THE EFFECTIVENESS OF PROJECT-BASED LEARNING IN DEVELOPING COMMUNICATIVE COMPETENCE IN STUDENTS OF A TECHNICAL UNIVERSITY

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This article investigates the effectiveness of project-based learning (PBL) in developing communicative competence among technical university students. Findings from a mixed-methods study involving 156 engineering students indicate that structured PBL interventions produce significant gains in oral presentation (d=0.85), technical writing (d=0.72), team communication (d=0.68), and visual communication (d=0.54). Qualitative data reveal that authentic communicative demands, iterative feedback, collaborative negotiation, and audience awareness development drive these improvements. The article concludes with recommendations for optimizing PBL implementation in technical higher education.

Contemporary engineering practice demands sophisticated communication skills—the ability to present ideas clearly, collaborate within multidisciplinary teams, and interact effectively with diverse stakeholders (Passow & Passow, 2017). Yet traditional technical curricula, dominated by lecture-based instruction, provide limited structured opportunities for communication skill development. This gap between educational preparation and professional requirements represents a significant challenge.

Project-based learning offers a theoretically grounded response. By engaging students in authentic projects mirroring professional engineering contexts, PBL creates natural communicative demands: teams must negotiate roles, explain decisions, document processes, and present outcomes. This article examines PBL's effectiveness in developing the communicative competence required of engineering graduates.

Communicative competence in engineering contexts encompasses technical writing, oral presentation, visual communication, teamwork communication, and intercultural awareness (Riemer, 2007). PBL is distinguished by its emphasis on authentic problems, sustained inquiry, collaborative work, and production of tangible artifacts (Thomas, 2000).

Theoretical support derives from situated learning theory (Lave & Wenger, 1991): learning occurs most effectively within authentic contexts. Prior research

demonstrates PBL's superiority over traditional instruction for skill application and long-term retention (Strobel & van Barneveld, 2009). However, communication gains are not automatic—they require explicit attention within project design (Helle, Tynjälä, & Olkinuora, 2006).

The study employed a mixed-methods approach with 156 third-year engineering students across two technical universities. The intervention group (n=82) participated in a 14-week interdisciplinary design project with explicit communication objectives, structured feedback, and varied communicative tasks. The comparison group (n=74) completed traditional coursework. Communicative competence was assessed through rubric-based evaluation of writing samples, oral presentations, peer evaluations, and a pre-post Communication Competence Inventory adapted for engineering contexts.

Results

Table 1: Pre-Post Changes in Communicative Competence Dimensions

DIMENSION	INTERVENTION (N=82)	COMPARISON (N=74)	EFFECT SIZE (D)
Technical Writing	+18.4%	+3.2%	0.72
Oral Presentation	+22.7%	+5.1%	0.85
Team Communication	+15.9%	+2.8%	0.68
Visual Communication	+12.3%	+4.5%	0.54

$p < .001$

Significant improvements were observed across all dimensions for the intervention group, with effect sizes ranging from moderate to large. Between-group differences were statistically significant for all measures ($p < .001$).

Qualitative findings identified key mechanisms:

- Authentic communicative demands: "In the project, we had to explain our design to the client—if they didn't understand, the project would fail. That made the communication feel real."

- Iterative practice and feedback: "My first presentation was terrible. But after feedback, the final was completely different. I learned through doing, not just hearing about it."

- Collaborative negotiation: "Everything connects. We spent so much time explaining, negotiating—that was where I really developed communication skills."

- Audience awareness: "I learned that how you explain something depends completely on who you're talking to."

Moderating factors included explicit communication objectives, structured feedback, varied communication genres, and stable team composition with genuine interdependence.

The large effect sizes, particularly for oral presentation (d=0.85) and technical writing (d=0.72), provide robust evidence for PBL's effectiveness. Results align with situated learning theory: communication embedded within authentic contexts produces more effective and transferable learning. Qualitative data illuminate underlying mechanisms—authentic demands, iterative practice, collaborative negotiation, and audience awareness development.

Critically, communication development is not an automatic byproduct of project participation. It depends on intentional design: explicit objectives, structured feedback, varied tasks, and genuine collaboration. Projects lacking these features may produce weaker outcomes.

Implications for practice:

- Curriculum design: Embed multiple PBL experiences with progressive complexity in both technical and communication demands

- Instructors: Provide communication instruction and models alongside assignments; offer formative feedback on drafts

- Institutions: Recognize project-based teaching workload; invest in faculty development for communication pedagogy

Conclusion This study demonstrates that project-based learning, when intentionally designed, effectively develops communicative competence in technical university students. Rather than treating communication as an isolated curriculum component, PBL integrates communication development within authentic engineering work. Effect sizes are particularly pronounced for oral presentation skills, though meaningful gains occur across all dimensions. Future research should examine long-term workplace transfer and optimal curricular sequencing. The evidence strongly supports PBL as an effective strategy for bridging the gap between engineering education and professional communication requirements.

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DIRECTIONS OF THE COMPETENCY-BASED APPROACH TO THE TRAINING OF FUTURE SPECIALISTS

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Employers increasingly demand professionals who can apply knowledge flexibly, collaborate across boundaries, and continue learning throughout their careers. Traditional educational models, organized around disciplinary knowledge transmission,