Project-Based English Language Learning

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Abstract: *As artificial intelligence (AI) becomes increasingly integrated into education, its potential role in project-based English language learning (PBL) requires empirical investigation. This study examined the effects of AI-mediated response tools on seventh-grade students' motivation and classroom engagement in a junior high school in eastern China. Ninety-four students from two intact classes participated, with one class receiving AI-supported PBL instruction and the other completing similar tasks without AI support. Data were collected through a motivation questionnaire, classroom observation, and semi-structured interviews. Results showed that the AI-supported group reported significantly higher motivation and confidence. Observational findings also indicated greater participation and engagement in oral activities. However, interview data revealed challenges related to limited routine use and implementation constraints. The findings suggest that AI-supported PBL can enhance student motivation and engagement, while highlighting the need for sustainable integration and teacher support in everyday classroom practice.*

Keywords: *AI in education; project-based English language learning; student motivation; student engagement*

1. Introduction

With the rapid development of generative AI tools such as Chinese AI-based response platform Doubao, AI-driven feedback systems have begun to play an active role in language learning contexts. These AI-mediated response tools provide real-time feedback, automated scoring, language suggestions, and interactive dialogue opportunities, potentially transforming how students engage with English learning tasks.

At the same time, project-based learning (PBL) has been widely advocated in English language education for its emphasis on authentic tasks, collaboration, and meaningful language use. PBL encourages students to construct knowledge through inquiry, problem-solving, and group interaction, thereby fostering both linguistic competence and learner autonomy. However, despite its pedagogical value, implementing PBL in junior high school English classrooms often presents challenges. Students may struggle with idea generation, language formulation, and sustained motivation during extended project tasks. Teachers, in turn, may face difficulties in providing timely and individualized feedback within limited classroom time.

AI-mediated response tools may offer a promising solution to these challenges. By providing immediate linguistic feedback, pronunciation evaluation, and content suggestions, AI tools can reduce learners' uncertainty during language production. They may also enhance learners' sense of competence and self-efficacy, thereby strengthening motivation. From a classroom interaction perspective, AI may function as a mediating tool that supports peer collaboration and task completion. However, while theoretical discussions highlight the potential of AI integration, empirical evidence in junior high school English PBL contexts remains limited.

Existing research on AI in language education has primarily focused on higher education settings[1], writing performance[2], or system usability[3], with limited attention to motivation and engagement in compulsory education. Moreover, prior studies have emphasized overall effects rather than how these effects unfold in real classrooms.

This study examines the impact of AI-supported PBL on students' motivation and classroom

engagement in a junior high school context. Two intact classes were compared, one with AI support and one without. Questionnaire data, classroom observations, and interviews were used to capture both outcome differences and underlying processes. Specifically, the study addresses the following research questions:

- (1) Does AI-supported PBL significantly influence students' L2 motivation and engagement?
- (2) How do students and teachers perceive its benefits and challenges in classroom practice?

The findings provide practical insights for integrating AI into English PBL classrooms.

2. Theoretical Rationale for AI-Supported PBL

2.1. AI-Mediated Feedback in L2 Learning

In foreign language education, AI technologies are increasingly shifting from outcome-oriented evaluation tools toward process-oriented learning support systems[4]. For example, automated writing evaluation systems can provide immediate feedback on grammatical, syntactic, and lexical features, thereby improving revision efficiency and reducing feedback delay[5]. Similarly, in speaking instruction, AI-based systems can offer real-time pronunciation feedback through speech recognition, which may enhance learners' fluency and confidence[6].

More recently, advances in generative AI have further expanded these functions by enabling more context-sensitive and interactive feedback. As a result, AI is increasingly positioned not only as an evaluation tool but also as a potential learning partner that supports ongoing language production and interaction[7].

2.2. AI Feedback in PBL: Motivation, Engagement, and Constraints

In project-based language learning, sustained engagement and active participation are essential, as learners are required to collaborate, produce extended outputs, and refine their work over time[8]. Feedback therefore plays a central role in maintaining learning momentum and supporting task completion. However, in many EFL classrooms, teachers face constraints in providing timely and individualized feedback, which may hinder students' motivation and engagement[9].

AI-mediated response tools offer a potential solution by delivering immediate and adaptive feedback during task execution. Such real-time support can reduce uncertainty, sustain task flow, and enhance learners' perceived competence, thereby promoting greater engagement and persistence[10]. Empirical studies have shown that AI-generated feedback is associated with increased revision activity, longer engagement time, and more positive learning attitudes[11].

