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FORMATION OF PROFESSIONAL LANGUAGE COMPETENCE IN A FOREIGN LANGUAGE FOR STUDENTS MAJORING IN PHYSICS

The research article investigates the effectiveness of an integrative teaching methodology in developing professional language competence among Physics students. The goal of the study was to determine the peculiarities of forming components of the language professional communicative competence, and to reveal criteria for the development of this competence in practical sessions using a foreign language. To achieve the goal of the study the methodological experiment was conducted based on the Eurasian National University named after L. N. Gumilyov. Employing various activities such as collaborative discussions, project-based learning, role-play simulations, and written assignments, the study focuses on the enhancement of specific language skills, including speaking and writing proficiency, acquisition of professional terminology and vocabulary, and the development of critical thinking and analytical abilities. The findings aim to contribute valuable insights into the pedagogical strategies that prove most beneficial in fostering comprehensive language competencies within the specialized domain of Physics education.

Keywords: professional language competence, language skills, integrative approach, physics students, professional context, communication.

Introduction

In the modern world the ability to communicate is essential. Especially it is vital in the professional area where English is used as lingua franca. For aspiring physicists, mastering a foreign language extends beyond basic communication; it serves as a crucial element in their career advancement and scientific pursuits. Professional proficiency in a foreign language entails possessing the necessary skills to effectively communicate, comprehend, and actively participate in

professional settings using a language other than one's native tongue. Specifically for physics students, proficiency in a foreign language encompasses not only general language abilities but also specialized scientific language and terminology. This includes the capability to comprehend scientific texts, present research findings, engage in scientific discourse, and collaborate with peers from diverse linguistic and cultural backgrounds.

The relevance and practical significance of this article lie in addressing a pressing need within the field of physics education. As globalization continues to shape the landscape of scientific research and collaboration, the ability for physics students to effectively communicate in a foreign language becomes increasingly vital. This article tackles this challenge by proposing methods for cultivating professional language competence among physics students. The study offers identifying the peculiarities of forming language professional communicative competence and providing practical criteria for its development. The practical significance of this research extends to its direct application in educational settings, where the proposed tasks and activities can be implemented to enhance language skills and facilitate effective communication within the physics domain.

The concept of fostering professional competence has been explored in pedagogical literature by various scholars including J. A. Bowden, E. R. Auerbach, R. Docking, T. Guskey, M. Marcellino, J. C. Richards, T. S. Rodgers, D. Larsen-Freeman, M. Anderson, A. V. Khutorsky, V. I. Mikheev, A. K. Markova, T. I. Rudneva, and I. A. Zimnyaya. The term «competence» reframes language acquisition as the development of communicative abilities rather than mere knowledge accumulation. It regards language as a tool for effective communication and underscores the practical use of language skills in real-life situations. According to Larsen-Freeman and Anderson (2013), competence is defined as «the underlying knowledge and skills that a speaker-bringer brings to bear in performing communicative acts» [1]. This definition of competence extends beyond grammar and vocabulary, highlighting the real-world use of language skills across diverse social and cultural settings.

A. V. Khutorsky defines competence as «the readiness of an individual to mobilize knowledge, skills, and external resources for effective action in a particular life situation» [2]. Kunanbaeva S. S. describes competence as «an integrated feature of educational qualities», linking it to the category of «educational outcomes» [3]. In line with these definitions, competence emerges as a product of formal education and is demonstrated through an individual's ability to apply acquired knowledge and skills in specific contexts.

Professional competence is a fundamental attribute for aspiring professionals, encompassing a diverse amalgamation of knowledge, skills, attitudes, and qualities

vital for effective performance and successful outcomes [4]. The following points outline key components of professional competence:

1 Knowledge: Comprehensive understanding of relevant subject matter and industry practices.

2 Abilities: Proficiency in carrying out various tasks.

3 Mindset: flexibility, eagerness to improve and learn [5].

Acquiring these components equips them with the requisite tools to actively contribute to global research initiatives, forge international partnerships, and advance scientific knowledge in their respective fields of expertise.

