

## TECHNOLOGY FOR FORMING LINGUISTIC COMPETENCE OF TECHNICAL UNIVERSITY STUDENTS IN EXTRACURRICULAR INDEPENDENT LEARNING CONDITIONS IN THE COURSE “FOREIGN LANGUAGE (ENGLISH)”

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### Abstract

The modernization of higher technical education requires the development of students' linguistic competence as a key component of professional communicative readiness. In non-linguistic universities, particularly technical institutions, limited classroom hours allocated to foreign language instruction necessitate the implementation of effective extracurricular independent learning technologies. This study aims to design, theoretically substantiate, and empirically validate a pedagogical technology for forming linguistic competence of technical university students in the course “Foreign Language (English)” under conditions of extracurricular independent learning.

The research employs a mixed-method approach combining theoretical analysis, pedagogical modeling, experimental teaching, and statistical data processing. The experimental study was conducted with 124 second-year engineering students divided into control and experimental groups. The proposed technology integrates digital platforms, task-based learning, professional discourse modeling, reflective self-assessment, and scaffolded autonomous learning strategies.

The results demonstrate statistically significant improvement in linguistic competence indicators (lexical, grammatical, discourse, and pragmatic components) among students exposed to the developed technology compared to those in traditional instruction settings ( $p < .05$ ). The findings confirm that structured extracurricular independent learning supported by digital tools and competency-based assessment enhances professional foreign language proficiency in technical education contexts.

The study contributes to the theory of linguistic competence formation and proposes a scalable model applicable in technical higher education institutions undergoing digital transformation.

**Keywords:** linguistic competence, technical university, autonomous learning, extracurricular education, English for Specific Purposes, pedagogical technology, digital learning environment

### 1. Introduction

#### 1.1 Background of the Study

Globalization and technological advancement have significantly transformed the requirements for professional training in higher education. Engineers and technical specialists are increasingly expected to operate in multilingual and multicultural environments, where English functions as the primary language of international communication, scientific discourse, and technological collaboration. Consequently, the formation of linguistic competence has become a strategic objective in technical higher education institutions.

However, the teaching of foreign languages in technical universities faces structural challenges. The limited number of classroom hours allocated to the course “Foreign Language (English)” restricts opportunities for systematic language development. Furthermore, students often perceive English as a secondary subject unrelated to their professional identity. This discrepancy highlights the need for innovative pedagogical technologies capable of organizing effective extracurricular independent learning.

#### 1.2 Problem Statement

Despite numerous studies addressing communicative competence and English for Specific Purposes (ESP), insufficient attention has been paid to the technological organization of

extracurricular independent learning aimed specifically at forming linguistic competence among technical students.

Traditional approaches to independent learning often lack:  
structured digital support;  
professionally oriented task design;  
systematic formative assessment;  
mechanisms for reflection and self-regulation.

Therefore, the problem addressed in this research is the development of an integrative pedagogical technology that ensures systematic formation of linguistic competence in extracurricular conditions.

### **1.3 Research Aim and Objectives**

The aim of this study is to develop and experimentally validate a technology for forming linguistic competence of technical university students through structured extracurricular independent learning in the course “Foreign Language (English)”.

The objectives are:

To analyze theoretical foundations of linguistic competence formation in non-linguistic higher education.

To design a structural-functional model of extracurricular independent learning technology.  
To implement the technology in an experimental teaching context.  
To evaluate its effectiveness using quantitative and qualitative indicators.

### **1.4 Research Hypothesis**

It is hypothesized that linguistic competence of technical university students will significantly improve if extracurricular independent learning is organized through:

competency-based task design;  
integration of ESP-oriented materials;  
digital learning platforms;  
structured self-assessment and feedback mechanisms;  
scaffolded autonomous learning strategies.

### **1.5 Structure of the Article**

The article follows the IMRAD structure. The Methods section describes the research design and participants. The Results section presents statistical findings. The Discussion interprets results within the theoretical framework. The Conclusion outlines implications and future research directions.2. Literature Review and Theoretical Framework

### **2.1 Linguistic Competence in Technical Education**

The concept of linguistic competence was first introduced by Chomsky (1965), defining it as an individual's internalized knowledge of language structure, including syntax, morphology, and phonology. Canale and Swain (1980) expanded this concept to communicative competence, integrating:

Grammatical competence – knowledge of syntax and morphology.  
Sociolinguistic competence – understanding language use in social contexts.  
Discourse competence – ability to produce coherent texts.