At the same time, the limitations of AI feedback should not be overlooked. AI systems may lack contextual sensitivity, emotional responsiveness, and pedagogical judgment, particularly in complex or meaning-focused tasks[12]. Overreliance on AI may also reduce opportunities for peer interaction and teacher guidance, potentially weakening the social dimension of engagement. These findings suggest that AI functions most effectively as a complementary form of support rather than a replacement for human feedback.

Despite growing interest in AI-supported language learning, empirical research examining how AI feedback operates within PBL classrooms, particularly in relation to student motivation and engagement at the secondary school level, remains limited. This gap motivates the present study.

3. Research Design

3.1. Participants

This study was conducted in a junior high school in eastern China. Two intact classes ($n = 94$) participated: one AI-supported PBL group ($n = 46$; 21 females, 25 males) and one non-AI PBL group ($n = 48$; 26 females, 22 males). Students were aged 12–14 and had comparable English proficiency based on mid-term examination scores (AI: $M = 77.4$; non-AI: $M = 78.2$). None had prior experience with AI-supported language learning.

Informed consent was obtained from all participants and their English teacher. Participation was

voluntary, and all data were anonymized.

3.2. Instruments

Three data sources were used: a questionnaire, semi-structured interviews, and classroom observations.

The questionnaire was adapted from Mehdiyev et al. (2017) and included 20 items on a five-point Likert scale, covering three dimensions: (a) PBL and personal use, (b) technology use, and (c) attitudes and self-confidence. Exploratory factor analysis supported a three-factor structure (KMO = 0.873; Bartlett's test $p < .001$), explaining 61.28% of total variance, with some moderate cross-loadings observed. Reliability was acceptable ($\alpha = 0.841, 0.883, 0.781$; overall $\alpha = 0.894$).

Semi-structured interviews were conducted with four students from the AI-supported group, selected to represent variation in motivational levels (two high-scoring and two low-scoring). In addition, the English teacher who taught both classes was interviewed to provide instructional and implementation perspectives. Interview questions focused on perceived changes in motivation and engagement, experiences with AI-supported tasks, and perceived benefits and challenges. All interviews were audio-recorded and transcribed for analysis.

Classroom observations were conducted in one lesson for each group using a structured protocol focusing on task engagement, interaction patterns, and feedback processes. Field notes were used to document students' behavioral and affective responses during PBL activities.

3.3. AI-Supported Learning Context

In the AI-supported group, students used Huawei tablets configured to allow only designated educational applications, including the AI tool Doubao. AI functions such as speech recognition, pronunciation feedback, and language suggestions were integrated into PBL tasks (e.g., poster design, presentations), providing real-time support during task completion.

The non-AI group completed equivalent tasks using traditional materials and teacher guidance. Both groups followed the same curriculum and PBL framework.

3.4. Data Collection Procedure

Data were collected during two parallel 45-minute PBL lessons, one in each group. Tasks included poster design, group presentations, and oral practice based on the same instructional unit.

Classroom observations were conducted during the lessons. Immediately afterward, all students completed the questionnaire. Four AI-group students and the teacher were then interviewed.

As no pre-test was administered, group comparability was based on prior examination scores. The study adopts a post-test comparative design.

3.5. Data Analysis

Quantitative data were analyzed using independent-samples t-tests to compare group differences, with effect sizes (Cohen's d) reported ($p < .05$).

Qualitative data were analyzed using thematic analysis[13]. Interview transcripts were coded and grouped into themes related to motivation, engagement, AI use, and challenges. Findings were triangulated with questionnaire and observation data.

4. Results

This mixed-methods study explored the impact of AI-mediated response tools on seventh-grade students' motivation and classroom engagement in project-based English learning (PBL), as well as students' and the teacher's perceptions of AI integration in instruction.

4.1. Students' L2 Learning Motivation

Statistical analysis of the motivation questionnaire confirmed significant between-group differences across all three measured dimensions, with effect sizes indicating meaningful practical impacts of AI integration (Table 1).

Table 1 Descriptive Statistics and t-Test Results for L2 Motivation

Dimension	Group	N	Mean	SD	t (df)	p	Cohen's d	Effect Size
Personal Use & PBL	AI-supported	46	4.05	0.58	3.41 (92)	.001	0.70	Moderate
	Non-AI	48	3.63	0.62				
Technology Integration	AI-supported	46	4.18	0.55	3.88 (92)	<.001	0.80	Moderate-Large
	Non-AI	48	3.71	0.60				
Attitudes & Confidence	AI-supported	46	3.98	0.61	3.13 (92)	.002	0.64	Moderate
	Non-AI	48	3.59	0.57				

Note: Scores range from 1 (Strongly Disagree) to 5 (Strongly Agree); effect size categorized per Cohen (1988): 0.5 = moderate, 0.8 = large.

