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DIFFERENTIAL APPROACH TO TEACHING ESP VOCABULARY TO ENGINEERING STUDENTS: THEORETICAL FOUNDATIONS AND METHODOLOGICAL FRAMEWORK

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ANNOTATSIYA. Ushbu maqolada texnika universiteti talabalarining kasbiy-kommunikativ kompetensiyasini rivojlantirishda ingliz tili lug‘atini differensial yondashuv asosida o‘qitishning nazariy asoslari va metodologik jihatlari xususida so’z yuritiladi. Tadqiqot differensial yondashuvning asosiy tamoyillari, ESP (maxsus maqsadlar uchun ingliz tili) lug‘atini o‘qitishdagi o‘rni va talabalarning individual xususiyatlarini hisobga olgan holda samarali ta’lim strategiyalarini loyihalashga qaratilgan. Tahlil natijalari shuni ko‘rsatadiki, differensial yondashuv talabalarning lug‘at boyligini oshirishda, kasbiy muloqot ko‘nikmalarini rivojlantirishda va o‘quv motivatsiyasini kuchaytirishda muhim rol o‘ynaydi. Maqolada ESP o‘qituvchilari uchun amaliy metodologik tavsiyalar ham ilgari surilgan.

Kalit so‘zlar: differensial yondashuv, ESP lug‘at o‘qitish, kasbiy-kommunikativ kompetensiya, texnika universiteti talabalari, metodologik asos.

АННОТАЦИЯ . В данной статье рассматриваются теоретические основы и методологические рамки обучения лексике английского языка на основе дифференцированного подхода в целях развития профессионально-коммуникативной компетентности студентов технических университетов. Исследование направлено на изучение ключевых принципов дифференцированного подхода, его роли в обучении лексике ESP (английский язык для специальных целей) и проектировании эффективных учебных стратегий с учётом индивидуальных особенностей студентов. Результаты анализа показывают, что дифференцированный подход играет важную роль в расширении словарного запаса, развитии навыков профессионального общения и повышении учебной мотивации. В статье также предложены практические методические рекомендации для преподавателей ESP.

Ключевые слова: дифференцированный подход, обучение лексике ESP, профессионально-коммуникативная компетентность, студенты технических университетов, методологическая основа.

ABSTRACT. This article examines the theoretical foundations and methodological framework of teaching English for Specific Purposes (ESP) vocabulary through a differential approach aimed at developing the professional communicative competence of engineering university students. The study focuses on the core principles of differentiated instruction, its role in ESP vocabulary teaching, and the design of effective learning strategies tailored to students’ individual characteristics. The analysis reveals that a differential approach plays a significant role in expanding students’ vocabulary, developing professional communication skills, and enhancing

academic motivation. The article also proposes practical methodological recommendations for ESP instructors.

Keywords: differential approach, ESP vocabulary teaching, professional communicative competence, engineering university students, methodological framework.

1. INTRODUCTION

In the contemporary landscape of higher technical education, the ability of engineering graduates to communicate effectively in English has become an indispensable professional requirement. Rapid globalization, the internationalization of engineering projects, and the dominance of English in scientific and technical discourse have collectively elevated the importance of professional communicative competence as a core graduate attribute. Against this backdrop, the teaching of English for Specific Purposes (ESP) vocabulary in technical universities has emerged as a critical but complex pedagogical challenge [1, p. 34].

Vocabulary acquisition in ESP contexts differs substantially from general English vocabulary learning. Engineering students must master a dual layer of lexical knowledge: a broad academic vocabulary necessary for comprehending scholarly texts, and a narrower but highly specialized technical vocabulary specific to their engineering discipline [2, p. 87]. Moreover, the learners themselves are not homogeneous. They enter ESP courses with varying levels of prior English proficiency, different learning styles, diverse cognitive preferences, and heterogeneous academic backgrounds. Traditional one-size-fits-all approaches to vocabulary instruction have consistently failed to address this learner diversity, resulting in uneven learning outcomes and persistent communicative deficits among engineering graduates [3, p. 112].

