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# PECULIARITIES OF TEACHING FOREIGN LANGUAGES TO COMPUTER SPECIALTIES STUDENTS

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**Abstract.** The present study investigates the unique challenges and opportunities associated with teaching foreign languages to students pursuing computer specialties. Drawing upon a comprehensive review of world scientific literature, we explore the cognitive and linguistic peculiarities inherent in computer-related tasks and their implications for language education. Employing an analytical approach, we identify the distinctive characteristics of language acquisition within the context of computer science training.

Through a critical synthesis of prior research, we delineate the inadequacies of conventional language teaching methods in catering to the specific needs of computer science students. Furthermore, we propose a specialized instructional framework that integrates domain-specific terminologies and contextualized language learning techniques to enhance language proficiency among these learners.

Our findings underscore the necessity for a tailored pedagogical approach that aligns with the cognitive profiles of computer specialists, enabling effective cross-cultural communication and international collaboration. We conclude that optimizing foreign language instruction for computer specialties students holds paramount significance in fostering their linguistic competence and adaptability in an increasingly interconnected global landscape.

**Key words:** foreign languages proficiency, communication, computer science, teaching methods, learning strategy, curriculum, intercultural communication.

**Introduction.** In the rapidly evolving landscape of modern technology, the acquisition of foreign language proficiency has emerged as an indispensable skill for students pursuing computer specialties. As the global interconnectedness continues to intensify, proficiency in foreign languages has become an essential asset for computer professionals, facilitating effective communication, international collaboration, and access to a vast repository of knowledge. Consequently, the scientific community has dedicated substantial attention to exploring the distinctive challenges and opportunities encountered in training foreign languages tailored to students of computer science and related disciplines.

Through extensive investigation and scholarly discourse, the issue of imparting foreign language education to computer science students has garnered increasing interest in the world scientific literature. Research has shown that conventional language teaching methods, while effective for general language learners, may not align optimally with the distinct cognitive and linguistic requirements of computer specialists. The cognitive processes and linguistic demands inherent in computer-related tasks, such as programming and algorithmic reasoning, necessitate a nuanced and contextually tailored approach to language education. Furthermore, the integration of domain-specific terminologies and jargon encountered in computer science disciplines

requires a specialized instructional framework to facilitate comprehensive language competence among these students.

The article endeavors to shed light on the multifaceted characteristics of teaching foreign languages to computer specialties students, considering the extensive experience in this area. By meticulously analyzing existing studies, this research aims to discern the intricacies surrounding language acquisition in the context of computer science education. Moreover, it seeks to identify and propose novel instructional methodologies that are specifically designed to enhance language learning outcomes and cater to the unique cognitive profiles of computer science students. Ultimately, the overarching goal of our work is to contribute to the optimization of foreign language training, fostering the linguistic aptitude and cross-cultural communicative proficiency of computer specialists' next generation.

**Foreign Language Proficiency.** In the dynamically evolving realm of computer science, foreign language proficiency assumes paramount significance as an indispensable asset for students pursuing computer specialties. The ability to communicate effectively in a global context and access diverse knowledge repositories constitutes an integral facet of professional competence in this domain. Addressing this critical pedagogical concern, the current study seeks to investigate the peculiarities of teaching foreign languages to students of computer specialties, focusing on optimizing language education for this distinct cohort. As technology continues to connect people across borders, the ability to communicate and work effectively in foreign languages has become a valuable asset for individuals pursuing careers in computer science and related fields. However, teaching foreign languages to students specializing in computer specialties requires careful consideration of their unique needs and the specific challenges they face (Kugai, 2023: 125).

The purpose of the work is to discern the unique characteristics of language acquisition among computer science students and propose a specialized pedagogical approach that augments their linguistic proficiency.

To achieve this goal the following tasks were set:

• to conduct a comprehensive critical synthesis of existing literature on the issue, comprising academic articles, books, and reputable websites. The examination of prior research will serve as the foundational step in identifying the current state of knowledge, pinpointing gaps, and gaining insights into effective language teaching practices for computer science students;

• to employ an analytical approach for investigating the cognitive and linguistic peculiarities inherent in computer-related tasks and their influence on language learning outcomes. This analytical framework will facilitate a nuanced understanding of the factors that impact language acquisition processes for students of computer specialties.

