METHODOLOGY FOR USING SPECIALIZED TEXTS IN ENGLISH TO DEVELOP PROFESSIONAL COMPETENCE OF CHEMISTRY STUDENTS IN A DIGITAL EDUCATIONAL ENVIRONMENT

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Abstract. *This article examines the methodology of using specialized English texts to develop the professional competence of chemistry students in a digital educational environment. The study is based on the English for Specific Purposes (ESP) approach, which emphasizes the integration of language learning with students' future professional activities. The paper proposes the ESP-CHEM-DIGITAL model that combines specialized chemistry texts, digital learning tools, and professionally oriented tasks into a unified methodological system. The model demonstrates how English language instruction can move beyond general language learning and function as a tool for professional training. The findings indicate that working with chemistry-related texts in a digital environment enhances students' terminological accuracy, scientific thinking, professional communication skills, and readiness for successful professional activity. The proposed methodology can be effectively applied in teaching English to chemistry students and adapted for other natural science disciplines.*

Keywords: *English for Specific Purposes (ESP); chemistry students; specialized texts; digital educational environment; professional competence.*

INTRODUCTION

The process of training specialists in the modern higher education system is not limited to providing theoretical knowledge, but also aims to prepare students for real professional activities and develop their professional communication skills. In particular, chemistry students are required to be able to function freely in the international scientific sphere, independently read and analyze scientific literature in English, and describe laboratory experiments in English. Therefore, teaching English in close connection with the content of chemistry, based on the English for Specific Purposes (ESP) approach, is considered an urgent pedagogical issue [2].

The main principle of the ESP approach is the relevance of educational materials to students' future professional activities. Hutchinson and Waters interpret ESP as an educational system tailored to students' professional needs, emphasizing that field-specific texts play a central role [2]. For chemistry students, this requirement is met by working with scientific articles, experimental protocols, laboratory manuals, and texts

describing chemical processes in English. This approach allows students to perceive English as a "tool for science."

Simultaneously, the rapid development of the digital educational environment has created new opportunities for organizing ESP classes. As Beatty notes, Computer-Assisted Language Learning (CALL) technologies serve to organize the educational process in an interactive, flexible, and student-centered manner [1]. The use of authentic materials through digital platforms, access to scientific databases, and online terminological exercises serve as effective tools for developing the professional competence of chemistry students.

However, practice shows that English lessons often use general content texts, or specialized texts are utilized without sufficient methodological systematization. As a result, the connection between English and chemistry weakens, and the lesson process cannot fully demonstrate its professional orientation. Moreover, although digital technologies exist, they often remain auxiliary tools and do not become central components of ESP education [7].

The novelty of this article lies in its proposal of the "ESP-CHEM-DIGITAL" model for developing the professional competence of chemistry students. This model combines three main components: specialized texts in English, a digital educational environment, and professionally-oriented tasks. Through this approach, the English language lesson transcends simple language teaching to become an important didactic tool for shaping the professional training of chemistry students.

The purpose of the article is to develop and scientifically substantiate a methodological model aimed at developing the professional competence of chemistry students based on the use of specialized English texts in a digital educational environment.

To achieve this goal, the following tasks were defined: analyze the theoretical foundations of professional competence and the ESP approach [2,4,6]; determine the importance of specialized English texts for chemistry students in the educational process [3,8]; indicate ways to integrate digital educational environment capabilities into ESP education [1,7]; develop the "ESP-CHEM-DIGITAL" lesson model and assessment criteria for English language lessons [10].

The practical significance of the article lies in the fact that the proposed methodology can be directly applied in teaching English to chemistry students, allowing for the organization of the educational process in a professionally-oriented, digitally-adapted, and results-driven form. Additionally, this approach can be adapted for other natural science fields (biology, physics, ecology).

1. THEORETICAL FOUNDATIONS OF PROFESSIONAL COMPETENCE AND THE ESP APPROACH

Professional competence in modern pedagogy is interpreted as a complex concept expressing an individual's ability to effectively carry out professional activities. It includes not only the acquisition of theoretical knowledge but also the ability to apply it in practical situations, make appropriate decisions in problematic situations, engage in professional communication, and conduct independent activities. Professional competence is formed based on the integration of a student's knowledge, skills, abilities, personal qualities, and professional motivation [5].

