Developing Communicative Competence in Primary School Students through Project-Based Learning Technologies

Iryna Bilous
Department of Educology and Pedagogy, West Ukrainian National University
11 Lvivska vul. (WUNU Building 1), 46009 Ternopil, Ukraine
E-mail address: 1982bilous@gmail.com
ORCID: **https://orcid.org/0000-0001-8203-1350**

Viktoriia Homotiuk
Department of International Economic Relations, West Ukrainian National University
11 Lvivska vul. (WUNU Building 1), 46009 Ternopil, Ukraine
E-mail address: vi.bryhadyr@gmail.com
ORCID: https://orcid.org/0000-0003-4723-9097

Zita Jenisová
Department of Chemistry Faculty of Natural Sciences and Informatics
Constantine the Philosopher University in Nitra
Tr. A. Hlinku 1, 949 01 Nitra, Slovakia
E-mail address: zjenisova@ukf.sk
ORCID: https://orcid.org/0000-0001-8720-4337

Tomáš Lengyelfalusy
Department of School Didactics DTI University
Sládkovičova 533/20, 018 41 Dubnica nad Váhom, Slovakia
E-mail address: lengyelfalusy@dti.sk
ORCID: https://orcid.org/0000-0001-7370-2212

Frantisek Heiser
Theological Institute in Spišské Podhradie Catholic University in Ruzomberok
Spišská Kapitula 12, 034 01 Ruzomberok, Slovakia
E-mail address: frantisek.heiser@ku.sk
ORCID: https://orcid.org/0009-0005-3726-5998

Tomas Hlavaty
Theological Institute in Spišské Podhradie Catholic University in Ruzomberok
Spišská Kapitula 12, 034 01 Ruzomberok, Slovakia
E-mail address: hlavaty86@email.cz
ORCID: https://orcid.org/0009-0002-9554-1530

ABSTRACT

Aim. This study examines the effectiveness of project-based learning (PBL) in developing communicative competence in primary school students and identifies which components are most sensitive to PBL-based intervention.

Methods. A mixed-methods quasi-experimental design was implemented with 148 students aged 6–10 from four mainstream primary schools, divided into an experimental group (PBL intervention) and a control group (traditional instruction). The 12-week PBL programme included collaborative projects, peer critique, co-construction of oral and written products, and public presentations. Communicative competence was assessed at pre-test and post-test across four components – oral interaction, pragmatic competence, strategic competence, and written communication – using piloted instruments with high internal consistency (Cronbach's $\alpha = .80–.89$). Quantitative data were analysed using descriptive statistics, paired t-tests, ANOVA, and effect sizes; qualitative data underwent thematic analysis.

Results. The experimental group showed improvement across all four components compared with the control group ($p < .001$), whereas gains in the control group were not significant ($p > .05$). Effect sizes ranged from $d = 0.55$ to 0.80, indicating medium to large effects. The proportion of students reaching a high level of communicative competence increased, especially in pragmatic and strategic components. Qualitative findings revealed improved collaboration, audience awareness, strategic communication, and contribution to joint writing.

Conclusions. PBL substantially enhances communicative competence in primary education by embedding meaningful, authentic communication into collaborative inquiry. It functions not only as a content-delivery pedagogy but also as a environment for communicative growth. The findings support integrating communication-focused PBL into primary school curricula to foster 21st-century skills.

Keywords: project-based learning, communicative competence, primary education, collaborative learning, pragmatic communication, strategic communication, oral interaction, written communication

Introduction

Contemporary education faces growing demands to prepare learners not only with subject-matter knowledge but also with communicative, collaborative and problem-solving skills vital for participation in twenty-first-century societies (Bilous et al., 2022). Technological advances and shifting labour-market expectations have intensified calls for pedagogies that foster active, contextualised, and transferable competencies rather than rote memorisation (Bransford et al., 2000). Project-based learning is frequently proposed as one such pedagogy: it engages learners in sustained, inquiry-driven projects that integrate content, practice, and authentic communication, making it particularly relevant for developing communicative competence in young learners.

PBL is a student-centred instructional approach in which students investigate real-world problems and produce public artefacts or performances over an extended period (Thomas, 2000). PBL promotes active knowledge construction, sustained inquiry, and collaborative work, and has been associated with gains in higher-order thinking, motivation, and engagement across K–12 settings (Bell, 2010; Thomas, 2000). Recent literature reviews indicate that while empirical evidence is mixed, owing in part to heterogeneity in implementation, well-designed PBL programmes tend to yield positive outcomes in both cognitive and socio-emotional domains when they include teacher scaffolding, clear assessment rubrics, and opportunities for reflection (Condliffe et al., 2017).

Communicative competence, originally conceptualised in sociolinguistics and later adapted to language pedagogy, encompasses not only grammatical knowledge but also pragmatic, sociolinguistic and strategic abilities that allow learners to use language effectively and appropriately in social contexts (Canale & Swain, 1980). In the primary classroom, communicative competence includes skills such as turn-taking, perspective-taking, task negotiation, clear oral and written expression, listening for meaning, and adapting language to audience and purpose. These skills are foundational for academic learning and future professional interaction; thus, explicit curricular attention to their formation is a priority in contemporary education.

PBL's emphasis on authentic tasks, public products, and sustained peer collaboration creates natural opportunities for practising and assessing communicative competence. Problem-solving projects, role plays, community interviews, and collaborative presentations require learners to negotiate meaning, plan joint activities, and communicate findings to audiences beyond the classroom–activities closely aligned with the components of communicative competence outlined by Michael Canale and Merrill Swain (1980). Moreover, PBL's iterative cycles of inquiry and feedback support the development of strategic and metacognitive aspects of communication, such as repair strategies, audience awareness, and reflective self-assessment. Empirical and theoretical work on problem-based and project-based approaches has emphasised their potential to foster flexible knowledge, collaboration, and communication when supported by appropriate scaffolds (Hmelo-Silver, 2004; Thomas, 2000).