To achieve the research objectives, an extensive literature review was conducted, encompassing peer-reviewed articles, monographs, and websites focusing on foreign languages training and computer science education. The critical synthesis involved a systematic examination of selected literature, analyzing and categorizing findings to identify key themes and trends. Subsequently, the analytical approach allowed for the identification of commonalities and disparities among studies, aiding in the generation of comprehensive insights into the challenges faced in teaching foreign languages to students of computer specialties.

The synthesis of the literature revealed a conspicuous dearth of studies exclusively focusing on language training tailored to computer science students, signifying a critical research gap in the field. However, several investigations highlighted the importance of incorporating domain-specific terminologies and contextualized language learning techniques to foster effective communication within computer science contexts (Lan et al., 2021).

Furthermore, the analytical examination exposed the incompatibility of conventional language teaching methods with the cognitive profiles of computer specialists. Computer science students

exhibited distinct cognitive patterns characterized by analytical thinking, problem-solving, and abstract reasoning, necessitating an innovative and adaptive approach to language instruction (Ellis et al., 2018).

As mentioned above, foreign language proficiency has become an increasingly vital skill for students pursuing computer specialties in the context of the ever-expanding globalized landscape. The paramount significance of linguistic competence for computer science students arises from a confluence of factors, including the widespread international collaboration, the need for effective cross-cultural communication, and the access to a diverse repository of knowledge and technological advancements.

*Facilitating Global Collaboration*. In the interconnected world of computer science, collaborative efforts with professionals from diverse cultural backgrounds have become the norm. Proficiency in foreign languages enables computer specialists to engage in international projects seamlessly, transcending linguistic barriers. As noted by Lan (2021), effective communication in foreign languages fosters a deeper understanding of diverse perspectives and methodologies, enhancing the collective problem-solving capabilities of interdisciplinary teams.

*Access to a Vast Knowledge Base*. The field of computer science is characterized by rapid advancements and continuous innovation. Valuable research papers, technical documents, and cutting-edge developments often originate from various linguistic communities. Proficient language skills enable students of computer specialties to access and comprehend these resources directly, avoiding potential inaccuracies that might arise from relying solely on translations (Ellis et al., 2018).

*Enhanced Adaptability in Multicultural Environments*. With multinational corporations and global startups spanning the computer industry, proficiency in foreign languages offers a competitive advantage to computer science graduates. It equips them with the ability to adapt and succeed in diverse multicultural work environments (Osadchyi et al., 2017:42). Cultivating cross-cultural competencies through language acquisition fosters sensitivity to cultural nuances and communication styles, promoting harmonious interactions in professional settings.

*Using Specialized Jargon and Terminology*. Computer science possesses a distinct lexicon of domain-specific terminologies and technical jargon. Integrating foreign language education tailored to the context of computer specialties allows students to master these specialized terminologies, thereby enhancing their precision and clarity in professional discourse.

*Cognitive Benefits*. The process of learning foreign languages can confer cognitive advantages to students pursuing computer specialties. According to a number of researchers, language acquisition stimulates cognitive functions such as memory, attention, and problem-solving abilities. These cognitive enhancements can contribute to the overall cognitive flexibility and adaptability of computer science students.

So, the acquisition of foreign language proficiency represents an indispensable facet of education for students of computer specialties. By facilitating global collaboration, providing access to diverse knowledge repositories, fostering adaptability in multicultural settings, and using domain-specific terminologies, linguistic competence empowers computer science graduates to navigate the complexities of a rapidly globalizing industry. Moreover, the cognitive benefits arising from language acquisition further underscore the value of foreign language education in nurturing well-rounded and capable professionals within the realm of computer specialties.

**Challenges and Difficulties.** The endeavor to impart foreign language education to students of computer specialties entails a set of distinctive challenges, arising from the intersection of linguistic instruction and the cognitive demands inherent in computer science disciplines. These unique peculiarities underscore the necessity for specialized pedagogical approaches that effectively address the difficulties encountered during the language learning process. In our opinion, it is appropriate to mention the following challenges.

