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INNOVATIVE TECHNOLOGIES FOR DEVELOPING STUDENTS' CRITICAL THINKING SKILLS THROUGH CORPUS ANALYSIS TOOLS

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Abstract

Critical thinking is widely recognized as a key competence in higher education and an essential skill for students preparing for professional activity in technology-oriented fields. In recent years, corpus linguistics and corpus analysis tools have been increasingly integrated into language education as innovative pedagogical technologies. This article explores the potential of corpus analysis tools as a means of developing students' critical thinking skills in the process of foreign language learning. The study focuses on the use of data-driven learning tasks that encourage learners to analyse authentic language data, identify patterns, formulate hypotheses, and draw evidence-based conclusions. The findings suggest that corpus-based instruction not only enhances linguistic competence but also fosters analytical reasoning, learner autonomy, and reflective thinking. The article argues that corpus analysis tools represent an effective innovative technology for promoting critical thinking in higher education.

Key words

corpus linguistics, corpus analysis tools, critical thinking skills, innovative technologies, data-driven learning, teaching English as a foreign language.

The rapid development of information and communication technologies has significantly transformed modern education and placed new demands on higher education graduates. Among these demands, critical thinking has emerged as one of the most important transversal skills required for academic success and professional competence. In the context of foreign language education, developing

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students' critical thinking skills requires instructional approaches that go beyond memorization and reproduction of linguistic material.

Corpus linguistics, which is based on the analysis of large collections of authentic texts, offers new opportunities for implementing innovative teaching technologies. Corpus analysis tools allow students to explore real language use, observe patterns, and verify assumptions through empirical evidence. Therefore, integrating corpus-based approaches into language teaching can contribute not only to language acquisition but also to the development of higher-order thinking skills.

The purpose of this article is to examine innovative technologies for developing students' critical thinking skills through the use of corpus analysis tools and to justify their teaching value in higher education.

Corpus-based learning is grounded in the principles of learner-centred and inquiry-based education, which are particularly relevant for students of information and communication technologies (ICT). ICT students are accustomed to working with data, algorithms, and problem-solving tasks; therefore, corpus analysis aligns naturally with their cognitive and professional profiles. Instead of passively receiving linguistic rules, learners engage in exploratory activities similar to data analysis in their core disciplines.

Corpus analysis tasks require students to formulate research questions, such as identifying typical collocations in technical documentation, analysing the frequency of domain-specific terminology, or comparing language use across different ICT-related genres (e.g., software manuals, technical blogs, and academic articles). Through concordance lines and frequency lists, students observe patterns, test hypotheses, and revise assumptions based on empirical evidence. These processes directly support key components of critical thinking, including analysis, evaluation, and logical reasoning.

Innovative technologies in corpus-based instruction include the use of online corpora, concordance, keyword analysis tools, and collocation extractors. For ICT students, such tools are especially effective when applied to professionally oriented content. By analysing authentic ICT texts, learners develop both language competence and professional literacy, learning how terminology functions in real communicative contexts.

When ICT students query the noun system in the NOW corpora using a concordance, they observe the following typical concordance lines:

-the operating system was upgraded last year

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-a computer system designed for data processing
-the system failed due to a software error
-a secure system for managing information

Students identify frequent verb–noun and adjective–noun patterns (upgrade a system, secure system, system fails). This leads them to conclude—based on evidence—that system is commonly used in evaluative and process-oriented technical contexts, supporting analytical reasoning rather than memorisation.

Using NOW corpora collocation extraction tool, students analyse the noun data. The most frequent collocates include:

-data processing
-data storage
-data analysis
-data transmission
-data security

Sample NOW concordance lines:

-the data processing unit handles large volumes
-secure data storage is essential for organisations
-the data analysis revealed significant trends

Students critically compare these authentic combinations with incorrect or non-native-like alternatives and justify their conclusions using corpus frequency and contextual evidence.

When ICT-related texts are compared with general prose in the NOW, the following keywords emerge:

-software
-network
-digital
-database

Example concordance lines:

-the software was developed for network security
-a digital system for information exchange
-the database stores user credentials

Students interpret why these items are statistically prominent and explain their communicative function in technical discourse, demonstrating evidence-based evaluation.

NOW concordance searches allow students to distinguish between near-synonymous verbs:

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install
-install the software on the local machine
-install a new operating system
deploy
-deploy the application on a server
-deploy network resources efficiently
implement
-implement a security solution
-implement a new system design
Students conclude that:
-install → physical or local setup
-deploy → system-wide or network-level action
-implement → abstract or procedural processes
By working with real NOW corpora data, ICT students:
-analyse authentic professional language,
-form hypotheses based on observable patterns,
-justify linguistic decisions using empirical evidence.