The development of components is a crucial facet of intercultural communicative professional competence [6]. In specialized fields like foreign language proficiency in physics, discerning and grasping the criteria for forming each component is vital. Through a thorough examination of these criteria, educators and learners can discern the precise prerequisites needed to cultivate proficiency in every aspect of professional competence [7]. This comprehension facilitates the creation of tailored educational curricula and targeted approaches for competency enhancement, resulting in improved language abilities and effective communication within the physics domain [8].

Materials and Methods

To demonstrate the efficacy of an integrated approach in teaching English as a second language to students specializing in physics, we conducted a research study. Eighteen first-year students majoring in Physics were selected for the experimental group, and 18 students for the control group at L. N. Gumilyov Eurasian National University. The selection was motivated by the desire to assess the influence of methods for developing communicative competence in the professional language of physics. Initially, a language skills test was conducted to evaluate the students. Based on the test results, the group of students with lower scores was chosen as the experimental group. The objective of the experiment was to ascertain the features involved in developing language professional communicative competence, and to delineate criteria for the development of this competence in practical sessions using a foreign language. Over 15 weeks, with 6 hours per week, students in the experimental group underwent special training and practical sessions focused on developing communicative skills in a professional context. This included role-playing, group discussions, physics-themed project work, as well as practical exercises aimed at improving oral and written communication.

The research employed various methodologies, including questionnaires to collect data on students' expectations, interviews, surveys, analysis, systematization. Additionally, testing and case studies were utilized.

Testing and surveys were conducted using Google Forms. During the testing, communicative language skills such as oral and written expression were assessed. The tasks were based on physics-related assignments in English, covering topics such as astrophysics, magnetism, solar energy, physics experiments, and dark matter.

Results and discussion

The experiment, spanning one semester, was carefully planned with the aim of developing the communicative component of professional language competence in physics students through an integrative approach. The sessions were organized in accordance with the curriculum requirements, applying an integrative approach by immersing students in the professional context for the control group. Each week consisted of several academic hours during which students learned to apply oral and written communicative skills within a professional setting. Additionally, they carried out independent work through activities within Google Classroom. Activities include collaborative problem-solving sessions, role-playing scenarios, project-based learning addressing real-world physics challenges, practical experimentation with foreign language instructions, professional communication workshops, and self-reflection with language portfolios. Assessment criteria encompass contributions to group discussions, clarity of communication, project quality, effective presentation, understanding and application of physics concepts, improvement in formal writing and presentation skills, and depth of self-reflection. This comprehensive approach aims to uncover the complexity of forming language professional communicative competence in practical physics contexts. Participants from the experimental group completed following tasks:

Task 1: Explore and discuss astrophysics concepts in English

Activity: Group project on a selected astrophysics topic, with a presentation in English

Description: Students work in small groups to describe astrophysics concepts; use of the foreign language for discussing and presenting solutions; emphasis on effective communication of ideas and concepts. The assessment criteria are represented in the following table (Table 1):

Table 1 – Assessment criteria of the project work

Project Presentation	Points
Content relevance and accuracy	10
Clarity of communication in English	10
Effective collaboration within the group	10
Summary Report	
Concise summary of project findings	7
Clear integration of language and physics concepts	8

This task enhanced language proficiency, engaged students in teamwork project. The project reflected professional content within utilizing a foreign language. Students conducted research, created presentations and delivered findings in English. As it is known project work provides an opportunity to integrate language skills with the scientific content [9].

Task 2: Learn about solar energy concepts and terminology in English

Activity: Collaborative discussion on the role of solar energy in physics

Independent work: Write a persuasive essay on the importance of solar energy in physics research. The assessment criteria are represented in the following table (Table 2):

Table 2 – Assessment criteria of the collaborative discussion

Collaborative discussion	Points
Active participation in the discussion	10
Effective use of English in expressing ideas	10
Persuasive essay	
Well-structured essay with a clear thesis	7
Effective use of persuasive language in English	8

By implementing this activity the following aim was persecuted: develop communicative competence by engaging students in collaborative problem-solving sessions related to physics concepts using a foreign language. Students worked in small groups to discuss the role of solar energy in physics. They used English for discussing and presenting solutions.