• *Cognitive Overload and Analytical Thinking*

Computer science students are often characterized by their advanced analytical thinking and problem-solving abilities, attributes that may inadvertently impact the language learning process. As a consequence, traditional language teaching methods may not resonate optimally with the cognitive profiles of these students (Sabitzer, 2012:2034). This cognitive overload can impede their ability to process and retain language concepts, resulting in potential frustration and decreased motivation.

• *Technical Jargon and Domain-Specific Terminology*

Computer science is replete with domain-specific terminologies and technical jargon, rendering the acquisition of relevant foreign language vocabulary particularly challenging. The accurate assimilation and utilization of such specialized language are essential for effective communication within the field. Conventional language instruction may struggle to adequately address the intricacies of this specialized lexicon, necessitating an innovative approach that seamlessly integrates domain-specific terminology into language education.

• *Time Constraints and Intensive Curriculum*

Computer science programs are often intensive and time-constrained, leaving limited room for extensive language learning. The need to balance the acquisition of both technical and linguistic competencies places additional pressure on students and educators alike (Holub, 2015). As a result, language courses tailored to computer specialties must be efficiently designed to optimize learning outcomes within the constraints of a demanding academic curriculum.

• *Abstract Concepts and Concrete Expression*

Computer science concepts often deal with abstract and complex ideas that can be challenging to articulate in a foreign language. The translation of intricate algorithms, programming paradigms, and computational processes demands linguistic proficiency that aligns with the nuanced demands of computer science disciplines (Ellis et al., 2018). Facilitating the transfer of such abstract concepts into concrete expressions necessitates specialized language teaching strategies that cater to the unique nature of computer science knowledge.

• *Limited Exposure to Cultural Contexts*

Due to the highly technical nature of computer science education, students may have limited exposure to the cultural contexts relevant to their target foreign language. Proficiency in a language involves more than just grammatical knowledge. It necessitates cultural awareness and the ability to navigate diverse social settings (Lan et al., 2021). Consequently, language educators must integrate cultural components into the curriculum, fostering cross-cultural competence in students to facilitate effective intercultural communication.

We can conclude that the peculiarities of teaching foreign languages to computer specialties students stem from the cognitive demands of the discipline, the intricacies of domain-specific terminologies, the constraints of a packed curriculum, and the need to bridge the gap between abstract concepts and concrete expression. Addressing these challenges requires innovative pedagogical approaches that align with the cognitive profiles of computer science students, seamlessly incorporate technical jargon, and foster cross-cultural competencies. By recognizing and proactively engaging with these peculiarities, educators can optimize language learning outcomes and empower computer science students to effectively communicate and collaborate in a diverse and interconnected world.

**Methods of teaching.** In light of the unique characteristics of language acquisition among computer science students, devising a specialized pedagogical approach is paramount to enhance their linguistic proficiency effectively. Soft skills empower students to actively and purposefully engage in all the choices that impact their personal lives and future career accomplishments (Malykhin et al., 2021:255). Several innovative methods and techniques can be employed to cater to the cognitive demands and domain-specific linguistic requirements of this distinct group.

• *Contextualized Language Learning*

Contextualized language learning is an essential technique that integrates domain-specific terminologies and real-world computer science scenarios into the language curriculum. By contextualizing language tasks within the realm of computer specialties, students are encouraged to develop linguistic skills that directly align with their academic and professional pursuits (Lan et al., 2021). For instance, language exercises can involve code annotations, algorithm descriptions, and software documentation to ensure relevance and applicability.

• *Gamification and Language Apps*

Computer games have a significant developmental effect in the training of specialists. Gamification is the process of using game thinking and game dynamics to engage the audience and solve the tasks, turning something into a game (Malykhin et al., 2020:48).

Applying gamification elements in language instruction can prove highly effective for computer science students, who often possess an affinity for technology-based learning. The use of gamification in the educational process makes it possible, firstly, to build a developmental educational environment that positively affects students personal development, and secondly, to ensure their successful socialization and development of social skills (Aristova et al., 2023:202).

Gamified language apps and software create an engaging learning environment, where students can earn rewards and achieve milestones as they progress through language modules. Popular language learning apps such as Duolingo and Memrise offer gamified features that can be harnessed to make language learning enjoyable and interactive.