The AI-supported group demonstrated consistently higher motivation across all three dimensions, with mean differences ranging from 0.39 to 0.47 points and effect sizes reaching up to $d = 0.80$. Rather than reflecting isolated statistical differences, these gains were closely tied to students' lived classroom experiences.

In terms of engagement with PBL tasks, the AI group's higher scores appeared to stem from uninterrupted task momentum. Interview data revealed that immediate linguistic feedback reduced pauses caused by uncertainty. A high-motivation male student (questionnaire mean = 4.75) explained: "If I'm not sure about a sentence for the poster, AI fixes it right away. I don't have to stop working and wait, so I feel more motivated to finish the project well." This immediacy minimized disruption during collaborative work and strengthened students' sense of autonomy, thereby reinforcing proactive participation in project tasks.

The largest quantitative difference emerged in students' motivation to integrate technology into learning ($d = 0.80$). Students did not perceive AI as an external add-on, but as an embedded support mechanism within the PBL process. Over three quarters of the AI group indicated that technology use felt purposeful and efficiency-enhancing. In contrast to the non-AI group's reliance on teacher-provided materials, AI-supported students frequently described the system as a "learning partner" that complemented brainstorming, drafting, and rehearsal. This alignment between tool function and task goal appeared to strengthen both technological and academic engagement.

Regarding attitudes and confidence, the AI group's higher mean score was associated with reduced anxiety in written and oral production. Real-time correction and pronunciation feedback enabled repeated practice without public embarrassment. A low-motivation female student (mean = 3.55) noted: "I used to cross out sentences I wrote because I thought they were wrong, but now AI checks them first, so I keep more of my ideas and feel braver to share them." Such experiences illustrate how AI-mediated feedback may enhance perceived competence, contributing to stronger confidence in English use.

However, interview data also revealed intra-group variation. While high-motivation students (means = 4.70 and 4.75) framed AI as a direct catalyst for their increased engagement, lower-motivation students (means = 2.85 and 3.55) reported limited gains. They described AI-generated language as occasionally too advanced and expressed uncertainty about formulating effective prompts. These barriers suggest that AI functioned more as a motivational amplifier for already confident learners rather than a universal equalizer.

Together, these findings suggest the integration of statistical trends and qualitative accounts indicates that AI-supported PBL enhanced motivation primarily by reducing cognitive disruption, strengthening task alignment, and increasing perceived competence, while its benefits remained moderated by learner proficiency and strategic ability.

4.2. Observable Classroom Engagement: Behavioral Patterns and AI's Role

Classroom observations were conducted in one 45-minute PBL lesson for each group. The AI-

supported class completed a campus-themed digital poster task along with an email-writing activity, while the non-AI class engaged in paper-based poster design. These observations revealed clear differences in behavioral engagement and task interaction, which aligned closely with the motivation questionnaire results (Table 2). Interview insights from students and the teacher further contextualized these observed patterns.

Table 2 Classroom Engagement in AI and Non-AI PBL Lessons

Engagement Indicator	AI-Supported PBL Group	Non-AI Traditional PBL Group
Task Interaction	Active modification and negotiation of AI-generated language suggestions; independent content revision; minimal teacher reliance for language questions.	Reliance on teacher/textbook for vocabulary/grammar clarification; limited content revision; passive acceptance of peer ideas with no independent refinement.
Group Collaboration	Orderly tablet sharing; joint discussion of AI feedback to select language outputs matching project goals; more equal participation across proficiency levels.	Focus on logistical poster organization (layout, content selection) rather than language refinement; uneven participation (lower-proficiency students contribute minimally).
Oral Participation	Voluntary volunteering for whole-class presentations; ability to explain revisions to their work; reduced hesitation in responding to follow-up questions.	Reluctance to volunteer for presentations; frequent hesitation during oral output; inability to address basic teacher follow-up questions.
Sustained On-Task Behavior	Approximately 90% of students remain actively engaged in PBL tasks for $\geq 80\%$ of the lesson; minimal off-task behavior (restricted to AI learning software only).	Around 75% of students remain on-task for $\geq 80\%$ of the lesson; occasional off-task behavior (chatting, distracted work) due to unresolved language problems.

