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THE IMPACT OF ARTIFICIAL INTELLIGENCE-SUPPORTED PROJECT-
BASED LEARNING ON STUDENTS' ENGLISH COMMUNICATIVE
COMPETENCE: AN EXPERIMENTAL STUDY

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Annotation: *This study investigates the effect of artificial intelligence (AI)-supported project-based learning (PBL) on the development of English communicative competence among secondary and tertiary-level English as a Foreign Language (EFL) learners. Adopting a quasi-experimental, pretest–posttest control-group design, the research compared an experimental group instructed through AI-integrated project tasks- including AI chatbots, speech-recognition applications, and generative writing assistants - with a control group taught through conventional project-based instruction without AI support. Communicative competence was measured across four sub-components: grammatical, discourse, sociolinguistic, and strategic competence, using a standardized speaking and writing assessment rubric adapted from established communicative-competence frameworks. Results indicate that the experimental group achieved statistically significant gains in overall communicative competence, with the most pronounced improvement in strategic and discourse competence, alongside increased learner motivation, autonomy, and willingness to communicate. The control group also improved, but to a significantly lesser degree.*

These findings suggest that embedding AI tools within project-based frameworks amplifies the benefits of experiential, task-based language learning by providing personalized feedback, authentic interactional opportunities, and reduced communication anxiety. Implications for curriculum design, teacher training, and the responsible integration of AI in language classrooms are discussed. The ability to communicate effectively in English has become a central goal of language education worldwide, driven by the demands of global academic mobility, international business, and digital communication. Traditional grammar-translation and audiolingual approaches, while useful for building linguistic accuracy, have long been criticized for failing to prepare learners for the spontaneous, context-sensitive nature of real-world communication (Canale & Swain, 1980). In response, communicative and task-based methodologies, and more specifically project-based learning (PBL), have gained prominence as pedagogical approaches that situate language use within meaningful, purposeful activity rather than isolated drills. Project-based learning engages students in extended, collaborative tasks that culminate in a tangible product — a presentation, a video, a report, or a public performance — requiring learners to negotiate meaning, plan discourse, and adapt language to audience and purpose (Bell, 2010; Beckett & Slater, 2019). Because PBL is inherently communicative, it has repeatedly been shown to



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strengthen learners' oral and written performance, confidence, and willingness to communicate (Astawa et al., 2017; Bakar et al., 2019). However, PBL implementation in EFL contexts is not without challenges: learners with limited proficiency often struggle to sustain communication independently, teachers face large class sizes that limit individualized feedback, and opportunities for authentic, low-anxiety practice outside class remain scarce. The recent proliferation of artificial intelligence (AI) tools — including conversational chatbots, automatic speech recognition and pronunciation feedback systems, and generative writing assistants — offers a potential solution to these constraints. AI tools can provide learners with on-demand, judgment-free interactional partners, instantaneous corrective feedback, and scaffolding tailored to individual proficiency levels (Al-khresheh, 2024; Edwards & Yahaya, 2025). When embedded within a project-based framework, AI may therefore extend the reach of communicative practice beyond the classroom while preserving the authentic, purpose-driven character that makes PBL pedagogically effective. Emerging studies on AI-supported project work in English for Specific Purposes (ESP) and business communication contexts report gains in speaking performance, learner autonomy, and reduced anxiety (Asrifan et al., 2025; Aysah & Hamsia, 2025). Yet, rigorous experimental evidence directly comparing AI-supported PBL with conventional PBL — particularly using validated measures of communicative competence rather than isolated skill scores — remains limited. This study addresses that gap by asking: (1) Does AI-supported project-based learning produce significantly greater gains in English communicative competence than conventional project-based learning? (2) Which sub-components of communicative competence benefit most from AI integration? (3) How do learners perceive the role of AI tools within their project work? By combining a quantitative experimental design with a qualitative perception survey, the study aims to provide both statistical evidence and pedagogical insight to inform the integration of AI into communicative language teaching. The construct of communicative competence originates in Hymes' (1972) critique of Chomsky's narrow focus on linguistic competence, arguing that knowing a language also requires knowing when, how, and to whom to use it appropriately. Canale and Swain (1980) operationalized this construct into four interrelated components: grammatical competence (accurate use of vocabulary and syntax), sociolinguistic competence (appropriateness to context), discourse competence (cohesion and coherence across stretches of language), and strategic competence (the ability to compensate for breakdowns in communication). This four-component model remains the dominant framework for designing and assessing communicative language instruction and was adopted as the assessment framework for the present study. PBL is grounded in constructivist and experiential learning theory, positioning learners as active agents who construct knowledge through sustained engagement with authentic problems (Bell, 2010). In language education, PBL requires learners to use the target language as a genuine communicative tool — negotiating roles, researching content, and presenting findings — rather than as an object of study. Astawa et al. (2017) found that PBL significantly improved EFL students' productive skills, attributing gains to the repeated cycles of planning, drafting,