• *Task-Based Language Teaching (TBLT)*

Task-Based Language Teaching centers on engaging students in real-life language tasks, simulating authentic language use scenarios. For computer science students, TBLT can involve completing programming projects, collaborating on software development in foreign languages, or participating in code reviews and technical discussions (Sabitzer, 2012:2038). These tasks not only foster language acquisition but also align with their core academic pursuits, making the learning process more purposeful.

• *Content and Language Integrated Learning (CLIL)*

Content and Language Integrated Learning is an approach that integrates language instruction with subject-specific content, creating a seamless fusion of language learning and computer science education. This method involves teaching computer science concepts in the target foreign language, allowing students to assimilate linguistic knowledge while deepening their understanding of core computer science principles (Holub, 2015). For instance, a programming class can be conducted entirely in the foreign language, immersing students in both language and technical content simultaneously.

• *Cross-Cultural Communication Training*

Given the globalized nature of computer science, training in cross-cultural communication is essential for students to effectively collaborate with international peers. Language educators can organize intercultural exchanges, virtual team projects, and cross-cultural workshops to enhance students' cultural awareness and communication skills. Such initiatives empower computer science students to navigate diverse cultural contexts and facilitate seamless international collaboration.

• *Language Learning Support Tools*

Various language learning support tools can aid computer science students in their language acquisition journey. Natural language processing (NLP) tools and machine learning algorithms can be employed to analyze students' linguistic strengths and weaknesses, enabling personalized feedback and tailored language exercises (Lan et al., 2021). Additionally, virtual language tutors and conversational chatbots can offer individualized language practice and boost students' conversational skills.

Thus, the methods of teaching foreign languages to students of computer specialties should be thoughtfully designed to accommodate their cognitive profiles and domain-specific linguistic

demands. Contextualized language learning, gamification, task-based language teaching, content and language integrated learning, cross-cultural communication training, and language learning support tools exemplify the innovative approaches that can foster linguistic proficiency while aligning with their computer science pursuits. By embracing these methods, language educators can empower computer science students to effectively communicate and collaborate across linguistic and cultural boundaries, laying the groundwork for successful integration into the globalized landscape of modern technology.

**Learning Strategies.** The pursuit of foreign language proficiency among students of computer specialties necessitates the formulation of personalized learning strategies tailored to their distinctive cognitive profiles and domain-specific linguistic requirements. As the pedagogy of teaching foreign languages to this group embraces specialized approaches, students, too, must actively engage in crafting effective strategies to optimize their language learning outcomes. In our study we have considered the following strategies.

• *Utilizing Technical Analogies*

Computer science students are adept at grasping technical concepts and utilizing analogies to facilitate comprehension. In the context of foreign language learning, using technical analogies can prove advantageous in relating linguistic structures to familiar computational patterns. For instance, equating grammatical rules with conditional statements in programming can aid students in memorization and application.

• *Incorporating Technology-Based Resources*

The successful use of computer technologies and obtaining productive learning results with their help increases the future specialist's confidence in the ability to plan complex professional tasks, as well as ensures business orientation and accuracy, which can be transferred to other fields of activity. A student from a subject of training turns into a subject of professional activity. This is due to the fact that the computer becomes an integral tool of the graduate's work in the future professional activity (Malyhkin et al., 2020:46). Given their affinity for technology, computer science students can use digital resources and language learning apps to enhance their language skills. Utilizing spaced repetition systems and flashcards can promote efficient vocabulary retention, while voice recognition technology enables interactive speaking practice (Ellis et al., 2018). Incorporating technology-based language resources aligns with their learning preferences and fosters a more engaged language learning experience.

• *Code Annotation in Foreign Language*

Incorporating foreign language annotation in code comments and documentation can serve as a dual-purpose approach for computer science students. By annotating code in the target language, students practice language application while simultaneously reinforcing their programming skills. This strategy bridges the gap between language learning and computer science education, creating a symbiotic relationship that bolsters proficiency in both domains.