Despite the conceptual fit between PBL and communicative competence, research explicitly examining the effects of PBL on communicative outcomes in primary school contexts remains comparatively limited. Reviews of the PBL literature note variability in outcome measures and a relative under-representation of rigorous studies focused specifically on communication skills in early grades (Condliffe et al., 2017). At the same time, practitioner frameworks (e.g., Buck Institute for Education [n.d.]) emphasise communication as a core project-competency, recommending instructional design elements–such as public audiences, communication rubrics, and structured peer critique–to maximise communicative development. Empirical studies are needed that combine robust diagnostics of communicative competence with carefully described PBL interventions in primary settings (Bilous et al., 2025).

This study responds to that gap by examining how a structured PBL intervention in primary classrooms influences the formation of communicative competence. Grounded in constructivist and socio-cultural theories of learning (Bransford et al., 2000), and guided by operational definitions of communicative competence (Canale & Swain, 1980), the research investigates both quantitative gains in targeted communicative behaviour and qualitative changes in students' communicative strategies during collaborative projects. The study's objectives are: to design and implement a PBL model tailored to primary learners with embedded communicative scaffolds; to measure changes in communicative competence using mixed diagnostic tools; and to identify pedagogical conditions that support sustainable communicative growth in young learners.

Research Questions of the Study

The purpose of this research is to examine how project-based learning technologies contribute to the development of communicative competence in primary school students and to determine which components of communicative competence are most sensitive to PBL-based intervention. The study aims to establish a relationship between the structured use of project activities and measurable improvements in pupils' communicative performance in real and simulated learning situations.

The objectives of the research are:

- *To clarify the concept of communicative competence* as applied to primary education and identify its structural components relevant to project-based learning;
- *To analyse contemporary international research* to determine the pedagogical conditions that enable PBL to function as an effective tool for developing communicative competence in young learners;
- *To design, systematise and describe a model of project-based learning technologies* suitable for primary school settings, with embedded communicative tasks, scaffolds, and assessment tools;

– *To evaluate the effectiveness of PBL in enhancing communicative competence*, using quantitative and qualitative diagnostic instruments appropriate for primary students.

The article's limitations stem from the diversity of interpretations of both communicative competence and project-based learning across educational systems. Although PBL is widely recognised as a powerful student-centred approach, its impact on communicative development may depend on contextual factors such as teacher expertise, classroom environment, age-specific characteristics, and the availability of structured assessment tools. Therefore, systematic theoretical analysis and carefully organised experimental implementation are required to ensure that PBL resources are used effectively to enhance communicative competence in primary school students.

Literature Review

System of Scientific Views on Project-Based Learning and Communicative Competence

With the growing need for holistic, competence-based education, PBL has become a strategically significant pedagogical technology, valued for its capacity to integrate knowledge and skills in socially meaningful contexts (Savitska et al., 2022). A similar orientation toward innovation and the modernisation of educational technologies is also reflected in contemporary Ukrainian pedagogical scholarship, which emphasises the need to update instructional models in accordance with competence-based learning paradigms (Bilous et al., 2022; Blahyi et al., 2025; Savitska et al., 2022). According to John W. Thomas (2000), PBL constitutes "a systematic teaching method engaging learners in extended, inquiry-based tasks that result in a realistic product or presentation", where communication is not auxiliary but structurally embedded in task completion. Stephanie Bell (2010) emphasises that the collaborative nature of PBL inherently supports interaction and shared responsibility, which makes it particularly suitable for developing communication-related learning outcomes. Similarly, Joseph S. Krajcik and Phyllis C. Blumenfeld (2006) highlight that PBL ensures sustained dialogic interaction, through which learners negotiate meaning, distribute roles, debate solutions, and articulate findings to real audiences.

A second line of scholarship underscores the socio-constructivist foundations of PBL. Cindy E. Hmelo-Silver (2004) argues that learning occurs most effectively when knowledge is co-constructed through purposeful interaction, scaffolding, and dialogic mediation – mechanisms that directly stimulate communicative strategies including explanation, justification, clarification, and reflective dialogue. Jan-Willem Strijbos and Frank Fischer (2007) note that PBL fosters "task-related communication of high

cognitive density" due to interdependence of roles and shared accountability for a common goal. In the primary school context, these mechanisms are particularly relevant, as communicative competence develops not only as a linguistic ability but also as a socio-emotional and pragmatic tool for coordinated action.

The communicative dimension of PBL becomes more evident when examined through the conceptual evolution of communicative competence. Dell Hymes (1972) introduced communicative competence as the ability to use language appropriately in sociocultural contexts rather than merely producing grammatically correct forms. Canale and Swain (1980) operationalised this into grammatical, sociolinguistic, discourse and strategic components–each essential to meaningful participation in interactive tasks. Lyle F. Bachman (1990) further expanded the model by foregrounding pragmatic competence and the role of contextual knowledge, while Marianne Celce-Murcia (2008) emphasised interactional skills, discourse organisation, and formulaic language, which are especially critical in the early school years. More recent work by Jack C. Richards (2015), Sandra J. Savignon (2017), and H. Douglas Brown and Heekyeong Lee (2020) stresses that communicative competence must be developed through authentic language use and problem-centred communication rather than mechanical drills. Research on foreign-language reading interventions also demonstrates that language-learning tasks can foster not only comprehension but also divergent thinking and tolerance of ambiguity, which are relevant to strategic and flexible communicative behaviour (Gadušová et al., 2021).