Task 3: A role-play «Dark matter exploration»

Activity: Each student is assigned a specific role related to the study of dark matter, such as a physicist, researcher, skeptic and science journalist. Students research their roles and gather information on the topic, then, they prepare for a formal debate. The assessment criteria are represented in the following table (Table 3):

Table 3 – Assessment criteria of a role-play

A role-play performance	Points
Active participation and engagement in the debate	10
Clarity and effectiveness of communication in English during the debate	15
Depth and accuracy of information presented	20
Integration of scientific concept and terminology	15

The aim of the activity was to enhance language skills and professional communication by incorporating role-play relevant to physics context. Students could participate in various roles, therefore engaged in simulated professional interactions using English. This role-play approach not only encourages students to delve into the complexities of dark matter but also provides a dynamic and interactive way to explore different viewpoints within the scientific community. It emphasizes critical thinking, effective communication, and the application of knowledge summarizing their collective understanding of dark matter.

Task 4: Famous experiments in physics

Activity: Students choose three famous experiments in physics from different eras and subfields, gather information, analyze its significance, make conclusion and write an essay. The assessment criteria are represented in the following table (Table 4):

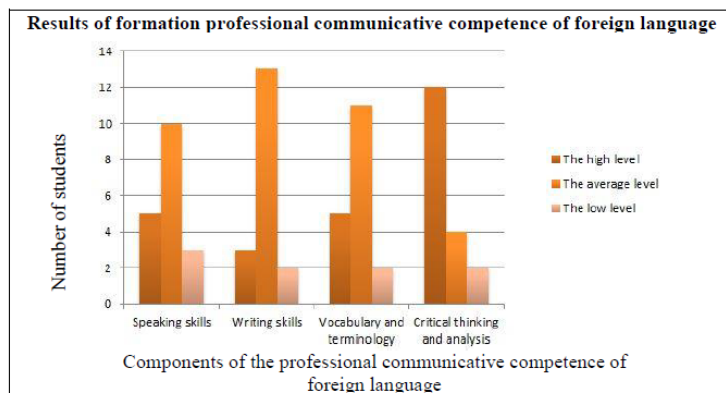
Table 4 – Assessment criteria of a written assignment

Written assignment	Points
Depth of the research and selection of diverse experiments	15
Clear analysis of the significance of each experiment	20
Reflection on the challenges and breakthroughs in experimental physics	15
Overall clarity, organization, and quality of writing	15
Creativity and original insights in presenting the information	10

The aims of the activity were to explore and analyze some of the most influential and groundbreaking experiments in the field of physics while enhancing English language proficiency. Understand the historical context, methodologies, and the impact these experiments had on shaping our understanding of the physical world, all while practicing effective communication in English. The assignment encouraged students to delve into the rich history of physics, critically analyze famous experiments, and develop a deeper appreciation for the role of experimentation in advancing scientific knowledge.

Throughout the semester-long experiment, we employed a multifaceted approach to foster the development of communicative professional competence in a foreign language among physics students. Activities such as collaborative problem-solving sessions, role-playing scenarios, project-based learning, practical experimentation, professional communication workshops, and self-reflection with language portfolios were designed to integrate language skills with physics concepts. Specifically, in the «Dark Matter Exploration» task, students engaged in a role-play debate and independently wrote research papers in English,

emphasizing effective communication and language use within a physics context. The culmination of these activities was reflected in a comprehensive test that assessed language proficiency, collaborative communication, and the application of language skills in physics-related scenarios.



Picture 1 – Results of formation professional communicative competence of foreign language

Diagram demonstrates the effectiveness of chosen activities which form professional communicative competence among the majority of participating students. Such components as speaking skills, writing skills, vocabulary and terminology, critical thinking and analysis were cultivated with the help of collaborative discussions, project-based learning, role-play and written assignments. While we proved the productiveness of them, it is essential to admit that students still face some difficulties. Some challenges include getting used to specific vocabulary and terminology used in physics, thinking deeply about physics concepts, as well as mastering collaborative speaking skills. Nevertheless, an integrated approach is highly efficient tool to achieve development of the foreign language skills [10].