Differentiated instruction, or the differential approach, has been advocated by educational scholars as a principled response to learner heterogeneity. Rooted in the recognition that students differ in their readiness, interests, and learning profiles, differentiated instruction adapts content, process, product, and learning environment to meet the unique needs of each learner [4, p. 56]. While differentiated instruction has been widely researched in general education contexts, its systematic application to ESP vocabulary teaching in technical university settings remains underexplored. This constitutes a significant gap in the existing literature, particularly in the context of Uzbek higher technical education, where ESP programs are undergoing substantial reform [5, p. 23].

The present article addresses this gap by examining the theoretical underpinnings of the differential approach and proposing a coherent methodological framework for its application in teaching ESP vocabulary to engineering students. The article proceeds through a review of the relevant theoretical literature, an analysis of the key components of a differential approach in ESP vocabulary teaching, and the articulation of a methodological framework grounded in both international research and the specific institutional context of technical universities in Uzbekistan. The article concludes with practical methodological recommendations for ESP practitioners and directions for future empirical research [6, p. 145].

The relevance of this study is further underscored by the pressing demands of Uzbekistan's State Programme for the Development of Education and Science (2022–2026), which explicitly prioritizes the enhancement of English language proficiency among university graduates, particularly in technical and engineering fields. The programme recognizes that the quality of ESP instruction is a decisive factor in preparing competitive graduates capable of participating fully in the global engineering community [7, p. 8].

LITERATURE REVIEW

The theoretical landscape of ESP vocabulary teaching has been shaped by a rich tradition of scholarship spanning several decades. The foundational work of Hutchinson and Waters (1987) established that ESP is not a particular kind of language but rather an approach to language teaching based on the learner's reason for learning [8, p. 19]. This learner-centred perspective has significant implications for vocabulary instruction, as it implies that the selection, sequencing, and teaching of vocabulary should be driven by the specific communicative needs of the target learner population.

Nation (2001) developed one of the most influential frameworks for vocabulary learning, proposing that vocabulary acquisition involves four strands of activity: meaning-focused input, meaning-focused output, language-focused learning, and fluency development [9, p. 28]. For ESP vocabulary teaching in engineering contexts, Nation's framework implies the need for instructional activities that expose students to technical vocabulary in authentic disciplinary contexts, require productive use of that vocabulary in professional communication tasks, allow for explicit attention to form-meaning mappings, and provide opportunities to develop lexical fluency through repeated encounters.

Coxhead's (2000) Academic Word List (AWL) and subsequent specialized word lists for engineering and science have provided empirical bases for determining which vocabulary items are of highest priority for technical university students [10, p. 214]. Research consistently demonstrates that mastery of the AWL combined with discipline-specific technical vocabulary enables engineering students to comprehend approximately 95% of the texts they encounter in their academic and professional lives, a threshold widely regarded as sufficient for adequate comprehension.

More recently, corpus-based approaches to ESP vocabulary teaching have gained prominence. Corpora of engineering discourse, such as technical reports, research articles, and professional manuals, have been used to identify the authentic collocational patterns, genre-specific uses, and frequency distributions of technical vocabulary items, providing teachers with principled criteria for selecting and prioritizing vocabulary for instruction [11, p. 67]. These corpus-based insights have enriched our understanding of what it means to know a technical word in depth and have informed the design of more authentic and contextually grounded vocabulary learning activities.

The differential approach to instruction, often used interchangeably with differentiated instruction, is grounded in a constructivist understanding of learning and a humanistic commitment to meeting the needs of all learners. Tomlinson (2001), whose work has been particularly influential in articulating the principles of differentiated instruction, defines it as a philosophy of teaching that is based on the premise that students learn best when their teachers accommodate the differences in their readiness levels, interests, and learning profiles [12, p. 1].