Connecting the two research domains, scholars such as Robyn M. Gillies (2016), Fais Wahidatul Arifatin (2023) and Joie Claire Mugabekazi et al. (2025) argue that PBL creates a natural ecological environment for communicative development, because the need to communicate is embedded in learning goals, not imposed artificially. Authentic audiences, public presentations, peer critique, negotiation of meaning, and co-authoring written artefacts strengthen both oral and written communication. The written dimension of communicative competence also requires explicit attention to coherence, cohesion and relevance, since problems in text organisation may limit students' ability to construct meaningful written messages (Khonamri et al., 2021). Additionally, iterative feedback cycles inherent in PBL enhance students' strategic competence (repair strategies, clarification requests, meta-discussion), which traditional lesson formats rarely cultivate. Recent empirical evidence also suggests that game-based and project-based technologies may function synergistically in strengthening communicative development and broader soft-skill formation (Bilous et al., 2025; Savitska et al., 2025), which opens promising directions for future research.

Despite strong theoretical alignment, several authors note fragmentation in o perationalisation of communicative outcomes. Barbara Condliffe et al. (2017) and Barbara Schneider et al. (2022) point to heterogeneity in PBL implementations

and the absence of unified communicative assessment tools, which hinders cross-study comparability. In primary education, the research gap is even more pronounced: international studies disproportionately focus on academic achievement, while communicative indicators–listening for meaning, turn-taking, negotiation, audience adaptation – remain under-examined.

Responding to this gap, the present study adopts the classical framework of communicative competence of Canale & Swain (1980) and applies it to a PBL-based intervention tailored to primary learners, focusing on pragmatic, interactional, and strategic behaviour in real collaborative projects. In contrast to research emphasising merely student engagement, this study measures fine-grained communicative indicators embedded within structured project-activity rubrics, integrating both qualitative and quantitative diagnostics.

Table 1 demonstrates how the construct of communicative competence has gradually expanded from linguistic correctness towards socio-pragmatic, discourse-based and strategic dimensions.

Table 1

Evolution of Communicative Competence in International Scholarship

Scholar	Core Focus of Definition	Structural Components	Pedagogical Implications
Hymes (1972)	Appropriate language use in context	Socio-cultural appropriateness	Communication as social action
Canale & Swain (1980)	Functional language ability	Grammatical, sociolinguistic, discourse, strategic	Explicit instruction + authentic contexts
Bachman (1990)	Communicative language ability	Pragmatic and organisational competence	Integration of formal & functional learning
Celce-Murcia (2008)	Interactional and discourse skills	Discourse, sociocultural, formulaic, strategic	Task-based and interaction-driven learning
Richards (2015)	Real-world communication	Genre and context-specific competence	Public-audience tasks and multimodality
Savignon (2017)	Dynamic, emergent competence	Performance-based	Communication develops through use
Brown & Lee (2020)	Social-cognitive dimension	Cognitive, affective, pragmatic	Collaborative problem solving

Source. Own research.

A review of above described research shows that project-based learning aligns not merely conceptually but functionally with the updated structure of communicative competence. In particular, the mechanisms inherent in PBL – collaboration, role distribution, iterative inquiry, public presentation, and peer critique – act as triggers for different components of communicative behaviour (Table 2).

Table 2

Convergence of PBL Mechanisms and Components of Communicative Competence

PBL Mechanism	Communicative Component Activated	Learning Manifestation
Collaborative task	Interactional / discourse	Turn-taking, joint planning, consensus building
Public presentation	Pragmatic	Adapting language to audience and purpose
Peer critique	Strategic	Repair strategies, clarification, negotiation of meaning
Role distribution	Sociolinguistic	Language registers, politeness, task-related discourse
Iterative inquiry cycles	Metacommunicative	Reflection, self-evaluation, questioning
Artifact co-construction	Written communicative competence	Co-authoring, argumentation, coherence

Source. Own research.

This convergence suggests that communicative competence formation does not occur in isolation from task design, but emerges as a behavioural response to authentic, socially meaningful challenges. In quantitative educational research, effect sizes complement significance testing by indicating the magnitude of observed differences and helping to judge their practical importance. As Sil Aarts et al. (2014) explain, Cohen's d is a widely used standardised effect-size measure, with values around 0.2 interpreted as small, around 0.5 as medium, and 0.8 or higher as large. Therefore, reporting effect sizes alongside p-values strengthens the interpretation of interventio n outcomes and makes the practical relevance of the findings more transparent.

Authorial Position Emerging From The Literature

The analysis suggests that communicative competence develops most effectively when three conditions coexist simultaneously:

- communication is embedded in meaningful collaborative activity (PBL), not isolated as a separate language task;
- feedback cycles are iterative and dialogic rather than evaluative only;
- assessment includes observable communicative behaviour beyond linguistic correctness.

Therefore, the proposed study conceptualises communicative competence as a multidimensional behavioural system emerging through participation in structured collaborative projects, rather than as a set of language skills taught explicitly.

This operationalisation becomes the basis of the intervention model tested empirically.

Methods

This study applied a mixed-methods quasi-experimental design to examine the impact of project-based learning (PBL) technologies on the development of communicative competence in primary school students. The methodological framework relied on socio-constructivist theory, which considers learning a socially mediated dialogic process (Hmelo-Silver, 2004), and on contemporary models of communicative competence that prioritise pragmatic, interactional and strategic performance (Canale & Swain, 1980; Celce-Murcia, 2008).