This confirms that corpus-based instruction functions as an innovative technology that simultaneously develops language competence, professional literacy, and critical thinking skills.

Furthermore, corpus-based tasks encourage collaborative learning and peer discussion. When ICT students compare findings, justify interpretations, and evaluate alternative explanations, they practice argumentation and evidence-based reasoning. This interactive dimension not only strengthens critical thinking skills but also mirrors professional practices in the ICT field, where teamwork and analytical decision-making are essential.The methodological framework of this study combines elements of pedagogical experimentation and qualitative analysis. The research was conducted with undergraduate ICT students studying English for specific purposes at a higher education institution. The participants were divided into an experimental group and a control group. While both groups followed the same syllabus, the experimental group received instruction based on corpus analysis tools, whereas the control group was taught using traditional textbook-based methods.

During the experimental period, which lasted six weeks, the experimental group completed a series of data-driven learning tasks based on real corpus data. For example, students worked with concordance lines extracted from large English corpora containing ICT-related texts. One task required learners to analyse the

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collocation patterns of the noun data by examining frequent combinations such as data processing, data storage, data transmission, and data security. Using concordance tools, students identified typical verb–noun and adjective–noun patterns and discussed why certain combinations are preferred in professional ICT discourse.

Another task focused on comparing near-synonymous verbs commonly used in technical contexts, such as deploy, install, and implement. Students searched the corpus for each verb, analysed their surrounding contexts, and formulated conclusions about differences in usage based on frequency, grammatical patterns, and collocational behaviour. This activity required learners to interpret evidence, reject incorrect generalisations, and support their claims with corpus examples.

In addition, students analysed short excerpts from different ICT genres, including software documentation and technical blog posts. By comparing concordance lines across genres, they identified variations in formality, terminology density, and phraseological patterns. Students worked independently and in small groups, documenting their observations and providing justifications for their conclusions based on corpus evidence.

Data collection methods included classroom observation, analysis of students' written tasks, and pre- and post-instruction assessments. The assessments were designed to measure not only linguistic improvement but also indicators of critical thinking development, such as the ability to formulate hypotheses, interpret linguistic data, evaluate evidence, and articulate reasoned conclusions. Comparative analysis of the results demonstrated noticeable improvement in the experimental group, particularly in analytical reasoning and reflective thinking skills.

The analysis of students' performance demonstrated clear differences between the experimental and control groups. ICT students who worked with corpus analysis tools showed improved ability to interpret linguistic data and justify their conclusions with evidence.

For example, in a post-test task on ICT collocations, students in the experimental group correctly identified and explained typical combinations such as deploy an application, configure a network, and ensure data security. When asked to justify their answers, they referred to corpus frequency and concordance evidence, noting that these combinations occurred repeatedly in authentic technical texts. In contrast, students in the control group often relied on literal translation or intuition and provided limited explanations.

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Another result was observed in tasks involving near-synonymous verbs. After corpus-based instruction, experimental-group students successfully distinguished between install (used mainly with software or hardware on a local system), deploy (frequently used in server-side and cloud contexts), and implement (associated with abstract processes or solutions). Their explanations were supported by corpus examples and genre-specific usage patterns.

The results indicate that corpus-based instruction has a positive impact on the development of ICT students' critical thinking skills. Working with authentic corpus data encouraged learners to analyse information systematically, evaluate alternative interpretations, and make decisions based on empirical evidence. These skills closely correspond to the analytical practices required in ICT-related professional activities.

The findings also confirm that corpus analysis tools are particularly effective for ICT students because they resemble data analysis processes familiar from their major subjects. As a result, students demonstrated higher engagement and greater autonomy in learning. Corpus-driven tasks transformed language learning into an investigative process, reinforcing both linguistic competence and higher-order thinking skills.

The study confirms that corpus analysis tools function as innovative educational technologies for developing students' critical thinking skills in foreign language instruction. Clear examples from ICT-oriented corpora demonstrate that data-driven learning tasks promote analytical reasoning, hypothesis testing, and evidence-based decision-making.Integrating corpus-based methods into the curriculum of ICT students enhances not only language proficiency but also essential professional and cognitive skills. Therefore, corpus analysis tools can be recommended as an effective methodological approach within the IMRAD framework for research and practice in higher education.

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