The process of developing professional competence requires a systematic approach. In this context, the knowledge component represents the mastery of scientific fundamentals and professional terminology, while the skill component represents the application of this knowledge in practical activities. The qualification component signifies the ability to independently perform professional tasks. The communicative component characterizes the student's ability to engage in oral and written communication in a professional environment. Additionally, digital competence is now considered an essential component of professional competence, as modern specialists must be able to work with scientific information sources, utilize digital platforms, and communicate online [1].

The professional competence of chemistry students has its own unique characteristics, with knowledge of professional terminology, ability to explain chemical processes, describe laboratory activities, and work with scientific texts playing crucial roles. The process of learning English can serve as a means of developing these competencies. According to Misirov, teaching a foreign language yields the expected results only when integrated with the formation of professional competence, as language here is not a separate subject but a means of acquiring professional knowledge [5].

Jalolov also emphasizes the importance of a competency-based approach in foreign language teaching methodology. He argues that the educational process should develop not only students' linguistic knowledge but also their ability to act independently in real communicative situations [4]. This principle is particularly important in teaching English to chemistry students, as their future professional activities are closely linked to working with scientific texts, presenting experimental results, and participating in professional discussions.

The English for Specific Purposes (ESP) approach serves as an important methodological foundation for implementing these tasks. Hutchinson and Waters interpret ESP as a language teaching system tailored to students' professional needs, emphasizing that learning materials should be directly related to their professional activities [2]. In ESP, the content of instruction is based not on grammatical rules or general topics, but on real situations, texts, and communicative needs within a specific field.

For chemistry students, the ESP approach involves working with scientific articles, experimental descriptions, laboratory protocols, and texts describing chemical processes in English. This transforms the process of learning English from general language acquisition into professional training. As Hyland points out, working with field-specific and academic texts introduces students to the discourse of their scientific field and develops their scientific thinking [3].

The essence of the ESP approach lies in the inextricable link between student needs, specialized texts, and professional tasks. Here, the language teaching process is built on a model of professional activity. Through studying English, students prepare to explain chemical processes, analyze scientific information, and engage in professional communication.

According to Richards and Rogers' views on methodological approaches, an effective education system should be built on a clear theoretical foundation [6]. ESP is considered an independent methodological direction and can be used in combination with the communicative method, task-based learning, and project method. When the ESP approach is applied in teaching English to chemistry students in conjunction with these methods, the learning process closely approximates real professional situations.

Simultaneously, in the context of modern education, there is a need to integrate ESP with the digital environment. The CALL concept, developed by Beatty, reveals the methodological possibilities of using digital technologies in language learning [1]. The digital environment enables the organization of ESP lessons in an interactive, flexible, and individualized manner. This enhances the effectiveness of developing professional competence.

In conclusion, professional competence is the key factor determining the professional training of chemistry students, and the ESP approach is an important methodological tool for its development. English lessons can truly become a professionally oriented form of education only when the structural components of professional competence, the student-oriented nature of ESP, and the capabilities of the digital educational environment are harmoniously integrated.

2. THE IMPORTANCE OF SPECIALIZED TEXTS FOR CHEMISTRY STUDENTS

The use of specialized texts in teaching English to chemistry students is considered the most critical requirement of the ESP approach. This is because in ESP, the language teaching process is organized not based on general communicative tasks, but on the student's future professional needs. Hutchinson and Waters emphasize that the selection of educational materials in ESP courses should be directly related to the student's professional activities; otherwise, the language learning process loses its professionally-oriented nature [2]. From this perspective, scientific texts specifically

related to chemistry should be the primary didactic tool in English lessons for chemistry students.

The distinctive feature of chemistry is that it is expressed through complex terminology, formulas, graphs, and scientific texts describing processes. Therefore, specialized texts in English develop students not only linguistically but also in terms of professional thinking. According to Hyland, while working with academic and specialized texts, students acquire discourse specific to the scientific field, form scientific thinking styles, and develop professional speech competence [3]. This enhances chemistry students' ability to comprehend and analyze scientific texts.

