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RESEARCH ARTICLE OPEN ACCESS

Developing Communicative Competence In Engineering Students Based On The Principles Of An Individualized Approach

Yalgosheva Mohichehra Olimovna

Basical doctoral student at the Department of Linguistics and English Language Teaching Methodology at Chirchik State Pedagogical University, Uzbekistan

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ABSTRACT

This study develops and evaluates an individualized methodology for English for engineering that calibrates input, tasks, and feedback to learner profiles while retaining shared outcomes. In a 14-week quasi-experimental course with 126 students across three disciplines, the treatment integrated initial diagnostics, calibrated case-based tasks, CEFR-aligned nested rubrics, and targeted feedback; the comparison followed a uniform ESP syllabus. Performance was assessed by blind panels via a design-review speaking task and a technical memo, with vocabulary, engagement analytics, and self-efficacy as secondary measures. The individualized cohort achieved larger gains in discourse management, pragmatic appropriateness, and organization of written justifications (medium-to-large effects); pronunciation and vocabulary also improved moderately. Students reported clearer goals and stronger transfer to design courses. The approach proved feasible without extra contact hours and aligns with the iterative, requirements-driven ethos of engineering design.

Keywords: Individualized approach; communicative competence; engineering education; ESP; task-based learning; Universal Design for Learning; adaptive learning; formative assessment; CEFR; constructive alignment.

INTRODUCTION

Contemporary engineering practice is communicative at its core. Design decisions are negotiated in multidisciplinary teams; safety and compliance depend on precise documentation; clients and regulators require transparent risk communication; and academic and industrial dissemination channels expect clear argumentation supported by data visualizations. Accreditation frameworks such as ABET, national qualification frameworks, and CDIO emphasize communication as a program outcome that must be systematically taught, evidenced, and assessed throughout the curriculum. For many engineering undergraduates in non-English-dominant contexts, English functions as the lingua franca of technical collaboration and scholarly exchange, raising the stakes for high-quality instructional design in English-for-engineering courses.

Traditional approaches to English for Specific Purposes (ESP) in engineering have provided valuable genre awareness in technical description, process explanation, report writing, and presentation delivery. Nevertheless, these approaches often operationalize a one-size-fits-all syllabus and a homogeneous pacing model driven by semester logistics rather than the heterogeneity of student profiles. In a typical cohort, some students may possess robust reading skills but limited spoken fluency, others may manage formulaic presentations yet struggle with spontaneous questioning, while still others carry strong receptive vocabulary but lack pragmatic sensitivity to audience, register, face-saving strategies, or intercultural norms. Uniform instruction risks ceiling effects for

advanced learners and discouragement for those who require structured scaffolding, thereby undermining both equity and efficiency.

The field of applied linguistics offers a nuanced account of communicative competence that justifies individualized instruction. From Hymes's sociolinguistic conception to Canale and Swain's structuralization into grammatical, sociolinguistic, discourse, and strategic components, competence is multidimensional. Bachman and Palmer later refined this into organizational and pragmatic components alongside strategic competence, making it clear that learners may be uneven across subcomponents. Research on task-based language teaching and output-oriented learning underscores the role of task complexity, cognitive load, and interactional moves in catalyzing development. Psycholinguistic and educational frameworks, including Vygotsky's zone of proximal development, Kolb's experiential learning cycle, and Felder–Silverman learning styles, further suggest that instruction calibrated to the learner's readiness and preferences fosters deeper uptake.

Engineering education research adds a complementary perspective. It highlights the centrality of problem framing, modeling, trade-off analysis, and evidence-based justification in design communication. Communication is a vehicle for systems thinking and for aligning stakeholders around design requirements, constraints, and risks. Hence, communicative competence in engineering should be construed as the ability to mobilize linguistic resources to accomplish discipline-specific purposes such as justifying design choices, integrating standards into rationales, explaining uncertainty and error propagation, and negotiating constraints with non-technical stakeholders. This alignment implies that individualized English instruction must be anchored in authentic engineering activities rather than abstract language drills.

