CLUSTER-BASED APPROACH TO TEACHING PROFESSIONAL ENGLISH TO BIOLOGY STUDENTS

Sokhiba J. Dushaeva
PhD
Gulistan State University
Gulistan
Republic of Uzbekistan

Abstract: This article examines a cluster-based approach to teaching English for Specific Purposes (ESP) to biology students in higher education. It identifies discrepancies between students' language proficiency and professional communication requirements. A six-module instructional model integrating general English, academic communication and biology-related tasks is proposed. The study also considers the role of the Empower English digital platform in supporting autonomous learning.

Keywords: cluster-based approach, professional English, biology education, ESP, communicative competence, modular learning.

I. Introduction

English proficiency is essential for biology students to access scientific literature and participate in international academic communication. However, insufficient integration of language instruction with professional disciplines limits students' communicative development. This study aims to develop a cluster-based methodology connecting English language acquisition with biological knowledge and professional competencies.

II. Literature Review

The theoretical foundations of English for Specific Purposes (ESP) have been extensively examined in contemporary applied linguistics. Hutchinson and Waters (1987) introduced a learning-centred approach, emphasizing that language instruction should be determined by learners' academic and professional needs rather than linguistic content alone. Their framework highlights the importance of motivation, prior knowledge and learning conditions in developing effective ESP programmes. These principles are particularly relevant to biology students whose language proficiency frequently differs from expected educational standards.

Dudley-Evans and St John (1998) further developed ESP methodology by examining the relationship between language instruction, disciplinary knowledge and professional communication. They emphasized the significance of specialized vocabulary, discourse analysis and communicative practices associated with particular academic fields. Their findings support the integration of biological terminology and discipline-specific communication tasks into English language curricula.

Long (2005) investigated methodological approaches to second language needs analysis, arguing that effective instructional programmes require systematic identification of learners' target communication requirements. His research demonstrates the importance of examining authentic professional tasks and consulting multiple stakeholders. This perspective provides methodological justification for involving biology students, subject teachers, language instructors and employers in curriculum development.

Hyland (2006) explored the disciplinary characteristics of academic English, demonstrating how academic communication is shaped by specific discourse communities and their conventions. His analysis suggests that language instruction should incorporate authentic disciplinary texts, academic writing and specialized communicative practices. For biology education, these principles justify the inclusion of scientific reading, research presentations and laboratory-related communication.

Belcher (2006) examined ESP instruction through learners' present and anticipated professional needs. She highlighted the importance of genre-based approaches, contextualized learning and the relationship between language education and professional identity. Her findings reinforce the necessity of developing communicative competencies that enable students to participate effectively in future scientific and occupational environments.

Basturkmen (2010) investigated practical approaches to ESP course development, focusing on needs analysis, syllabus design and the selection of discipline-specific instructional materials. Her work provides methodological support for constructing sequential learning modules that progressively develop general, academic and professional language competencies.

Anthony (2018) examined the methodological foundations of ESP course development, emphasizing the interrelationship between needs analysis, learning objectives, instructional materials and assessment. His framework provides practical justification for designing professionally oriented English courses that respond to students' disciplinary requirements. Similarly, Flowerdew and Peacock (2001) explored the linguistic and pedagogical

dimensions of English for Academic Purposes, highlighting the importance of preparing students for discipline-specific academic communication.

Johns (2013) traced the historical development of ESP research, demonstrating its progression from technical vocabulary instruction towards genre analysis, disciplinary discourse and contextualized language learning. This perspective supports the integration of biological terminology, scientific communication and professional practice within a unified instructional framework.

Dörnyei (2001) investigated motivational strategies in foreign language education, identifying the importance of supportive learning environments, relevant instructional activities and learner engagement. His theoretical framework is particularly applicable to addressing declining motivation among university students. Gilmore (2007) examined the pedagogical value of authentic materials, emphasizing their potential contribution to contextualized language learning. His findings support the inclusion of scientific articles, laboratory instructions and biology-related texts in ESP instruction.

Garrison and Kanuka (2004) explored the transformative potential of blended learning in higher education, emphasizing the integration of face-to-face instruction with online learning environments. Their research provides a theoretical basis for incorporating the Empower English digital platform into the proposed modular methodology, particularly in supporting independent learning and extending educational activities beyond conventional classroom instruction.