Strategic competence – communication strategies to overcome gaps in knowledge. In the context of technical higher education, linguistic competence extends to English for Specific Purposes (ESP), focusing on domain-specific vocabulary, technical genres, professional communication, and comprehension of academic texts (Dudley-Evans & St John, 1998).

### **2.2 English for Specific Purposes (ESP) and Technical Students**

ESP approaches emphasize:

Needs analysis tailored to professional domains.

Integration of authentic technical texts, manuals, and research papers.

Development of skills relevant to engineering communication: technical report writing, oral presentations, and collaborative discussions.

Nation (2001) highlights that vocabulary acquisition, particularly technical terminology, is crucial for professional communication and reading comprehension in ESP contexts.

Hyland (2006) notes that successful ESP programs foster genre awareness and pragmatic competence, ensuring that students can operate effectively in their disciplinary communities.

### **2.3 Learner Autonomy and Extracurricular Independent Learning**

Learner autonomy theory (Holec, 1981; Benson, 2013) emphasizes students' ability to plan, monitor, and evaluate their learning independently. Autonomous learners exhibit:

Strategic use of learning resources.

Self-regulation in time management and task completion.

Reflective assessment of strengths and weaknesses.

Integration of autonomous learning with digital platforms (LMS, online corpora, and interactive tools) has been shown to enhance engagement, motivation, and sustained learning outcomes, particularly in technical disciplines (Little, 1991).

### **2.4 Digital Pedagogy and Task-Based Learning**

Digital learning environments provide scaffolded support for autonomous learning. Task-based learning (Ellis, 2003) offers opportunities for:

Contextualized practice of lexical and grammatical structures.

Collaborative problem-solving through authentic professional tasks.

Formative assessment via automated quizzes and peer review.

For technical students, the combination of ESP materials and task-based digital activities promotes both professional language proficiency and strategic competence.

### **2.5 Research Gap and Significance**

While prior studies have examined linguistic competence, ESP, and learner autonomy separately, there is limited research addressing structured extracurricular independent learning models for technical university students. Existing studies often focus on classroom-based ESP instruction or generic autonomous learning without integrating domain-specific tasks, digital tools, and reflective assessment systematically.

This study addresses this gap by designing a comprehensive pedagogical technology that integrates these components, empirically testing its effectiveness in a real-world technical university setting.

## **3. Methodology**

### **3.1 Research Design**

A quasi-experimental mixed-method design was employed to evaluate the effectiveness of the proposed technology. The study included:

Experimental group: students using the developed structured independent learning technology.

Control group: students following the traditional ESP course.

The intervention lasted 16 weeks (one academic semester). Quantitative measures (pre-tests and post-tests) assessed linguistic competence, while qualitative data (questionnaires and learning diaries) explored learner autonomy and engagement.

### **3.2 Participants**

Sample size: 124 second-year engineering students.

Experimental group: n = 62

Control group: n = 62

All participants had English proficiency levels of A2–B1 according to CEFR standards. Groups were matched in terms of prior achievement and demographic characteristics.

### **3.3 Instruments**

Pre- and Post-tests:

40-item tests assessing lexical, grammatical, and communicative competence.

Validated by three ESP instructors.

Autonomy Questionnaire:

Likert-scale (1–5) measuring self-directed learning strategies.

Cronbach's alpha = 0.87 (high reliability).

Learning Diaries:

Students recorded task completion, reflections, and challenges weekly.

Observation Checklist:

Used by instructors to assess task engagement and participation in online activities.

### 3.4 Pedagogical Technology Description

The proposed technology integrates five components:

Digital Support Environment

LMS platform with embedded tasks and quizzes.

Quizlet sets for ESP vocabulary.

Online corpora and professional video lectures.

Task-Based Independent Assignments

Profession-oriented reading and writing tasks.

Contextualized grammar exercises.

Collaborative problem-solving tasks.

Project-Based Learning

Group mini-projects (technical reports, presentations).

Application of ESP vocabulary in authentic contexts.

Reflective Monitoring

Learning diaries for self-assessment.

Weekly peer feedback and progress tracking.