Recent advances in learning analytics, adaptive platforms, and Universal Design for Learning enable scalable individualization. Diagnostics can map learner profiles across vocabulary strata, discourse functions, pronunciation features, and pragmatic awareness. Adaptive task banks can present variant inputs and outputs calibrated to the learner's zone of proximal development while maintaining consistent learning outcomes. Universal Design for Learning recommends multiple means of engagement, representation, and action/expression, which are particularly relevant for heterogeneous engineering cohorts that include students with different cognitive and sensory profiles. Constructive alignment provides a design rule: articulate outcomes in communicative terms, design tasks that elicit those outcomes, and align assessment rubrics to the same construct.

Despite this convergence of theory and technology, empirical evidence on individualized approaches in engineering English remains limited, often confined to small case studies without robust comparison groups or discipline-specific rubrics. This study addresses that gap by articulating a coherent methodology and evaluating its effects on communicative competence across writing and speaking in comparison to a standard ESP syllabus. Beyond reporting outcomes, the paper details implementation steps that program directors can use to retrofit individualized methodology into existing curricula without increasing contact hours.

The aim of this study is to develop and evaluate an individualized instructional methodology for engineering English that measurably improves communicative competence across discourse, pragmatic, and strategic dimensions while remaining feasible within a standard semester structure. The study seeks to determine whether individualized calibration of input, tasks, and feedback produces superior gains relative to a conventional, uniform syllabus when measured by performance-based assessments aligned with engineering communication outcomes.

The study was conducted at a public polytechnic university with large cohorts in electrical, civil, and mechanical engineering. A total of 126 students participated, all of whom had completed a first-year general English requirement and were enrolled in a second-year English for Engineering course. Participants were assigned by existing timetables to one of six intact sections. Three sections comprising 64 students constituted the individualized condition, and three sections comprising 62 students constituted the comparison condition. The semester spanned fourteen weeks with two ninety-minute sessions per week. Both conditions met for identical contact hours and pursued the same program learning outcomes expressed in terms of CEFR-referenced performance descriptors contextualized for engineering communication.

The individualized methodology began with a multi-layer diagnostic administered during week one. The diagnostic included a CEFR-aligned speaking task consisting of a

mini design pitch with follow-up questions, a discipline-specific writing sample in the form of a one-page technical memo justifying a material or component choice, a timed reading of an engineering standards excerpt followed by a brief synthesis, and a vocabulary measure focusing on mid-frequency academic and technical lexis. Acoustic recordings supported pronunciation profiling focused on segmental contrasts and prosodic patterns relevant to intelligibility in technical talk. These instruments produced a learner profile with scores on grammatical control, discourse management, sociopragmatic appropriateness, strategic competence, technical lexis, and pronunciation features, along with qualitative annotations capturing strengths and development targets.

Instruction for the individualized condition employed a task bank of case-based scenarios derived from discipline courses and capstone projects. Each scenario existed in three calibrated variants in terms of input density, numerical reasoning load, visual data complexity, and communicative risk. During weeks two to thirteen, students completed weekly task cycles consisting of a short pre-task reading or video brief, a planning phase with language focus tailored by the teacher based on profile data, a performance phase involving either a written deliverable or a short oral review with peers, and a feedback phase using rubrics and brief video annotations. While the class moved through the same weekly scenario, individual students received calibrated input, prompts, and support materials to ensure appropriate challenge. For example, a student who showed strong grammatical control but limited pragmatic range received prompts emphasizing hedging, face-threat mitigation, and stance markers when responding to critical questions, whereas a student with constrained discourse organization worked with explicit discourse frames for signposting, cause-effect linking, and concession.

Formative assessment used a two-layer rubric system. The outer layer captured global CEFR-aligned descriptors contextualized for engineering purposes, while the inner layer operationalized discourse functions such as problem framing, justification with evidence, risk articulation, and response to critique. Rubrics were shared with students in week two and used consistently for self-assessment, peer feedback, and teacher feedback. Micro-credentials were issued for mastery of specific communicative micro-skills, such as delivering a succinct methods overview or explaining uncertainty in measurement. Analytics from the learning management system tracked submission timing, edit counts, view durations for feedback videos, and participation in peer review, providing engagement indicators that informed weekly coaching.

The comparison condition followed a widely used ESP textbook sequence for engineering students supplemented by instructor-selected articles and videos. Tasks were delivered uniformly to the class, with occasional differentiation by grouping and optional supplementary exercises. Feedback was provided in written form for writing assignments and as whole-class comments after oral presentations. Both conditions prepared a final oral design review with slides and a final written design report in teams matched to discipline courses.