• *Immersion through Technical Content*

Students of computer specialties can immerse themselves in foreign language learning by engaging with technical content in the target language. Reading programming tutorials, coding documentation, and research papers in the foreign language exposes students to domain-specific terminologies while honing their reading comprehension. This immersion approach intertwines language acquisition with the subject matter, rendering learning both purposeful and rewarding.

• *Participating in Language-Based Projects*

Collaborating on language-based projects that involve coding and language application provides students with practical language practice and fosters a sense of purpose in their language learning journey. Projects such as localization of software, developing multilingual websites, or contributing to open-source projects in foreign languages encourage active language use within the context of computer specialties (Lan et al., 2021).

• *Cross-Cultural Exchanges*

The cross-cultural dimension in teaching foreign languages pursues not only a pragmatic goal (to provide students with the necessary means for speech interaction with native speakers), but also a developing and general educational goal. Learning a foreign language means entering an unfamiliar world, becoming open to something new, experiencing a cultural community with native speakers, and giving communication a special fullness and multidimensionality (Postryhan, 2016:114).

Actively engaging in cross-cultural exchanges with native speakers of the target language allows computer science students to refine their language skills while gaining insight into diverse cultural norms. Virtual language exchanges, cultural exchange programs, and online language communities provide platforms for interactive language practice and intercultural communication.

The strategies of learning foreign languages by students of computer specialties entail a personalized and dynamic approach that aligns with their cognitive dispositions and domain-specific linguistic needs. Applying technical analogies, incorporating technology-based resources, code annotation in foreign languages, immersion through technical content, participating in language-based projects, and embracing cross-cultural exchanges constitute effective strategies that optimize language acquisition while fostering a meaningful integration of language and computer science disciplines. By actively engaging in these strategies, students of computer specialties can augment their linguistic proficiency, enhancing their communicative competence and empowering their success in an increasingly interconnected global landscape.

**Conclusions.** The present study has explored the distinct challenges and opportunities faced when teaching foreign languages to students pursuing computer specialties. Through a thorough review of the world scientific literature, we have explored the cognitive and linguistic peculiarities inherent in computer-related tasks, and their implications for language training. Adopting an analytical approach, we have identified the unique characteristics of language acquisition within the context of computer science training.

Our critical synthesis of prior research exposed the inadequacies of conventional language teaching methods in catering to the specific needs of computer science students. This highlighted the necessity for a tailored pedagogical approach that aligns with the cognitive profiles of computer specialists, to enable effective cross-cultural communication and international collaboration. Therefore, we proposed a specialized instructional framework that integrates domain-specific terminologies and contextualized language learning techniques, aiming to enhance language proficiency among these learners.

The importance of foreign language proficiency for students of computer specialties cannot be overstated. As the field of computer science continues to expand globally, linguistic competence has become a vital asset, enabling effective collaboration, access to diverse knowledge, and adaptability in multicultural settings. Our study has emphasized the significance of optimizing foreign language instruction for computer science students to foster their linguistic competence and enrich their potential in an interconnected world.

Teaching foreign languages to computer specialties students presents several challenges. Their advanced analytical thinking and problem-solving abilities can lead to cognitive overload when faced with traditional language teaching methods. Additionally, the presence of technical jargon and domain-specific terminology demands an innovative approach to language instruction. Moreover, the time constraints and intensive curriculum of computer science programs require efficient language courses that align with their academic pursuits. The transfer of abstract concepts into concrete expression and limited exposure to cultural contexts further complicate the language learning process.

To overcome these challenges, we have outlined a range of strategies that students of computer specialties can adopt to optimize their language learning experience. Utilizing technical analogies, incorporating technology-based resources, code annotation in foreign languages, immersion through

technical content, participating in language-based projects, and embracing cross-cultural exchanges constitute effective approaches to enhance linguistic proficiency while complementing computer science education.

In view of the above it can be concluded that teaching foreign languages to students of computer specialties requires a purposeful, tailored, and innovative pedagogical approach. By recognizing the unique cognitive and linguistic characteristics of computer science students, educators can bridge the gap between language learning and computer specialties, fostering effective cross-cultural communication and equipping them with valuable skills for success in a globalized world. As the demand for multilingual computer specialists grows, our findings underscore the importance of cultivating linguistic competence to empower the next generation of computer science professionals.

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