Instructor Feedback System

Formative feedback on tasks and projects.

Scaffolded guidance to support autonomy.

### 3.5 Data Analysis

Quantitative: pre- and post-test scores analyzed using SPSS.

Descriptive statistics: mean, standard deviation.

Inferential statistics: independent samples t-test, effect size (Cohen's d).

Qualitative: thematic analysis of learning diaries and questionnaires to identify patterns in autonomous learning behaviors and engagement.

## 4. Results

### 4.1 Quantitative Findings

The experimental group demonstrated significant improvement across all linguistic competence components compared to the control group.

Table 1. Pre-test and Post-test Results of Linguistic Competence

Competence Component

Control Group Pre-test (%)

Control Group Post-test (%)

Experimental Group Pre-test (%)

Experimental Group Post-test (%)

Growth (%)

Lexical	Grammatical	Communicative	Strategic
55	57	53	50
67	69	64	61
54	56	52	49
84	80	78	82
+30	+24	+26	+33

Independent samples t-test confirmed statistically significant differences in post-test scores between experimental and control groups for all components ( $p < .05$ ).

Effect sizes (Cohen's d) ranged from 0.68 to 0.85, indicating medium to large effects.

## 4.2 Qualitative Findings

Analysis of learning diaries and questionnaires revealed:

Increased learner autonomy and motivation in the experimental group.

Positive perception of digital tools for vocabulary acquisition and grammar practice.

Higher engagement in professional tasks and projects.

Improved confidence in technical presentations and professional writing tasks.

Students in the control group reported less engagement, limited independent practice, and lower confidence in using English in professional contexts.

## 5. Discussion

The findings support the research hypothesis that structured extracurricular independent learning enhances linguistic competence among technical university students.

**Lexical Competence:** The significant growth (+30%) reflects the effectiveness of integrated digital tools (Quizlet, online corpora) and task-based ESP assignments.

**Grammatical Competence:** Contextualized grammar exercises embedded in profession-oriented tasks contributed to a 24% improvement.

**Communicative Competence:** Project-based learning and group discussions enhanced oral and written communication by 26%.

**Strategic Competence:** Reflective diaries and autonomy scaffolds increased students' self-regulation and strategic language use by 33%.

These results align with findings from prior research:

ESP methodology supports profession-specific language acquisition (Dudley-Evans & St John, 1998).

Autonomous learning and reflective practices improve motivation and self-directed strategies (Holec, 1981; Benson, 2013).

Digital learning environments facilitate scaffolded, interactive, and contextualized language practice (Hyland, 2006).

The study demonstrates that integrating ESP content, digital platforms, project-based tasks, and reflection mechanisms provides a synergistic effect on the development of linguistic competence in technical students.

## 6. Pedagogical Implications

**Curriculum Design:** The model can inform ESP curriculum modernization in technical universities, emphasizing out-of-class structured learning.

**Digital Learning Integration:** Incorporating LMS, online exercises, and professional content supports autonomous practice.

**Task-Based and Project-Based Learning:** Assignments simulating real-world professional tasks enhance relevance and engagement.

**Assessment:** Combining formative feedback, self-assessment, and reflective diaries supports continuous improvement and learner autonomy.

**Professional Competence:** Improved ESP skills contribute to graduate employability and professional communication readiness.

## 7. Limitations and Future Research

**Limitations:**

Single-institution study limits generalizability.

Duration limited to one semester; long-term retention was not measured.

Sample size ( $n=124$ ) restricts extensive subgroup analysis.

**Future Research:**

Multi-institutional studies with larger cohorts.

Longitudinal research to assess retention and professional application.

Integration of AI-assisted learning tools for enhanced digital scaffolding.

Cross-disciplinary comparison to assess technology effectiveness in other technical majors.8.

#### Conclusion

The study confirms that structured extracurricular independent learning technology significantly improves linguistic competence of technical university students in the course “Foreign Language (English)”.

Key outcomes:

Statistically significant improvement in lexical, grammatical, communicative, and strategic competence.

Enhanced learner autonomy, engagement, and professional language skills.

Positive student perception of digital tools, task-based and project-based assignments, and reflective monitoring.

The proposed pedagogical technology represents a scalable model for competency-based ESP instruction, integrating digital tools, task-based learning, and reflective assessment in technical higher education.

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