Outcome measures were administered in week fourteen by an assessment panel that was blind to condition. The speaking assessment consisted of a structured design review simulation with a five-minute presentation and a ten-minute question-and-answer period conducted by a panel including a language instructor and a faculty member from the student’s discipline. The writing assessment required a two-page technical memo summarizing design rationale, standards compliance, and limitations for a given scenario. Both assessments used the same two-layer rubrics as in the individualized condition but were applied by the blind panel across both groups. Vocabulary was measured through a parallel form test, and self-efficacy was captured via a validated scale for communicative confidence in technical contexts. To capture qualitative evidence, all Q&A segments were recorded and transcribed for discourse analysis, and a stratified sample of reflective journals was coded for references to audience awareness, strategy use, and learning from feedback.

Data analysis proceeded in two phases. First, pre-post gains within and between conditions were compared using ANCOVA with pretest scores as covariates. Effect sizes were calculated using partial eta-squared and converted to Cohen’s d for interpretability. Second, qualitative data were analyzed using thematic coding focused on discourse-functional development and pragmatic moves. Inter-rater reliability for rubric scoring exceeded commonly accepted thresholds after calibration sessions. Ethical procedures included informed consent, anonymization of data, and the right to withdraw without penalty.

Students in the individualized condition demonstrated higher posttest performance on both speaking and writing assessments when controlling for pretest levels. For the

oral design review, the individualized group's mean global score increased by just over one full CEFR sub-band on average, corresponding to movement from B1-high towards B2-mid on contextualized descriptors. The comparison group improved by approximately half a sub-band, yielding a between-group effect size in the medium-to-large range. Subcomponent analysis revealed the largest gains for discourse management and pragmatic appropriateness in the individualized condition, particularly in structuring responses during Q&A, using hedging and stance expressions to manage uncertainty, and signaling concessions or trade-offs. Pronunciation gains were strongest in prosodic control of prominence and phrasing, which positively affected intelligibility under time pressure.

For the written technical memo, the individualized group outperformed the comparison group on organization, cohesion, and claim-evidence alignment. Students receiving individualized prompts and feedback showed more consistent integration of standards citations, clearer articulation of assumptions and limitations, and more disciplined use of visual evidence such as small tables or annotated figures, even though the rubric evaluated these behaviors through textual indicators rather than graphic design. Lexical measures indicated broader coverage of mid-frequency academic and technical lexis and more precise use of collocations relevant to materials, tolerances, and safety factors. Gains in grammatical control were present but smaller than those in discourse and pragmatics, which aligns with the explicit focus of coaching.

Vocabulary growth displayed a moderate advantage for the individualized condition. Engagement analytics indicated earlier and more frequent interactions with feedback, higher rates of peer review completion, and greater persistence on revisions. Self-efficacy scores increased in both conditions but showed a larger rise among students exposed to individualized coaching, with narrative comments emphasizing the value of targeted prompts that helped students answer challenging technical questions and explain decisions to non-specialists.

Discourse analysis of Q&A transcripts revealed that individualized students more often reframed questions to ensure mutual understanding, used contrastive and concessive structures to weigh options, and explicitly invoked constraints such as cost, manufacturability, and safety to justify choices. These moves correspond to the pragmatic and strategic components of communicative competence and align with engineering design reasoning. In reflective journals, individualized students frequently described how rubric-anchored feedback and micro-credentials clarified their goals for the next iteration and fostered a sense of progress. By contrast, students in the comparison condition, while appreciative of exposure to genre models and vocabulary extension, sometimes reported uncertainty about how to prioritize improvements.

No significant difference in contact hours or assignment load was observed between groups, suggesting that the gains are attributable to qualitative differences in how tasks and feedback were calibrated rather than to additional instructional time. Instructors reported manageable preparation overhead after an initial setup period for diagnostic materials and task variants. The individualized approach benefitted from a repository of case scenarios co-authored with discipline faculty, which ensured authenticity and reduced the burden on language instructors to invent technical contexts.