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and public presentation embedded in project work. Similarly, Bakar et al. (2019), in a quasi-experimental study of Malaysian technical college students, reported significant improvement in oral communicative competence following a twelve-week PBL intervention, alongside high learner satisfaction. These findings collectively support PBL's capacity to develop not only linguistic accuracy but also the discourse and strategic competencies necessary for real-world interaction. AI-assisted language learning (AALL) encompasses a broad range of tools, from automatic speech recognition and pronunciation-feedback applications to generative conversational agents capable of sustaining extended dialogue. Al-khresheh (2024) demonstrated that presentation-based activities enhanced with technological feedback significantly improved Saudi EFL students' speaking proficiency, while Edwards and Yahaya (2025) found that AI tools promoting feedback, translation, and self-monitoring enhanced communicative competence among vocational EPP students, particularly by lowering affective barriers to speaking. Asrifan et al. (2025) combined AI with video-based project work in ESP classrooms and reported significant gains in speaking performance together with increased learner autonomy and confidence. Aysah and Hamsia (2025) similarly found that AI-based PBL fostered a low-pressure, supportive environment that increased students' willingness to practice speaking and receive immediate feedback. Taken together, this literature suggests that AI's core affordances — personalization, immediacy of feedback, and reduced social risk — are highly complementary to the collaborative, product-oriented structure of PBL. Despite this converging evidence, most existing studies have examined AI tools or PBL in isolation, employed qualitative or single-group designs, or focused narrowly on speaking performance rather than the full construct of communicative competence (Beckett & Slater, 2019). Few studies have used a controlled experimental design to isolate the specific contribution of AI integration within an otherwise identical project-based curriculum. The present study was designed to fill this gap by directly comparing AI-supported and conventional PBL under controlled conditions, using a validated multi-component measure of communicative competence. This study employed a quasi-experimental, pretest–posttest, nonequivalent control-group design. Two intact classes of EFL learners were assigned, respectively, to an experimental group (AI-supported PBL) and a control group (conventional PBL) over a ten-week instructional period. Both groups completed identical project themes and product requirements (e.g., a persuasive presentation, a collaborative video, and a community-issue report), ensuring that curricular content and task structure were held constant across conditions. The sole manipulated variable was the presence or absence of AI tools embedded within the project workflow. Participants were 64 upper-intermediate EFL learners ($n = 32$ per group) enrolled in a university English communication course. Groups were matched on prior English proficiency using institutional placement test scores, and an independent-samples t-test confirmed no significant baseline difference between groups ($p > .05$). Participation was voluntary, and informed consent was obtained in accordance with institutional research-ethics procedures. The experimental group carried out project tasks with the support of three categories of AI tools: (a) a conversational chatbot for rehearsing dialogues and receiving

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real-time content and grammar suggestions, (b) an automatic speech-recognition application providing pronunciation and fluency feedback, and (c) a generative writing assistant offering feedback on organization and register during script and report drafting. The control group completed the same project cycle using conventional peer feedback, teacher conferencing, and print reference materials, without AI tools. Both groups met for the same number of instructional hours and were guided by the same instructor to control for teacher-effect confounds. Communicative competence was assessed using an integrated speaking-and-writing task administered before and after the intervention, scored with an analytic rubric operationalizing Canale and Swain's (1980) four-component model: grammatical, sociolinguistic, discourse, and strategic competence, each rated on a 1–5 scale by two trained raters (inter-rater reliability, Cohen's $\kappa = .84$). A supplementary end-of-study questionnaire, adapted from prior AI-in-PBL research (Asrifan et al., 2025; Aysah & Hamsia, 2025), captured learners' perceptions of confidence, anxiety, and autonomy using five-point Likert-scale items and open-ended reflection prompts. Quantitative pretest and posttest scores were analyzed using a mixed between-within analysis of variance (ANOVA) to examine the interaction between group (experimental vs. control) and time (pretest vs. posttest), supplemented by independent-samples t-tests on gain scores for each competence sub-component. Qualitative responses from the perception questionnaire were analyzed thematically to identify recurring patterns related to motivation, anxiety, and perceived usefulness of AI support. Descriptive statistics showed comparable pretest means for the experimental ($M = 2.81$, $SD = 0.46$) and control groups ($M = 2.79$, $SD = 0.44$) on overall communicative competence, confirming baseline equivalence. Following the ten-week intervention, both groups improved; however, the experimental group's posttest mean ($M = 4.12$, $SD = 0.38$) exceeded that of the control group ($M = 3.42$, $SD = 0.41$). A mixed ANOVA revealed a significant group-by-time interaction, $F(1, 62) = 27.65$, $p < .001$, partial $\eta^2 = .31$, indicating that the AI-supported group improved at a significantly greater rate than the control group. Analysis of sub-components indicated differential gains across the four competence dimensions. Strategic competence showed the largest between-group difference (gain difference = 1.02 points), followed by discourse competence (0.81), sociolinguistic competence (0.64), and grammatical competence (0.41), suggesting that AI support was particularly effective in strengthening learners' ability to sustain and repair communication and to organize extended discourse, while producing comparatively modest additional gains in grammatical accuracy relative to conventional PBL. Questionnaire results indicated that 84% of experimental-group participants agreed or strongly agreed that AI tools reduced their anxiety about speaking English, and 78% reported increased willingness to initiate communication in English outside class. Thematic analysis of open-ended responses identified three recurring benefits: (a) the availability of a nonjudgmental practice partner for rehearsal, (b) immediate and specific feedback that accelerated revision cycles, and (c) a sense of increased autonomy in managing their own learning pace. A smaller subset of respondents (approximately 15%) expressed concern about over-reliance on AI-generated suggestions, particularly during the writing components of the project, echoing similar