The research was conducted in four mainstream Ukrainian primary schools and involved 148 students aged 6–10 years. This age range corresponds to the early stages of formal schooling internationally and is characterised by rapid development of pragmatic and interactional communication, which makes it optimal for the formation of communicative competence through collaborative tasks. Two groups were formed based on intact class units:

- *experimental group* (n = 74) – engaged in a structured PBL intervention;
- *control group* (n = 74) – followed the standard curriculum without project-based components.

To minimise teacher-related bias, participating teachers had comparable qualifications and teaching experience, following recommendations for experimental research in education (Gillies, 2016; Mugabekazi et al., 2025). At baseline, there were no statistically significant differences between the experimental and control groups in terms of age, gender distribution or pre-test scores on any communicative competence components (all $p > .05$).

The intervention lasted 12 weeks and consisted of three interdisciplinary projects designed to cultivate communicative competence through collaborative investigation, problem solving and public presentation. Core PBL elements included role distribution, shared planning, co-construction of written and oral products, peer critique and iterative feedback cycles, aligned with internationally validated PBL principles (Thomas, 2000; Krajcik & Blumenfeld, 2006). Teachers in the experimental group completed preparatory training on PBL scaffolding and communication rubrics. This emphasis on scaffolding is consistent with recent research on teacher–student emotional dynamics in language learning, which indicates that co-regulation techniques, including praise, consensus-based decision-making and emotion-prompting scaffolding, may support learner engagement and learning outcomes (Ajmal et al., 2025).

To measure different dimensions of communicative competence, four complementary diagnostic instruments were applied at pre-test and post-test:

- Structured observation protocol for oral interaction and discourse behaviour (after Gillies, 2016);
- Communicative performance rubric for pragmatic competence and audience awareness (adapted from Celce-Murcia, 2008);

- Interactional strategies checklist assessing clarification, negotiation and repair (after Bachman, 1990);
- Collaborative writing grid for written communication (Richards, 2015).

The use of transparent and learner-sensitive assessment tools is important because students' perceptions of assessment validity, authenticity, washback and practicality may influence how assessment tasks are experienced within the learning process (El Kasri et al., 2025). The diagnostic framework was based on the multidimensional structure of communicative competence conceptualised by Canale and Swain (1980) and extended in the works of Bachman (1990) and Celce-Murcia (2008). International scholarship indicates that oral interaction, pragmatic competence, strategic competence and written communication are the components most sensitive to change within project-based instructional contexts (Bell, 2010; Gillies, 2016; Mugabekazi et al., 2025; Arifatin, 2023). Therefore, these four components were operationalised as observable behavioural indicators in the present study.

To ensure measurement accuracy, all diagnostic tools were pilot-tested in a preliminary trial three months before the intervention. Internal consistency reliability was examined using Cronbach's α. The coefficients ranged from α = .81 to .88 for oral interaction and pragmatic communication rubrics, α = .83 to .89 for strategic communication instruments, and α = .80 to .86 for collaborative writing assessment, indicating high internal consistency and suitability for research use in primary education settings. For each instrument, item scores were summed and rescaled linearly to a 0–100 scale so that higher values reflected higher levels of communicative competence. Component scores for oral interaction, pragmatic communication, strategic communication and collaborative writing were then averaged to obtain an overall communicative competence index. Performance was additionally categorised into three levels – Beginner (50–69), Intermediate (70–84) and High (85–100) – based on expert consensus and the distribution of scores in the pilot study.

In addition to quantitative diagnostics, semi-structured interviews and reflective journals (experimental group only) were collected for qualitative triangulation. Quantitative data were analysed using descriptive statistics, paired t-tests and ANOVA to compare pre- and post-intervention results between groups. In addition, effect sizes were calculated using Cohen's d to estimate the practical magnitude of the observed differences; values around 0.2, 0.5 and 0.8 were interpreted as small, medium and large effects, respectively (Aarts et al., 2014). Qualitative data were examined using thematic analysis following the Braun and Clarke protocol. The mixed-methods convergence design enabled cross-validation of quantitative and qualitative findings.

Ethical approval was obtained at the institutional level. Written parental consent and child assent were collected. Participation was voluntary, confidentiality was en-

sured, and withdrawal did not affect academic evaluation. To prevent psychological discomfort, peer feedback and public presentations were conducted in a supportive rather than competitive format, consistent with best practice for PBL in early childhood and primary education. In digitally mediated or hybrid project environments, attention should also be paid to students' wellbeing, since online communication may support motivation, interpersonal connectivity and preferred forms of learning when pedagogically organised (Tkáčová et al., 2021).

Results

This section presents the findings of the pedagogical experiment aimed at determining the influence of project-based learning (PBL) technologies on the development of communicative competence in primary school students. The results are organised according to the research questions of the study and correspond to the components of communicative competence assessed in both the experimental and control groups.

During the experimental period, students in the experimental group participated in three interdisciplinary projects integrated into the primary school curriculum. Projects included collaborative inquiry, group planning, co-construction of written artefacts, public presentations to real audiences, and structured peer feedback sessions. The emphasis was placed on meaningful communication in collaborative contexts rather than on isolated language practice. Students regularly engaged in activities such as role-play, interviewing, collective report preparation, and joint problem solving. Central to the intervention was guided interaction: teacher scaffolding, communication rubrics, and peer critique.

The control group followed the traditional instructional model, which included individual responses, reproduction of instructional material and teacher-led classroom discourse without authentic communicative tasks.

The study formulated two hypotheses:

- H1. The structured use of PBL technologies during classroom learning significantly enhances the development of communicative competence in primary school students.
- H2. The components of communicative competence most sensitive to PBL-based intervention are interactional and pragmatic competences associated with collaborative discourse, negotiation and audience-oriented expression.