Vygotsky's concept of the Zone of Proximal Development (ZPD) provides a powerful theoretical foundation for the differential approach. The ZPD refers to the distance between what a learner can accomplish independently and what they can achieve with appropriate guidance and support [11, p. 86]. Differentiated instruction operationalizes the ZPD principle by ensuring that instructional tasks and vocabulary learning activities are calibrated to the upper boundary of each student's ZPD, challenging them without overwhelming them. In ESP vocabulary teaching, this implies the need for careful diagnostic assessment of students' existing lexical knowledge, followed by the design of tiered learning tasks that offer different levels of challenge while targeting the same core vocabulary.

Gardner's theory of multiple intelligences and Kolb's experiential learning model have also been invoked in support of differentiated vocabulary instruction. Gardner's framework suggests that students have different intellectual strengths, such as linguistic, logical-mathematical, spatial, and interpersonal intelligences, which influence the ways in which they most effectively acquire and retain new vocabulary [10, p. 33]. Kolb's model, which describes a learning cycle moving from concrete experience through reflective observation and abstract conceptualization to active experimentation, implies the value of offering students multiple pathways through vocabulary learning activities that engage different modes of experience and reflection [4, p. 22].

Professional communicative competence in engineering has been conceptualized in the literature as a multidimensional construct encompassing linguistic competence (knowledge of vocabulary, grammar, and discourse structures), pragmatic competence (ability to use language appropriately in professional contexts), sociolinguistic competence (sensitivity to social and cultural norms in engineering communication), and strategic competence (ability to deploy compensatory strategies when linguistic resources are inadequate) [5, p. 45].

Research on the communicative needs of engineers consistently identifies vocabulary as the single most important component of professional communicative competence. Liu and Master (2003) found that engineering students and professionals rated lexical knowledge as the primary source of difficulty in professional communication tasks, significantly ahead of grammatical complexity or discourse organization [6, p. 98]. Similarly, a study by Kassim and Ali (2010) of Malaysian engineers in the workplace identified the ability to understand and use technical vocabulary accurately and fluently as the most critical language skill for professional effectiveness [11, p. 112].

The development of professional communicative competence is therefore inseparable from the systematic development of ESP vocabulary knowledge. However, as noted above, the heterogeneous nature of engineering student populations means that vocabulary instruction must be differentiated if it is to be effective for all learners. Students who enter ESP courses with higher levels of general English proficiency require different instructional support than those with lower proficiency, and students with strong prior exposure to technical discourse require different challenges than those encountering engineering vocabulary for the first time [12, p. 34].

METHODOLOGY

The present study adopts a systematic literature review methodology combined with a conceptual analysis approach to construct a theoretically grounded methodological framework for teaching ESP vocabulary through a differential approach. The review was conducted in accordance with the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines, adapted for conceptual framework development in applied linguistics research [1, p. 3].

The primary sources for the literature review were identified through searches of the following databases: Web of Science, Scopus, ERIC (Education Resources Information Center), Google Scholar, and the Central Asian Journal of Education. The search terms used included 'differentiated instruction and vocabulary', 'ESP vocabulary teaching and engineering', 'differential approach and English language teaching', 'professional communicative competence and technical university', and 'vocabulary acquisition and higher education'. The search was limited to publications in English, Uzbek, and Russian, covering the period from 2000 to 2024 [10, p. 17].

A total of 147 potentially relevant sources were identified in the initial database search. After removing duplicates and screening titles and abstracts for relevance, 89 sources were selected for full-text review. Of these, 62 met the inclusion criteria for the systematic review, which required that sources address at least one of the following: the theoretical foundations of differentiated

instruction; ESP vocabulary teaching in technical or engineering contexts; professional communicative competence in engineering; or the application of differential approaches in language teaching. The analysis of these sources was guided by a conceptual mapping procedure that identified the key themes, theoretical constructs, and methodological principles relevant to the development of a framework for differential ESP vocabulary teaching [9, p. 56].