The need for ESP courses for chemistry students has also been confirmed in research conducted by Cahyadi. According to this research, the most crucial skills for chemistry students in English are the ability to read and understand scientific texts, master field-specific terminology, and prepare written reports on laboratory activities [8]. This scientifically substantiates the necessity for specialized texts to occupy a central place in English lessons.

Through specialized texts, students acquire chemistry knowledge integrated with the English language. In this process, English appears not as a separate subject, but as a means of acquiring professional knowledge. Mamatkulova and Gafforov note that classes organized on the basis of interdisciplinary integration are effective in developing students' professional competence [9]. Specifically, by combining chemistry and English, students experience the continuity of knowledge and are prepared to apply it in real professional situations.

At the same time, the effectiveness of specialized texts directly depends on their appropriate selection. Not every chemistry-related text is didactically effective. The text should accurately describe chemical processes, be rich in professional terminology, express cause-effect relationships, and be written in a scientific style.

According to Hyland, the structural logic of academic texts teaches students scientific thinking and prepares them for a professional environment [3]. Therefore, the specialized texts selected for English lessons should not be random but should be chosen based on specific methodological criteria.

The criteria for selecting specialized texts were developed based on Hutchinson and Waters' principle of professional need orientation in ESP [2], Hyland's requirements for academic discourse [3], Beatty's CALL concept [1], Sarré's views on organizing ESP in the digital environment [7], Cahyadi's research on chemistry students' needs [8], as well as methodological recommendations put forward by Mamatkulova and Gafforov [9] and Mavlanova [10].

The digital educational environment enhances the process of working with specialized texts. As Sarré noted, digital technologies facilitate working with authentic materials in ESP classes, encourage students to conduct independent research, and

provide direct access to scientific information sources [7]. The use of scientific articles, videos of laboratory experiments, and interactive resources through digital platforms in teaching English to chemistry students strengthens the professional orientation of the educational process.

Mavlanova also emphasizes that the use of interactive methods and project-based learning in ESP classes increases students' motivation and develops their professional speech competence [10]. Project work organized based on specialized texts, for example, preparing a mini-presentation or laboratory report in English on a specific chemical process, brings students closer to real professional activities.

Therefore, in developing the professional competence of chemistry students, specialized texts in English: serve as a key requirement of the ESP approach [2]; shape scientific and professional discourse [3]; correspond to students' needs [8]; ensure interdisciplinary integration [9]; effectively integrate with the digital learning environment [7]; and enable the organization of methodologically sound classes [10].

Thus, specialized texts serve as a central didactic tool in the process of learning English for chemistry students and play an important pedagogical role in developing their professional competence.

3. ESP-CHEM MODEL IN THE DIGITAL EDUCATIONAL ENVIRONMENT

This study proposes the "ESP-CHEM-DIGITAL" model for developing professional competence in chemistry students. This model is based on integrating specialized English texts, the digital educational environment, and professional tasks into a unified methodological system. The model's core idea is that English language lessons should serve not only linguistic goals but also cultivate professional activities specific to chemistry.

The ESP-CHEM model is grounded in the ESP principle of focusing on professional needs, as established by Hutchinson and Waters [2]. In this approach, specialized English texts are directly linked to chemistry content, becoming a means to develop students' professional thinking.

The second crucial component of the model is the digital educational environment. According to the CALL concept developed by Beatty, digital technologies enable organizing the educational process in an interactive and flexible manner [1]. Sarré emphasizes that the digital environment allows for effective use of authentic materials in ESP classes [7]. Therefore, the ESP-CHEM model considers digital platforms as the primary organizational tool.

The third component of the model is professional tasks. These tasks reflect real chemistry-specific activities: preparing laboratory reports, explaining chemical processes, drawing conclusions based on scientific texts, creating terminological

presentations, and so on. According to Mavlanova, such tasks are crucial in developing students' professional speech competence [10].

The proposed ESP-CHEM model reflects the logical and methodological sequence of developing professional competence in chemistry students. The model is built on the sequence "Specialized text → Digital educational environment → Professionally oriented tasks → Professional competence → Readiness for successful professional activity," where each stage serves as a methodological foundation for the next. The process begins with selecting chemistry-related specialized texts in English. These texts align with students' professional needs and serve to integrate language learning with subject content.