AI-supported PBL was associated with more active, sustained, and deeper engagement, compared with traditional non-AI PBL, and this engagement directly aligned with the higher motivation scores in the AI group, reflected in three main patterns. First, task interaction in the AI group was characterized by adaptive tool use: students did not copy AI outputs verbatim but modified suggestions to fit their project's unique goals (e.g., simplifying AI-generated slogans for their campus map). The teacher emphasized this critical distinction in her interview: "*Students in the AI group aren't just using the tool. They're debating which AI suggestion fits their poster best, and that's more language thinking than the non-AI group does when they just write what's in the textbook.*" Second, group collaboration in the AI group was more inclusive. Lower-proficiency students, supported by AI's basic grammar and vocabulary feedback, contributed more to verbal discussions than in the non-AI group, where they often remained silent due to lack of immediate language support. This aligns with the *Attitudes and Confidence* motivation findings, as AI reduced the anxiety that previously prevented these students from participating in group work. Third, sustained on-task behavior was notably higher in the AI group, with a substantially larger proportion of students remaining on-task throughout the lesson. AI's instant feedback eliminated downtime from waiting for teacher assistance, and pre-set restrictions to AI-only learning software minimized off-task device use, which is a structured design choice the teacher identified as essential for seventh-grade classrooms. In the non-AI group, off-task behavior frequently stemmed from unresolved language questions, which disrupted task momentum and led to disengagement from PBL work.

4.3. Participant Perceptions: Potentials and Challenges of AI Integration

Student (4 interviewees: 2 high/2 low motivation) and teacher perceptions of AI-mediated response tools in PBL directly explain the observed motivation and engagement outcomes, addressing the study's second research question (Table 3). These perceptions highlight both AI's core strengths and the practical barriers to its widespread effectiveness.

Table 3 Student and Teacher Perceptions of AI-mediated response tools in English PBL

Group	Key Perceived Potentials	Key Perceived Challenges
AI-Supported Students	1) Instant, on-demand language support: Real-time feedback on pronunciation, grammar, and sentence expression, eliminating delays in resolving language questions. 2) Enhanced task efficiency: Faster content generation and revision for PBL tasks (e.g., poster design, presentation scripts), reducing reliance on teacher availability. 3) Reduced anxiety: Lowered fear of making errors in English use, leading to increased willingness to participate in speaking and writing tasks.	1) High-motivation/proficiency students: Occasional network lag during peak usage; overly technical AI explanations for complex linguistic points. 2) Low-motivation/proficiency students: AI-generated language is too advanced for basic proficiency levels; uncertainty about how to frame targeted prompts; limited perceived value for daily English learning.
English Teacher	1) Individualized support for large classes: Compensates for limited one-on-one teacher time by providing personalized feedback to students. 2) Boosted oral participation: Increased willingness to volunteer for presentations, especially among shy or low-confidence students, due to pre-practice with AI pronunciation tools. 3) Task-specific effectiveness: High utility in speaking-focused PBL stages (pronunciation, script revision).	1) Logistical barriers: 10–15 minutes of lesson time lost to tablet distribution and recovery. 2) Classroom management: Occasional off-task device use by students with underdeveloped self-regulation. 3) Uneven adaptability: High-proficiency students use AI effectively, while low-proficiency students either copy outputs directly or abandon use. 4) Limited curricular fit: Minimal added value in reading or grammar-focused PBL lessons; feasible only for showcase/open classes, not daily instruction.

The universally identified core benefit, instant real-time language feedback, was the primary driver of the AI group’s higher motivation (especially in Attitudes and Confidence) and more active oral participation. This feature resolved a critical limitation of traditional PBL (delayed language support) and reduced student anxiety, a key barrier to engagement. The teacher noted that shy students who rarely volunteered in non-AI lessons actively presented in the AI-supported lesson, having used AI to refine their scripts and practice pronunciation beforehand.

However, practical challenges moderated AI’s impact across the board. Low-motivation students’ struggles with AI’s content complexity and operational demands meant they saw little to no gain in motivation or engagement, creating intra-group disparities in AI’s effectiveness. The teacher’s identified logistical and management barriers, lost lesson time to tablet logistics and occasional off-task device use, also restricted AI’s ability to deliver consistent, sustained impacts. These challenges explain why the AI group’s motivation gains were moderate (not large) and engagement improvements were limited to the observed showcase lesson, rather than daily instruction.

Task-specific effectiveness further shaped outcomes: AI’s strong utility in speaking-focused PBL stages (pronunciation, script revision, presentations) aligned with the AI group’s most notable engagement improvement that is voluntary oral participation. Conversely, the teacher confirmed that AI added no meaningful value to reading or grammar-focused PBL lessons, as it could not replace systematic teacher instruction for these content areas. This task-specificity suggests that engagement differences were less evident in non-speaking PBL components.