Both hypotheses were verified through quantitative and qualitative data processing.

To determine the levels of communicative competence among students before and after the intervention, each component was assessed on a 100-point scale. Table 3 presents the initial and final mean values for both the experimental and control groups.

Table 3

Initial and Final Mean Scores of Communicative Competence (Pre/Post)

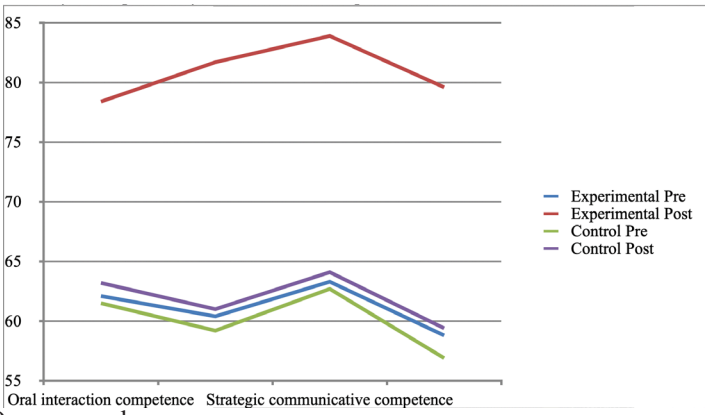
Component of communicative competence	Experimental Pre	Experimental Post	Control Pre	Control Post
Oral interaction	62.1	78.4	61.5	63.2
Pragmatic competence	60.4	81.7	59.2	61.0
Strategic competence	63.3	83.9	62.7	64.1
Written communication	58.8	79.6	56.9	59.4

Source. Own research.

As shown in Table 3, mean score increases in the experimental group ranged from *+16.3 to +21.3 points,* whereas the control group demonstrated only marginal improvement. The visual distribution of pre- and post-test scores is provided in Figure 1.

Figure 1

Pre/Post Means for Components of Communicative Competence



Source. Own research.

The comparison of pre- and post-intervention results demonstrates significant improvement across all components in the experimental group. Gain scores are shown in Table 4.

Table 4

Difference Between Initial and Final Mean Scores (Post – Pre)

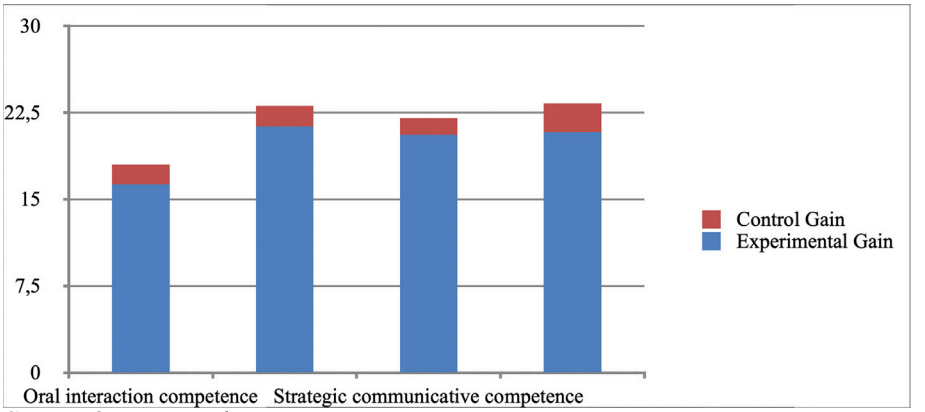
Component	Experimental Gain	Control Gain
Oral interaction	+16.3	+1.7
Pragmatic competence	+21.3	+1.8
Strategic competence	+20.6	+1.4
Written communication	+20.8	+2.5

Source. Own research.

Figure 2 presents a comparative view of gain scores, highlighting the difference between the PBL-based experimental group and the traditionally instructed control group.

Figure 2

Gain Scores Comparison (Experimental vs Control)



Source. Own research.

The experimental group demonstrated *medium-to-high effect sizes across components*, whereas improvements in the control group were statistically insignificant. These results empirically confirm *H1*.

Statistical analysis confirmed the robustness of these improvements. Paired t-tests indicated that pre–post differences in the experimental group were statistically significant for all four components of communicative competence ($p < .001$), whereas changes in the control group were not statistically significant ($p > .05$). In addition, effect size calculations demonstrated substantial practical significance: *Cohen's d values ranged from 0.55 to 0.80 across the four components, indicating medium to large effects* of the PBL intervention according to conventional benchmarks (Aarts et al., 2014). These findings demonstrate that the observed improvements are not only numerically evident but statistically and practically meaningful.

To analyse not only average growth but also distribution of achievement levels, the proportion of students reaching a *High level of communicative competence (≥ 85 points)* was calculated. Table 5 presents the results.

Table 5

Percentage of Students Achieving High Level of Communicative Competence After the Intervention

Component	Experimental High %	Control High %
Oral interaction	34%	18%

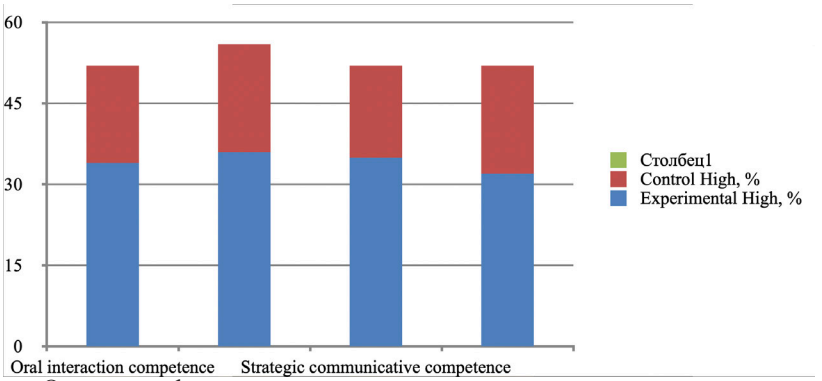
Component	Experimental High %	Control High %
Pragmatic competence	36%	20%
Strategic competence	35%	17%
Written communication	32%	20%

Source. Own research.