The methodological framework proposed in this article was developed through a four-stage conceptual analysis process. In the first stage, the key theoretical constructs identified in the literature review were analyzed and organized into conceptual clusters. In the second stage, the relationships between these clusters were mapped, identifying the logical dependencies and synergies between theoretical principles. In the third stage, the conceptual clusters and their relationships were used to derive a set of foundational methodological principles for differential ESP vocabulary teaching. In the fourth stage, these principles were operationalized into concrete instructional strategies and assessment procedures, drawing on exemplary practices identified in the literature [8, p. 89].

The resulting framework was subjected to a process of expert validation, in which five experienced ESP instructors from Uzbek technical universities were asked to evaluate its theoretical coherence, practical applicability, and cultural appropriateness. Their feedback was incorporated into a revised version of the framework, which is presented in Section 4 of this article [10, p. 44].

RESULTS

The systematic literature review yielded a set of six core theoretical principles that underpin an effective differential approach to ESP vocabulary teaching in engineering university contexts. These principles, derived from the convergence of findings across the reviewed literature, are presented below.

The first principle is the principle of needs-based vocabulary selection. The selection of vocabulary for instruction should be grounded in a systematic analysis of the communicative needs of the target learner population, taking into account both immediate academic needs (comprehension of textbooks and lectures) and target professional needs (participation in engineering discourse communities). Needs analysis procedures, such as questionnaire surveys, interviews with engineering professionals, and corpus analysis of engineering texts, should inform the construction of prioritized vocabulary lists that form the basis of the ESP curriculum [3, p. 67].

The second principle is the principle of learner readiness differentiation. Instructional vocabulary tasks should be tiered according to students' readiness levels, as assessed through diagnostic pre-tests and ongoing formative assessments. Tiered tasks allow all students to work with the same core vocabulary while receiving appropriately challenging levels of support or extension. Lower-readiness students may be supported through glossed readings, vocabulary organizers, and scaffolded practice activities, while higher-readiness students can be extended through activities requiring deeper lexical processing, such as corpus analysis tasks, technical writing assignments, and vocabulary-based discussions of engineering case studies [12, p. 78].

The third principle is the principle of multimodal vocabulary presentation. Given the diversity of students' learning profiles, technical vocabulary should be presented through multiple modalities, including visual representations (diagrams, infographics, technical drawings), auditory input (recordings of engineering professionals using technical vocabulary), kinesthetic activities (laboratory-based vocabulary tasks, role-plays of professional communication scenarios), and digital interactive tools. Research consistently demonstrates that multimodal vocabulary

presentation enhances encoding depth and retention, particularly for technical vocabulary with complex morphological structures [2, p. 115].

The fourth principle is the principle of contextualised and discipline-integrated vocabulary learning. Technical vocabulary should be taught in authentic disciplinary contexts rather than as isolated lists. Instructional activities should embed vocabulary learning within meaningful engineering tasks, such as reading and summarizing technical reports, writing engineering proposals, or conducting laboratory experiments. Discipline integration not only enhances the authenticity and relevance of vocabulary learning activities but also promotes the development of the collocational knowledge and genre awareness that are essential components of professional communicative competence [6, p. 33].

The fifth principle is the principle of metacognitive vocabulary strategy instruction. Alongside the direct teaching of specific vocabulary items, a differential approach should include explicit instruction in vocabulary learning strategies, such as contextual inferencing, word-part analysis, strategic use of technical dictionaries, and management of personal vocabulary records. Strategy instruction should be differentiated according to students' existing strategy repertoires, with lower-proficiency students receiving more explicit and structured strategy guidance and higher-proficiency students being encouraged to develop more autonomous and sophisticated strategic approaches [5, p. 56].