5. Discussion

The present study set out to examine whether integrating an AI-based response system into project-

based learning (PBL) could enhance secondary school students' motivation and classroom engagement in English learning. The findings indicate that students in the AI-supported group demonstrated significantly higher levels of motivation across all measured dimensions, including personal and PBL-related motivation, technology integration motivation, and attitudes and confidence. Classroom observations further revealed stronger behavioral engagement, more active collaboration, and more confident presentations in the AI-supported class compared to the traditional PBL group. These results suggest that AI-supported PBL may positively influence both affective and behavioral aspects of language learning.

These findings align with prior research demonstrating that technology-enhanced learning environments can increase learner motivation and participation. For example, studies in mobile-assisted language learning (MALL) contexts have reported improvements in engagement and confidence when digital tools are integrated into project-based tasks[13]. Similarly, recent research on AI-powered language applications has shown that personalized and immediate feedback can enhance speaking performance and reduce anxiety, particularly in EFL settings[14]. The present study extends these findings by situating AI integration within an authentic secondary school PBL classroom and by foregrounding motivation and engagement rather than performance outcomes alone.

One possible explanation for the observed motivational gains lies in the immediacy and non-judgmental nature of AI feedback. Unlike delayed teacher feedback, AI-generated responses provide instant suggestions, which may reduce uncertainty and sustain task involvement. Moreover, students in the interviews frequently described AI as "objective" and "less embarrassing," indicating that psychological safety may play a role in encouraging risk-taking and sustained participation. This supports previous research suggesting that technology-mediated feedback can enhance learners' self-efficacy and willingness to communicate by lowering affective barriers. At the same time, the findings partially diverge from research emphasizing the superiority of guided peer feedback in fostering deeper cognitive development[15]. While guided peer modes may better support higher-order thinking within learners' zones of proximal development, the current study suggests that AI support may exert stronger influence on affective engagement and behavioral participation in large classroom settings. This suggests that AI tools function more effectively as affective and procedural scaffolds rather than replacements for human-mediated cognitive guidance.

Despite these promising findings, several limitations should be acknowledged. First, the relatively short duration of the intervention raises the possibility of a novelty effect. Students' heightened motivation may partially reflect excitement about using a new technology rather than sustained pedagogical impact. Second, although the two classes followed the same curriculum, the quasi-experimental design limits causal inference, and pre-existing group differences cannot be entirely ruled out. Third, the study primarily relied on self-reported motivation measures and observational data; future research could incorporate longitudinal performance data and validated engagement tracking tools to strengthen measurement validity. Additionally, teacher interviews revealed practical constraints, including device management challenges and potential distractions, which may limit scalability in real classroom contexts.

Even so, the study offers several important implications. Pedagogically, the findings suggest that AI-mediated response tools can be strategically integrated into PBL environments to support real-time feedback during productive tasks such as speaking and presentation activities. Rather than replacing teacher guidance, AI tools may serve as supplementary scaffolds that sustain momentum during project work. Theoretically, the study contributes to emerging AI-in-education research by shifting attention from performance metrics to motivational and engagement-related outcomes, particularly in secondary EFL contexts where empirical evidence remains limited. The results indicate that AI may enhance students' perceived competence and confidence, thereby strengthening the affective foundation necessary for sustained language learning.

Future research should investigate the long-term effects of AI-supported PBL to determine whether motivational gains persist beyond initial exposure. Comparative studies examining different types of AI feedback, such as dialogic versus corrective modes, would further clarify which mechanisms most effectively promote engagement. Additionally, exploring hybrid models that combine AI feedback with structured peer interaction may help balance cognitive depth with affective support, as peer feedback itself has been shown to promote writing development through increased revision and active knowledge construction[16]. As AI technologies continue to evolve, understanding how they interact with classroom ecology, teacher practices, and learner psychology will be essential for designing sustainable and pedagogically meaningful integration strategies.

6. Conclusion

This study examined the effects of AI-mediated response tools on student motivation and classroom engagement in project-based English learning. The findings indicate that AI-supported PBL can enhance students' motivation, confidence, and active participation, particularly in speaking-related tasks. These effects appear to be driven by the immediacy of feedback and the reduced anxiety associated with AI-supported language practice. However, the benefits of AI integration were not uniform across all learners and were influenced by students' proficiency levels and ability to use AI effectively. In addition, practical constraints, such as classroom management and limited applicability across task types, may restrict its broader implementation. Overall, AI-mediated response tools show potential as supplementary support in PBL contexts, but their effectiveness depends on careful pedagogical integration rather than standalone use.

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