Collectively, these studies establish the theoretical basis for needs-oriented, professionally contextualized English instruction. However, they do not directly examine the proposed six-stage cluster-based model for biology students in Uzbekistan. The present research addresses this specific context by integrating general English, academic communication, professional specialization and cooperation with employers into a unified modular framework supported by the Empower English digital platform.

III. Methods

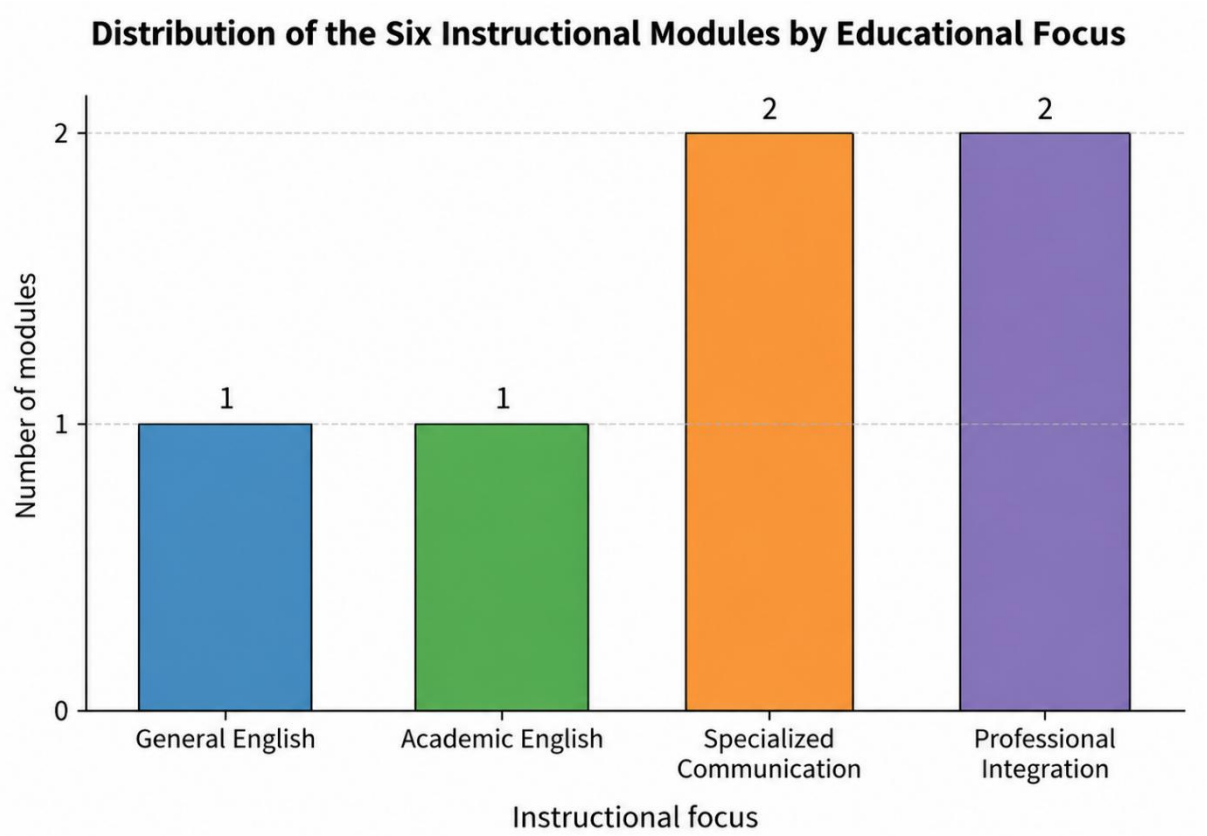
The research was conducted during 2020–2023 at three higher education institutions in Uzbekistan. Curriculum analysis, proficiency assessment, needs analysis and pedagogical experimentation were employed. Students, language teachers, subject specialists and employers participated in identifying professional communication needs. Based on these findings, a six-module instructional framework and the Empower English platform were developed.

IV. Results

The research conducted during the 2020–2023 academic period at three higher education institutions in Uzbekistan revealed several challenges affecting the development of English language proficiency among biology students. The findings identified discrepancies between students' actual language competence and the proficiency levels prescribed by national higher education qualification requirements. These discrepancies highlighted the necessity of developing a professionally oriented

instructional framework integrating general language acquisition, academic communication and biology-specific competencies.