DISCUSSION

The findings support the claim that individualized methodology can produce meaningful improvements in communicative competence for engineering students without requiring expanded curricular real estate. Several mechanisms likely contributed to these outcomes. Diagnostics provided a precise map of learner readiness across competence components, enabling instruction to avoid redundancy for advanced learners and to concentrate scaffolding where it mattered for others. Calibrated variants of the same weekly scenario preserved a shared class narrative and assessment comparability while allowing different cognitive and linguistic loads, which reduced frustration and enabled productive struggle in the zone of proximal development.

Task design played a central role. Engineering communication is purpose-driven and audience-sensitive; it centers on problem framing, trade-off justification, uncertainty explanation, and negotiation of constraints. Individualized tasks emphasized these discourse functions and offered multiple expressive channels that adhered to Universal Design for Learning. Some learners gained traction through data commentary before attempting extended argumentation; others built confidence by preparing structured responses to anticipated questions before delivering presentations. Because the same underlying scenario was used, peer learning and

collaborative critique remained robust, yet each student encountered inputs and prompts aligned with their needs.

Formative assessment with nested rubrics provided clarity and continuity. When descriptors explicitly refer to engineering discourse functions, students can visualize what progress looks like beyond generalized fluency. Micro-credentials for discrete communicative micro-skills capitalized on the motivational power of incremental wins, which may explain the gains in self-efficacy. Feedback personalization through brief video annotations was consistently cited as helpful because it modeled target language in context and made strategy use visible. Analytics played a complementary role by signaling disengagement early and by allowing instructors to target nudges.

The individualized approach resonates with the epistemology of engineering. Both domains value requirements elicitation, prototyping, iteration, and verification against specifications. Treating communicative competence as a design constraint enabled students to understand feedback as performance tuning rather than as remediation. The alignment between communicative outcomes and disciplinary authenticity likely contributed to transfer from the language classroom to design studios and laboratory courses. Importantly, the methodology proved feasible at scale after an initial investment in diagnostics and task banks. The approach does not demand continuous one-on-one tutoring; rather, it orchestrates calibrated experiences within normal class structures, supported by rubrics and analytics.

Several limitations temper the conclusions. The study used intact classes and quasi-experimental design, which leaves room for unmeasured instructor effects. While rubric reliability exceeded standard thresholds, any performance assessment carries subjective elements. The time horizon was one semester, which constrains claims about long-term retention and transfer to internship or workplace contexts. Future research should examine delayed posttests, triangulate with employer or internship supervisor evaluations, and explore cost–benefit analyses of technology-supported adaptation. Additional work is needed to refine pronunciation coaching for discipline-specific intelligibility challenges and to optimize task calibration for students whose profiles combine advanced grammatical control with low pragmatic sensitivity or vice versa.

CONCLUSION

An individualized methodology for developing communicative competence in engineering English can deliver gains that are both statistically significant and educationally meaningful. By combining initial profiling, calibrated task variants grounded in authentic engineering scenarios, nested rubrics aligned to discourse functions, and targeted feedback supported by learning analytics, programs can raise performance without increasing contact hours. The approach fosters discourse management, pragmatic appropriateness, and strategic communication during high-stakes interactions such as design reviews and technical memos. It also strengthens learners' self-efficacy and engagement, which are essential for sustained development in communication-intensive engineering environments.

For program directors and instructors, the practical implication is to redesign existing ESP courses around a stable sequence of weekly engineering scenarios while differentiating inputs and prompts per learner profiles. Rubrics should operationalize communicative outcomes in discipline-relevant terms, and feedback should be brief, targeted, and iterative. Partnerships with discipline faculty are crucial for scenario authenticity and for constructive alignment across the curriculum. Investment in a reusable task bank and diagnostics yields cumulative returns over cohorts, making individualized methodology sustainable at the program level. Aligning communication instruction with the iterative logic of engineering design not only improves language outcomes but also prepares graduates to articulate, defend, and refine their technical decisions in diverse professional arenas.

REFERENCES

1. Hymes D. On Communicative Competence // Pride J., Holmes J. (eds.). Sociolinguistics. Harmondsworth: Penguin, 1972. P. 269–293.

2. Canale M., Swain M. Theoretical Bases of Communicative Approaches to Second Language Teaching and Testing // Applied Linguistics. 1980. Vol. 1, No. 1. P. 1–47.