The highest increases were observed in pragmatic and strategic competences – components associated with communication in authentic contexts – thereby confirming *H2* and demonstrating that authentic task-driven interaction, negotiation, and public presentation serve as key drivers of communicative growth in PBL environments.

Figure 3

Percentage of Students Achieving High Level by Component



Source. Own research.

A qualitative thematic analysis of student reflections and researcher classroom observations revealed four dominant indicators of communicative development, which are presented in Table 6.

Table 6

Indicators of Communicative Development Identified through Qualitative Thematic Analysis

Indicator	Behavioural manifestation
Collaboration	Increased use of turn-taking, negotiation of decisions and shared planning
Audience awareness	Clearer explanations, verbal structuring, adaptation of tone and vocabulary
Strategic communication	Active use of clarification requests, paraphrasing and self-correction
Written co-construction	Improved coherence and contribution to joint written products

Source. Own research.

Students frequently reported that public presentations and peer feedback were "the most difficult but the most useful" tasks. The necessity to prepare messages for real audiences, respond to questions and justify decisions contributed to confidence and communicative autonomy.

Content analysis of student comments (reflection journals, interview notes) identified the following recurring categories, which are presented in Table 7.

Table 7

Content Analysis of Student Attitudes toward Communication-Focused Learning Activities

Category	Content of comments	Frequency
Interest and engagement	"It was interesting to talk in front of others", "I wanted to prepare better"	21
Teamwork motivation	"We helped each other", "We solved problems together"	18
Awareness of communication skills	"I learned how to explain better", "Now I ask questions when I don't understand"	15
Satisfaction from public presentation	"I liked presenting our work", "The audience made us responsible"	12

Source. Own research.

Students almost unanimously expressed that communication tasks made learning *more meaningful, engaging, and socially valuable.*

The experiment demonstrated that project-based learning technologies significantly increased communicative competence in primary school students. Improvement was consistent across all components and especially pronounced in pragmatic and strategic communication – those directly linked to collaboration, negotiation and public presentation. Quantitative growth was verified through gain scores and the increased proportion of learners achieving high proficiency levels, while qualitative findings confirmed deeper communicative involvement, confidence and metacognitive control during collaborative tasks.

Overall, the results prove that PBL is an effective pedagogical mechanism for fostering communicative competence in primary school students, providing empirical justification for integrating inquiry-based collaborative projects into the primary education curriculum.

Discussion

The findings of this study demonstrate that project-based learning (PBL) technologies are highly effective in fostering communicative competence in primary school students. However, the implementation of PBL in real educational settings reveals a number

of challenges that may hinder the full realisation of its potential. These challenges do not negate the effectiveness of PBL but highlight organisational, methodological and psychological barriers that must be addressed to ensure sustainable results.

First, the success of PBL depends significantly on the teacher's ability to provide *scaffolding of communication*, including guided collaboration, peer feedback and modelling of effective discourse practices (Krajcik & Blumenfeld, 2006; Gillies, 2016). In practice, however, many teachers are accustomed to traditional directive instruction and may lack experience in managing long-term group projects and orchestrating productive dialogue among young learners. This leads to uneven teacher facilitation and insufficient support for communication processes within groups.

Second, PBL often requires *a shift in classroom interaction patterns*, moving away from teacher-centred knowledge transmission towards shared decision-making and collaborative problem solving. While this transition benefits communication development, it may create discomfort for teachers who perceive a reduction in control over the learning process, and for students who are not accustomed to expressing and defending their ideas publicly in front of peers.

Third, *time constraints remain one of the most frequently cited obstacles* to PBL implementation in primary school. Designing and completing interdisciplinary projects, organising presentations, and conducting peer critique are significantly more time-consuming than traditional workbook-based assignments. As a result, teachers may struggle to balance project activities with curricular pressure to cover a wide range of content in limited instructional hours.

Fourth, *heterogeneity of communicative development* in young learners presents a practical challenge. Students with lower initial communication skills may initially withdraw during group discussions, while more confident speakers dominate the discourse. This difficulty can be resolved through carefully structured roles and communication rubrics, yet teachers need specialised methodological preparation to manage such dynamics effectively (Arifatin, 2023).

Fifth, although this study demonstrates the high effectiveness of PBL in improving communicative competence, *the availability of assessment tools remains limited*. Traditional evaluation strategies – tests, individual oral responses – do not adequately capture interactional behaviour, strategic communication, or audience adaptation. The development and dissemination of user-friendly rubrics for formative assessment of communication are therefore essential for broader adoption of PBL.

Finally, *parental expectations and cultural factors* may also complicate implementation. In contexts where academic achievement is associated primarily with memorisation and correctness, project-based learning may be perceived as "less serious" or "not academically rigorous", despite empirical evidence demonstrating its long-term benefits for cognitive and social growth.

Taken together, these challenges indicate that the successful use of PBL for communicative development requires not only technological and methodological resources

but also a broader transformation of school culture. Professional training for teachers, adequate time allocation for collaborative learning, systematic communication assessment tools and supportive attitudes from parents and school administration are required to ensure sustained integration of PBL in primary education.