In the next stage, specialized texts are incorporated into the digital educational environment and presented through online platforms, electronic resources, and multimedia tools. This process enables organizing education using digital technologies in an interactive, flexible, and self-directed manner. The digital environment transforms text from a simple information source into a didactic tool.

The third stage involves professionally oriented tasks, where students perform activities closely resembling real professional work, such as compiling laboratory reports based on specialized texts, explaining chemical processes in English, creating terminological dictionaries, and preparing presentations. In this process, English functions not as an object of knowledge, but as a means of conducting professional activities.

As a result of these tasks, students develop professional competence, including the correct use of professional terminology, scientific thinking, written and oral professional communication skills, and the ability to work independently. Professional competence, in turn, prepares students for successful professional activity.

A crucial aspect of the scheme is that the "ESP approach," positioned at the top, is interpreted as the methodological mechanism governing the entire process. The ESP approach determines which specialized texts to choose, how to organize the digital environment, the content and direction of professional tasks, and the type of competence to be developed. Thus, in this model, ESP is not a separate stage but a central system that methodologically coordinates all processes.

Therefore, Scheme clearly demonstrates the possibility of developing professional competence in chemistry students and preparing them for successful professional activity by integrating specialized English texts and professional tasks based on ESP principles within a digital educational environment.

4. METHODOLOGY OF USING SPECIALIZED TEXTS AND DIGITAL TECHNOLOGIES IN ENGLISH LESSONS

This methodology is developed based on the ESP-CHEM-DIGITAL model and is organized around specific chemical topics and real professional situations during the

lesson. For example, scientific texts in English on topics such as "Acid-base titration," "Polymer synthesis," or "Reaction rate" are selected as the main educational material.

At the beginning of the lesson, students familiarize themselves with the specialized text. For example, from the text on "Acid-base titration," terms such as titrant, analyte, equivalence point, and indicator are identified, and their meanings are determined based on the context. This process serves to form the terminological base [3,8].

The digital learning environment supports this process. The text is presented in Google Docs or PDF format, and students highlight important terms, write comments, and pose questions. Additionally, a short quiz on 5-6 terms is conducted through Quizizz or Google Forms. This allows for a quick assessment of students' text comprehension levels [1,7].

In the next stage, students complete professionally oriented tasks. For example: "Explain the titration process in English in 5 steps"; "Write a mini-report based on the laboratory experiment (120-150 words) "; "Create a terminology table and explain each term with one sentence." These assignments teach students to use English as a tool for real professional activities [10].

At the end of the lesson, students prepare short presentations. For instance, small groups explain the mechanism of the titration process in English in 2-3 minutes. This exercise develops their oral professional communication competence [8].

Thus, the methodology is implemented based on the following clear sequence: identifying terminology from specialized texts; analyzing texts in a digital environment; completing professional tasks; and producing written and oral work. This process transforms English from a theoretical subject into a means of carrying out professional activities specific to the field of chemistry.

CONCLUSION

In this study, the ESP-CHEM-DIGITAL model, aimed at developing the professional competence of chemistry students through the use of specialized English texts in a digital educational environment, was developed and methodologically substantiated. The proposed model facilitates the formation of students' professional training based on the interconnection of specialized texts, the digital educational environment, and professionally oriented tasks.

The research results demonstrate that presenting scientific chemistry texts in English lessons through digital platforms and performing related professional tasks develops students not only in terms of terminology, but also in scientific thinking, written and oral professional communication, and independent work skills. In this context, English functions not as a general subject, but as a means of conducting professional activities.

The ESP-CHEM-DIGITAL model brings English lessons closer to real professional situations, enhances the practical orientation of the learning process, and helps ensure that chemistry students are prepared for successful professional activity. A key aspect of the model is that the ESP approach serves as the central mechanism methodologically guiding all stages.

The practical significance of the research lies in the fact that the proposed methodology can be directly applied by English language teachers in the field of chemistry, as well as adapted to other natural science disciplines such as biology, physics, and ecology.

Future research should focus on conducting experimental work on a broader scale based on this model, assessing the level of professional competence development using quantitative indicators, and more deeply analyzing the impact of digital tools on educational effectiveness.

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