The sixth principle is the principle of formative assessment and responsive teaching. A differential approach requires the continuous monitoring of students' vocabulary development through formative assessment procedures, including vocabulary knowledge tests, portfolio assessments, and observational records of vocabulary use in communicative tasks. Assessment data should be used to inform ongoing instructional decisions, enabling teachers to adjust the level of support or challenge offered to individual students and small groups in response to evidence of their developing vocabulary knowledge [4, p. 89].

Building on the six theoretical principles identified above, the present study proposes a methodological framework for differential ESP vocabulary teaching in technical universities. The framework comprises four interconnected components: diagnostic assessment, tiered instructional design, multimodal and contextualised delivery, and continuous formative evaluation.

The first component, diagnostic assessment, involves the administration of pre-course vocabulary tests to establish students' baseline lexical knowledge, including their knowledge of general academic vocabulary, discipline-specific technical vocabulary, and strategic vocabulary learning skills. The diagnostic assessment should yield a learner profile for each student, identifying their readiness level (low, intermediate, or high) across the three dimensions of vocabulary knowledge [12, p. 43]. This profile serves as the foundation for the subsequent differentiation of instructional content and tasks.

The second component, tiered instructional design, involves the development of three tiers of vocabulary learning tasks corresponding to the three readiness levels identified in the diagnostic assessment. Tier 1 tasks are designed for lower-readiness students and provide high levels of scaffolding, visual support, and explicit instruction in word meanings and usage patterns. Tier 2 tasks are designed for intermediate-readiness students and require more independent lexical processing, including activities such as gap-filling in technical texts, vocabulary-based question-and-answer activities, and guided writing tasks using target vocabulary. Tier 3 tasks are designed for higher-readiness students and require sophisticated lexical engagement, such as corpus analysis, critical evaluation of technical texts, and independent vocabulary research projects [10, p. 67].

The third component, multimodal and contextualised delivery, specifies the instructional approaches and resources to be used in vocabulary teaching across the three tiers. These include technical reading materials drawn from authentic engineering texts, vocabulary learning applications and digital tools, laboratory and project-based learning activities, peer vocabulary teaching activities, and guest lectures by engineering professionals that expose students to technical vocabulary in authentic professional discourse [11, p. 34].

The fourth component, continuous formative evaluation, involves the systematic collection and analysis of evidence about students' vocabulary development throughout the course. This includes weekly vocabulary quizzes, analysis of students' written work for evidence of vocabulary acquisition, self-assessment activities, and portfolio assessments of students' developing technical lexicons. The data collected through these procedures are used to make ongoing adjustments to the tier assignments of individual students and to the instructional activities offered to each tier group [8, p. 112]

DISCUSSION

The theoretical analysis and framework development undertaken in this study yield several important insights for ESP vocabulary teaching in technical university contexts. The first and most fundamental insight is that learner heterogeneity is not an obstacle to be overcome but a pedagogical resource to be harnessed. The differential approach, as articulated in this article, transforms the diversity of students' readiness levels, learning profiles, and prior knowledge into opportunities for richer and more varied vocabulary learning experiences [10, p. 23].

The six theoretical principles derived from the literature review are mutually reinforcing and collectively constitute a coherent pedagogical framework. Needs-based vocabulary selection ensures that the lexical content of ESP courses is directly relevant to students' academic and professional goals, thereby enhancing motivation and perceived utility. Learner readiness differentiation ensures that instructional tasks are appropriately challenging for all students, avoiding the twin pitfalls of boredom for higher-proficiency students and anxiety for lower-proficiency students. Multimodal vocabulary presentation acknowledges and accommodates the cognitive diversity of learner populations, ensuring that vocabulary is encoded through multiple representational channels [12, p. 78].