3. Canale M. From Communicative Competence to Communicative Language Pedagogy // Richards J., Schmidt R. (eds.). Language and Communication. London: Longman, 1983. P. 2–27.

4. Bachman L. F. Fundamental Considerations in Language Testing. Oxford: Oxford University Press, 1990. 408 p.

5. Widdowson H. G. Teaching Language as Communication. Oxford: Oxford University Press, 1978. 168 p.

6. Hutchinson T., Waters A. English for Specific Purposes: A Learning-Centred Approach. Cambridge: Cambridge University Press, 1987. 183 p.

7. Dudley-Evans T., St John M. J. Developments in English for Specific Purposes: A Multi-disciplinary Approach. Cambridge: Cambridge University Press, 1998. 301 p.

8. Council of Europe. Common European Framework of Reference for Languages: Learning, Teaching, Assessment. Companion Volume. Strasbourg: Council of Europe Publishing, 2020. 250 p.

9. Dörnyei Z. Motivational Strategies in the Language Classroom. Cambridge: Cambridge University Press, 2001. 155 p.

10. Long M. H. Second Language Acquisition and Task-Based Language Teaching. Oxford: Wiley-Blackwell, 2015. 376 p.

11. Swain M. The Output Hypothesis: Theory and Research // Hinkel E. (ed.). Handbook of Research in Second Language Teaching and Learning. Mahwah, NJ: Lawrence Erlbaum, 2005. P. 471–483.

12. Spada N. Classroom Instruction and SLA // Language Teaching. 2015. Vol. 48, No. 1. P. 69–96.

13. Nation I. S. P. Learning Vocabulary in Another Language. Cambridge: Cambridge University Press, 2001. 477 p.

14. Vygotsky L. S. Mind in Society: The Development of Higher Psychological Processes. Cambridge, MA: Harvard University Press, 1978. 159 p.

15. Kolb D. A. Experiential Learning: Experience as the Source of Learning and Development. Englewood Cliffs, NJ: Prentice-Hall, 1984. 256 p.

16. Felder R. M., Silverman L. K. Learning and Teaching Styles in Engineering Education // Engineering Education. 1988. Vol. 78, No. 7. P. 674–681.

17. Biggs J. Enhancing Teaching through Constructive Alignment // Higher Education. 1996. Vol. 32, No. 3. P. 347–364.

18. Black P., Wiliam D. Assessment and Classroom Learning // Assessment in Education. 1998. Vol. 5, No. 1. P. 7–74.

19. Mishra P., Koehler M. J. Technological Pedagogical Content Knowledge: A Framework for Teacher Knowledge // Teachers College Record. 2006. Vol. 108, No. 6. P. 1017–1054.

20. Crawley E. F., Malmqvist J., Östlund S., Brodeur D. R. Rethinking Engineering Education: The CDIO Approach. 2nd ed. New York: Springer, 2014. 311 p.

21. ABET. Criteria for Accrediting Engineering Programs. Baltimore, MD: ABET, 2024. 38 p.

22. Bhatia V. K. Analysing Genre: Language Use in Professional Settings. London: Longman, 1993. 256 p.

23. Hyland K. English for Academic Purposes: An Advanced Resource Book. London: Routledge, 2006. 333 p.

24. Flowerdew J., Peacock M. (eds.). Research Perspectives on English for Academic Purposes. Cambridge: Cambridge University Press, 2001. 342 p.

25. CAST. Universal Design for Learning Guidelines. Wakefield, MA: CAST Publishing, 2011. 98 p.

26. O'Hagan M., Ashworth D. Translation-mediated Communication for the Global Technical Market. Clevedon: Multilingual Matters, 2002. 224 p.

27. Bygate M. Teaching and Testing Speaking. 2nd ed. Cambridge: Cambridge University Press, 2018. 262 p.

28. Biber D., Conrad S. Register, Genre, and Style. Cambridge: Cambridge University Press, 2009. 260 p.

29. Kuteeva M., Mauranen A. Disciplinary Voices in Academic Discourse // Journal of English for Academic Purposes. 2014. Vol. 13. P. 1–4.

30. Montgomery S. L. The Chicago Guide to Communicating Science. 2nd ed. Chicago: University of Chicago Press, 2017. 296 p.