Limitations

Several limitations should be acknowledged when interpreting the findings of this study. First, the experiment was conducted in four schools located in one national context, which limits the generalisability of the results to other regions and educational systems. Second, the research design was quasi-experimental, and the groups were based on intact classes rather than random assignment, which may introduce uncontrolled contextual factors. Third, the intervention lasted 12 weeks, and therefore the study did not assess whether communicative gains would be sustained in the long term. Finally, communicative competence was measured within classroom-based collaborative tasks, and the study did not examine students' communicative performance in informal or real-life settings beyond school. These limitations do not diminish the significance of the findings but should be taken into account in future research and interpretation.

Conclusions

The purpose of this study was to examine the impact of project-based learning technologies on the development of communicative competence in primary school students. The results obtained through mixed-methods analysis provide compelling evidence that PBL is an effective pedagogical mechanism for enhancing oral, pragmatic, strategic and written communicative competences among young learners.

Quantitative data demonstrated statistically significant improvements in all competence components in the experimental group, accompanied by a marked increase in the proportion of students achieving a high level of communicative performance. Qualitative observations confirmed deeper behavioural changes manifested in collaborative discourse, audience-oriented communication, increased willingness to express and defend opinions, strategic communicative behaviour, and meaningful participation in joint written production.

The key mechanism underlying the effectiveness of PBL lies in the authentic communicative demands embedded in interdisciplinary projects: learners are required to plan collaboratively, negotiate meaning, create shared outcomes and present their work to real audiences. These iterative communicative cycles – supported by teacher scaffolding and structured peer feedback – create favourable conditions for the development of both linguistic and socio-interactional dimensions of communication.

Thus, the study provides empirical confirmation that PBL technologies can function not only as tools for content learning, but also as a structured environment for the formation of communicative competence in primary school education. Integrating PBL into teaching practice can contribute to the development of 21st-century skills, bolstering students' readiness for academic, social and future professional interaction.

Practical Implications

The findings of this study have several practical implications for primary education. First, teachers may enhance communicative competence by embedding structured project activities that require students to negotiate meaning, co-construct written and oral products and present work to authentic audiences. Second, classroom roles, communication rubrics and peer-feedback protocols can serve as effective scaffolds to support participation of both confident and less confident speakers. Third, school administrators can facilitate the adoption of PBL by allocating dedicated time for collaborative learning and by providing professional development on dialogic teaching and facilitation of group interaction. Finally, curriculum developers and policymakers may consider integrating communication-focused project tasks into primary education programmes to cultivate 21st-century competences from the earliest stages of schooling.

Future Directions

Although the research confirms the effectiveness of PBL technologies for communicative development, the findings open several promising avenues for further investigation:

- Longitudinal studies are needed to evaluate whether communicative gains achieved through PBL persist beyond the intervention period and influence later academic performance and social adaptation;
- Differentiated models of PBL scaffolding should be developed to support students with initially low communicative competence and ensure balanced participation during collaborative tasks;
- Digital and hybrid project-based learning formats could be explored to determine whether online communication tools, virtual collaboration spaces or multimodal presentation formats can successfully complement face-to-face PBL, provided that such formats also include media-literacy safeguards against uncritical sharing of online information (Tkáčová et al., 2023);
- Assessment tools for communicative competence in primary education require further refinement, particularly rubrics that measure behavioural indicators such as negotiation strategies, repair strategies or audience-aware discourse;

- Cross-cultural studies would enrich the understanding of how sociocultural norms shape communicative development in project-based learning environments, enabling the adaptation of PBL models to diverse educational contexts;
- Teacher professional development research is needed to identify the most effective approaches for training educators to facilitate communication-centred PBL, manage group dynamics and provide constructive dialogic feedback.

Overall, further research should focus on refining methodological models of PBL implementation, expanding diagnostic tools for communication assessment, and ensuring sustainable integration of PBL into primary education systems.

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Appendix A

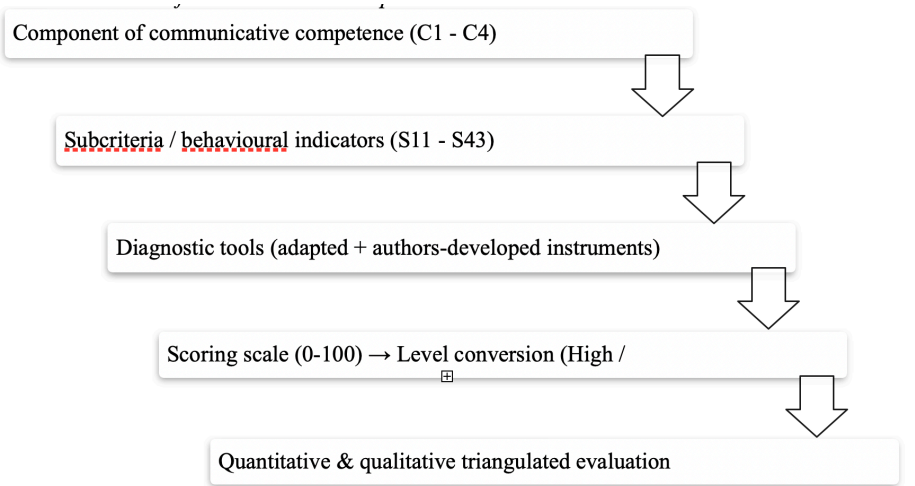
To ensure the objectivity and reliability of the experimental evaluation, a structured diagnostic framework was developed for assessing communicative competence within project-based learning (PBL). The framework is based on a combined system of adapted and authors-designed diagnostic instruments and reflects the multidimensional nature of communicative competence in primary education. Four core components were operationalised: *oral interaction competence (C1), pragmatic communicative competence (C2), strategic communicative competence (C3), and written communicative competence (C4)*. Each component includes a set of subcriteria that represent observable communicative behaviours in collaborative project work and are used to diagnose progress throughout the learning process. The core components were specified through the following subcriteria:

- C1 (oral interaction competence): turn-taking and responsiveness; clarity and coherence of oral messages; active listening.
- C2 (pragmatic communicative competence): audience adaptation (tone, vocabulary); purpose-driven communication; negotiation in social interaction.
- C3 (strategic communicative competence): clarification requests and paraphrasing; repair and self-correction; managing turns during discussions.
- C4 (written communicative competence): coherence and cohesion in writing; participation in joint written production; adaptation of written messages to audience and communicative purpose.