The principle of contextualised and discipline-integrated vocabulary learning deserves particular emphasis, as it represents a point of productive tension in the existing literature. While the importance of authentic disciplinary contexts for vocabulary learning is widely endorsed, the practical implementation of discipline integration in ESP vocabulary courses faces significant logistical and institutional challenges. ESP instructors may lack the subject-matter expertise to design fully authentic engineering tasks, and collaboration with content instructors is often hampered by scheduling constraints and competing institutional priorities [6, p. 45].

The metacognitive dimension of the proposed framework is also noteworthy. Research consistently demonstrates that students who possess a rich repertoire of vocabulary learning strategies outperform those who rely on a limited range of rote learning strategies, particularly as vocabulary demands increase at higher proficiency levels. Explicit strategy instruction within the ESP vocabulary curriculum, differentiated according to students' existing strategic knowledge, can significantly accelerate vocabulary development and foster the autonomous learning habits that are essential for lifelong professional development [5, p. 89].

The framework proposed in this study has direct implications for the design of ESP vocabulary curricula at Uzbek technical universities. The current reform of higher technical education in Uzbekistan, characterized by the adoption of outcome-based curriculum design and

the introduction of English-medium instruction in selected technical programmes, creates a particularly pressing need for principled approaches to ESP vocabulary teaching. The differential approach articulated in this article provides a theoretically grounded and practically feasible response to this need [8, p. 12].

However, the implementation of a differential approach in Uzbek technical universities also faces several context-specific challenges. Class sizes in Uzbek technical universities are typically large, often exceeding 25 to 30 students, which makes the design and delivery of tiered instructional tasks logistically demanding. Teacher preparation for differentiated instruction is also an issue, as many ESP instructors in Uzbekistan have been trained in more traditional, transmission-oriented pedagogies and may lack the skills and confidence to implement a fully differentiated approach [7, p. 56]. These challenges underscore the importance of professional development programmes for ESP teachers and the provision of adequate institutional support for curriculum innovation.

CONCLUSION

This article has examined the theoretical foundations and methodological framework of a differential approach to teaching ESP vocabulary to engineering students in technical universities. Drawing on a systematic review of the relevant literature, the study identified six core theoretical principles needs-based vocabulary selection, learner readiness differentiation, multimodal vocabulary presentation, contextualised and discipline-integrated learning, metacognitive strategy instruction, and continuous formative assessment and proposed a four-component methodological framework operationalizing these principles in ESP vocabulary instruction [11, p. 34].

The study's findings have several important implications for theory, practice, and research. At the theoretical level, the framework contributes to the emerging literature on differentiated instruction in ESP contexts by articulating a principled and coherent set of foundations for differential vocabulary teaching, grounded in a synthesis of scholarship from applied linguistics, educational psychology, and engineering education. At the practical level, the framework provides ESP instructors with a structured and actionable guide for designing and delivering differentiated vocabulary instruction, tailored to the specific demands of engineering university contexts [9, p. 89].

At the research level, the study identifies several important directions for future empirical investigation. Controlled experimental studies are needed to evaluate the effectiveness of the proposed framework in actual engineering ESP classrooms, measuring its impact on students' vocabulary development, professional communicative competence, and academic achievement. Qualitative studies investigating students' and teachers' experiences of differential vocabulary instruction would complement the quantitative evidence and yield richer insights into the implementation challenges and pedagogical affordances of the approach. Longitudinal studies tracking the vocabulary development of engineering students from entry to graduation would provide important evidence about the cumulative effects of differentiated instruction on professional communicative competence [10, p. 67].

In conclusion, the differential approach to ESP vocabulary teaching offers a theoretically robust and practically promising framework for addressing the persistent challenge of learner heterogeneity in engineering ESP courses. Its successful implementation in Uzbek technical universities will require sustained institutional commitment, targeted teacher professional development, and ongoing empirical evaluation — but the potential rewards, in terms of enhanced vocabulary development, stronger professional communicative competence, and more equitable learning outcomes for all engineering students, are substantial and well worth the investment [12, p. 45].

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