Conclusion

The goal of the study was to identify the peculiarities of forming this competence, as well as to determine criteria for its development in practical sessions using a foreign language. It can be noted that the conducted experiment clearly demonstrates the effectiveness of using integrated approach for developing language professional competence in physics students. The findings revealed

that the use of special trainings, project work, role-playing games, and practical exercises significantly improved students' communicative skills in a professional context. The tasks proposed within the study covered various aspects of physics and allowed students to actively apply the acquired knowledge and skills in practice. Tasks related to discussing current concepts in astrophysics, studying solar energy terminology, role-playing in the «Dark Matter Exploration» theme, and analyzing famous experiments in physics proved to be especially beneficial among the others. However, applying of an integrated approach to teaching foreign language might be challenging for teachers [11]; overall, the research findings confirm that systematic use of such methods and tasks contributes to the effective development of language professional competence in future physicists, which may be crucial for their successful careers in global scientific community.

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«ФИЗИКА» МАМАНДЫҒЫНДА СТУДЕНТТЕРДІҢ ШЕТ ТІЛІНІҢ ҚАЭСІБИ ТІЛДІК ҚУЗЫРЕТТІЛІГІН ҚАЛЫПТАСТЫРУ

Ғылыми мақалада «Физика» мамандығы бойынша оқитын студенттердің кәсіби тілдік қузыреттілігін қалыптастыруда интегративті оқыту әдістемесінің тиімділігі қарастырылған. Зерттеудің мақсаты – лингвистикалық кәсіби коммуникативтік қузыреттілік компоненттерін анықтау, сондай-ақ шет тілін пайдалана отырып, практикалық сабақтарда осы қузыреттілі дамыту критерийлерін анықтау. Зерттеу мақсатына жету үшін Л. Н. Гумилев атындағы Еуразия Ұлттық университетінің базасында әдістемелік эксперимент жүргізілді. Мига шабуыл, жобалық оқыту, рөлдік модельдеу және жазбаша тапсармалар сияқты әртүрлі әдістерді пайдалана отырып, зерттеу ауызша

және жазбаша сауаттылықты, кәсіби терминологияны және сөздік қорды, сыни ойлау мен аналитикалық ойлауды қоса алғанда, белгілі бір тілдік дағдыларды дамытуға бағытталған. Қорытындалар физика білімінің мамандардырылған саласында жан-жақты тілдік құзыреттіліктерді дамытуға үлкен әсер ететін педагогикалық стратегиялар туралы құнды түсініктерді беруге бағытталған.

Кілтті сөздер: кәсіби тілдік құзыреттілік, тілдік дағдылар, интегративті тәсіл, физика студенттері, кәсіби контекст, коммуникация

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ФОРМИРОВАНИЕ ПРОФЕССИОНАЛЬНОЙ ЯЗЫКОВОЙ КОМПЕТЕНЦИИ ИНОСТРАННОГО ЯЗЫКА У СТУДЕНТОВ СПЕЦИАЛЬНОСТИ «ФИЗИКА»

Научная статья исследует эффективность интегративной методологии преподавания в формировании профессиональной языковой компетенции среди студентов, обучающихся по специальности «Физика». Цель исследования заключалась в выявлении особенностей формирования компонентов языковой профессиональной коммуникативной компетенции, а также в определении критериев развития этой компетенции на практических занятиях с использованием иностранного языка. Для достижения цели исследования был проведен методологический эксперимент на базе Евразийского национального университета имени Л. Н. Гумилева. Используя разнообразные методы, такие как коллективные обсуждения, обучение на основе проектов, ролевые симуляции и письменные задания, исследование фокусируется на развитии конкретных языковых навыков, включая устную и письменную грамотность, усвоение профессиональной терминологии и словарного запаса, а также на развитии критического мышления и аналитических способностей. Полученные результаты направлены

на предоставление ценных идей в области педагогических стратегий, которые оказывают наибольшее воздействие на формирование всесторонних языковых компетенций в специализированной области образования по физике.

Ключевые слова: профессиональная языковая компетенция, языковые навыки, интегративный подход, студенты физики, профессиональный контекст, коммуникация.

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