These subcriteria are operationalised through behavioural indicators measured via a multimethod diagnostic system incorporating teacher observation, peer assessment, student self-assessment, and quantitative scoring of project performance. Each diagnostic tool includes descriptors and rubrics to reduce subjectivity and ensure replicability of the evaluation procedure. The structural logic of the diagnostic model is presented in Figure A1.

Figure A1

Structural Model of Communicative Competence Assessment in PBL



Source. Own development.

To support systematic implementation of this model, a detailed mapping of components, subcriteria, and diagnostic tools was developed. Table A1 presents the full matrix linking communicative competence components to their corresponding behavioural indicators and assessment instruments.

Table A1

Criteria, Subcriteria and Diagnostic Tools

Component (Criterion)	Subcriteria / behavioural indicators	Diagnostic tools
C1 – Oral interaction competence	S11 – turn-taking and responsiveness; S12 – clarity and coherence of oral messages; S13 – active listening	Adapted checklist based on L. Starkey's communication assessment protocol; teacher observation rubric (authors modification)
C2 – Pragmatic communicative competence	S21 – audience adaptation (tone, vocabulary); S22 – purpose-driven speaking; S23 – polite disagreement / negotiation	Peer-feedback sheet (authors-developed); oral presentation rubric adapted from Cambridge Primary Assessment
C3 – Strategic communicative competence	S31 – clarification and paraphrasing; S32 – repair/ self-correction; S33 – turn management in discussions	Observation protocol based on discourse strategy indicators (adapted from Dornyei); self-assessment checklist (authors-developed)

Component (Criterion)	Subcriteria / behavioural indicators	Diagnostic tools
C4 – Written communicative competence	S41 – coherence and cohesion; S42 – group writing collaboration; S43 – awareness of written audience and purpose	Joint writing assessment rubric (authors-developed); text structure checklist adapted from Graham & Harris

Note. All diagnostic tools were pilot-tested and adapted for primary school learners.
Source. Own research.

Because the diagnostic instruments differ in scale and format, all results were standardised using a 0–100 scoring scale, later converted into a three-level interpretation model (High / Intermediate / Beginner) for statistical comparison between groups. Thresholds for the three levels (H = 85–100, I = 70–84, B = 50–69) were established through expert consensus, informed by the empirical distribution of scores in the pilot study. This conversion increases clarity in interpreting developmental progress while maintaining sensitivity to individual score differences. The complete interpretation grid is presented in Table A2.

Table A2
Interpretation Grid for Communicative Competence Levels

Level	Score range (0–100)	Behavioural profile
High competence (H)	85–100	Demonstrates confident participation in communication; expresses ideas clearly; adapts language to task and audience; negotiates decisions; uses strategic communication autonomously
Intermediate competence (I)	70–84	Participates in communication and task solving with occasional support; ideas mostly clear; uses selected strategies when prompted; requires guidance to maintain interaction
Beginner competence (B)	50–69	Limited participation in joint communication; message structure often unclear; relies heavily on teacher support; shows minimal control of communication strategies

Note. Conversion to levels was performed after initial scoring on the 0–100 scale.
Source. Own research.

To reinforce multi-source evaluation and reduce bias in a communication-centred experiment, both *teacher-based and learner-based assessment tools* were used. Tables A3 and A4 provide sample fragments of the evaluation sheets included in the diagnostic system.

Table A3

Sample Fragment of Teacher Observation Rubric

Indicator	0–2	3–4	5–6	Score
Turn-taking and responsiveness	rarely responds; avoids speaking	responds but briefly; few elaborations	confidently initiates/responds; encourages peers	___
Negotiation and collaborative decision making	does not negotiate; waits for direction	participates when invited	proposes solutions, justifies ideas, negotiates constructively	___
Use of communication strategies (clarification, paraphrasing)	not used	occasionally used after prompting	used autonomously and purposefully	___
Adaptation to audience during presentation	reads without awareness of audience	some adaptation of tone and pace	strong audience awareness; clear tone and structure	___

Note. The total score is converted to a 0–100 scale and then interpreted as B / I / H.
Source. Own research.

Table A4

Sample Fragment of Student Self- and Peer-Assessment Form

Statement	Never	Sometimes	Often	Always
I listen to groupmates until they finish speaking	☐	☐	☐	☐
I ask questions when I do not understand something	☐	☐	☐	☐
I help our group decide together instead of only following others	☐	☐	☐	☐
I adjust how I speak depending on who will listen (teacher / classmates / parents / guests)	☐	☐	☐	☐
I try to improve the group's writing	☐	☐	☐	☐

Note. Reflection prompt: Today in my group I contributed most to communication when I…
Source. Own research.

Purpose of Appendix A

Appendix A documents the operational model of communicative competence measurement applied in the experimental study. The combined diagnostic system (adapted instruments + authors-developed rubrics and checklists) ensured reliable evaluation through multi-source triangulation: teacher observation, peer interaction, student self-assessment and quantitative scoring. This framework supports transparency, methodological reproducibility and transferability for future PBL-based research in primary education.