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concerns raised by Edwards and Yahaya (2025). The results of this study support the hypothesis that embedding AI tools within a project-based learning framework produces greater gains in English communicative competence than conventional project-based instruction alone. This finding aligns with, and extends, prior research demonstrating the individual benefits of both PBL (Astawa et al., 2017; Bakar et al., 2019) and AI-assisted language learning (Al-khresheh, 2024; Asrifan et al., 2025) by providing controlled experimental evidence that their combination yields a synergistic rather than merely additive effect.

The disproportionately large gains observed in strategic and discourse competence suggest a plausible mechanism: AI tools such as conversational chatbots and speech-recognition applications afford learners frequent, low-stakes opportunities to rehearse turn-taking, clarification, and repair strategies — the very behaviors that constitute strategic competence — while generative writing assistants support learners in structuring cohesive, purpose-appropriate discourse during project drafting. In contrast, grammatical competence, which is less dependent on interactional practice and more reliant on cumulative instructional input, improved similarly across both groups, indicating that AI's comparative advantage lies less in remediating discrete linguistic errors and more in cultivating the pragmatic and organizational dimensions of communication. The perception data further suggest that AI's benefits operate substantially through affective pathways. Consistent with Aysah and Hamsia (2025) and Edwards and Yahaya (2025), learners in this study reported that AI tools created a psychologically safer space for practice, reducing the fear of negative evaluation that often inhibits willingness to communicate in traditional classroom settings. This affective scaffolding may be particularly valuable in large or mixed-proficiency classes where individualized teacher feedback during project work is logistically constrained. Nonetheless, the minority of learners who expressed concern about over-reliance on AI-generated content raises an important pedagogical caution. Without deliberate scaffolding, learners may accept AI suggestions uncritically, potentially undermining the development of independent linguistic judgment and originality that PBL is intended to foster. This suggests that successful integration of AI into PBL requires explicit instructional design — for example, requiring learners to justify or revise AI-generated suggestions in their own words — rather than unstructured tool access. Several limitations qualify these conclusions. The quasi-experimental design, while controlling for curriculum and instructor variables, could not achieve full random assignment, leaving open the possibility of unmeasured group differences. The ten-week duration, though sufficient to detect statistically significant effects, cannot speak to the durability of these gains over a full academic year. Finally, the study was conducted in a single institutional context, limiting generalizability to other proficiency levels, age groups, or educational systems. This experimental study demonstrates that integrating artificial intelligence tools into project-based learning significantly enhances EFL learners' English communicative competence beyond the gains achieved through conventional project-based instruction, with the most substantial benefits observed in strategic and discourse competence. These gains appear to be driven both by the



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increased quantity and immediacy of practice opportunities AI affords and by its capacity to reduce communication anxiety and foster learner autonomy. At the same time, the findings underscore the importance of deliberate pedagogical scaffolding to prevent uncritical dependence on AI-generated language. For curriculum designers and teacher educators, these results suggest that AI should be conceived not as a replacement for project-based pedagogy but as an amplifier of its communicative affordances — one that requires thoughtful integration, clear guidelines for appropriate use, and continued teacher mediation. Future research should employ randomized designs, extend intervention duration, and examine long-term retention of communicative gains across diverse educational settings.

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