The initial assessment demonstrated that many first-year students entered higher education with English proficiency corresponding to CEFR A2 or below, despite entrance assessment expectations associated with higher proficiency levels. Furthermore, the investigation revealed considerable variation in graduates' language competence, ranging from A2 to B2. These findings suggest that conventional English instruction does not consistently ensure the achievement of the expected B2 proficiency level.



Source: Author-developed six-module instructional framework.

Another significant finding concerned the limited correspondence between existing English language curricula and students' professional needs.

Traditional instructional materials frequently emphasized general grammatical structures and vocabulary without sufficient integration of biological terminology, scientific texts and authentic professional communication. Consequently, students experienced difficulties transferring previously acquired linguistic knowledge to discipline-specific communicative situations.

To address these challenges, a six-stage cluster-based modular instructional model was developed. The model establishes progressive connections between general language acquisition, academic communication, disciplinary specialization and practical professional activities. Its structure is presented in Figure 1.

The first module, English for General Purposes, concentrates on fundamental grammatical structures, vocabulary development and basic communicative skills. Particular attention is given to students whose initial proficiency remains below the expected entrance level.

The second module, English for Academic Purposes, introduces academic reading, scientific vocabulary and essential principles of academic communication.

The third and fourth modules, Stride to Speciality and Communicating in Speciality, emphasize the integration of English language competence with biological knowledge. Students engage with subject-specific terminology, scientific descriptions and professional communication tasks. These modules facilitate the transition from general language proficiency towards discipline-specific communicative competence.

The fifth module, Establishment of Cooperation, promotes interaction between language teachers, biology specialists and professional stakeholders. The sixth module, Incorporation of Education and Production, establishes connections between academic instruction and practical professional contexts, enabling students to apply language skills to situations related to their prospective occupations.

An important practical outcome of the research was the development of the Empower English digital learning platform. The platform incorporates systematically organized learning materials and sequential exercises corresponding to the proposed modular framework. Its implementation was intended to strengthen students' independent learning abilities, provide additional opportunities for language practice and increase their motivation to acquire professional English.

The pedagogical observations conducted during the investigation indicated positive changes in students' engagement with English learning activities and their participation in independent study. The integration of professionally relevant content also provided opportunities for connecting linguistic knowledge with previously acquired biological concepts.

Overall, the findings suggest that a cluster-based modular approach offers a structured solution to several identified limitations of conventional English instruction. By combining progressive language development, interdisciplinary cooperation and digital learning resources, the proposed methodology creates favourable conditions for developing biology students' professional communicative competence.

Nevertheless, the available research description does not provide numerical pre-test and post-test results, detailed proficiency distributions or statistical significance indicators. Therefore, the findings should be interpreted as evidence of the model's methodological development and observed instructional benefits rather than definitive statistical proof of its effectiveness.

V. Conclusion

The findings of this study demonstrate the methodological potential of a cluster-based approach to teaching professionally oriented English to biology students in higher education. The investigation identified significant discrepancies between students' actual language proficiency and the competencies required for effective academic and professional communication. These challenges highlight the necessity of integrating general English instruction with discipline-specific knowledge, practical communication tasks, and independent learning activities.

The proposed six-module instructional model provides a systematic framework for the gradual development of linguistic, academic, and professional communicative competencies. By establishing connections between language teachers, biology specialists, students, and potential employers, the model promotes interdisciplinary cooperation and strengthens the professional relevance of English language education. Furthermore, the integration of the Empower English digital platform creates additional opportunities for autonomous learning, individualized practice, and increased student motivation.

The research suggests that combining modular instruction, needs-based curriculum development, and digital educational resources can contribute to improving the quality of English language teaching in non-philological higher education programmes. Although further quantitative assessment is required to establish the measurable effectiveness of the proposed methodology, the developed framework offers a practical foundation for supporting biology students in progressing towards CEFR B2 proficiency. Future research should focus on longitudinal proficiency assessment and comparative evaluation of the model across different scientific disciplines.

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Reviewer:

Dr. Zhu Wenzhong

Professor

Guangdong University of Foreign Studies, China