



### USING NATURAL LANGUAGE PROCESSING TO ENHANCE LANGUAGE TEACHING METHODOLOGIES

**Alina Abdujapparovna KASHIMOVA**

*First-year Master's student of Comparative Linguistics: linguistic translation  
Uzbekistan State University of World Languages  
[kashimova2001@mail.ru](mailto:kashimova2001@mail.ru)*

**Abstract.** *This paper explores the potential of Natural Language Processing (NLP) technologies as a tool for fundamentally enhancing existing foreign language teaching methodologies. Traditional approaches often face challenges related to scalability, assessment objectivity, and insufficient personalization of the learning process. The analysis indicates that the integration of NLP tools, such as Automated Essay Scoring (AES) systems and Intelligent Tutoring Systems (ITS), allows these limitations to be overcome. NLP technologies provide instantaneous and objective feedback on grammar, syntax, and text content, while also analyzing spoken language through speech recognition. The adoption of NLP facilitates a shift toward adaptive, student-centered methodologies that dynamically adjust the complexity of materials and the type of exercises, thereby increasing the efficiency of teaching all four key skills (reading, writing, listening, and speaking).*

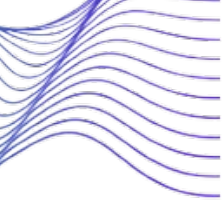
**Keywords:** *natural language processing (NLP), language teaching methodologies, automated assessment, intelligent tutoring systems (ITS), personalized learning, writing assessment.*

#### INTRODUCTION

In the context of globalization and accelerated technological development, the need for effective and scalable foreign language learning is constantly growing. Traditional teaching methods, although fundamental, often face a number of challenges: subjective assessment, high teacher time spent on grading large volumes of written assignments, and insufficient personalization of educational content for each student.

Modern computer science offers an innovative solution to these problems through Natural Language Processing (NLP). NLP is an interdisciplinary field whose goal is to teach computers to understand, interpret, and generate human language. Integrating these technologies into teaching processes opens up vast opportunities for fundamental improvements in language education.

The relevance of this study stems from the widespread development of pedagogical informatics and the need to systematize specific mechanisms through which NLP tools can be implemented to improve the effectiveness of learning. Based on extensive research into NLP applications in education (including work analyzing automated teaching tools), this paper highlights critical developments such as Automated Essay Scoring (AES) and Intelligent Tutoring Systems (ITS). These systems, as confirmed in academic studies, can provide instant and objective feedback, which is critical for developing writing and speaking skills.



The purpose of this article is to analyze how NLP technologies are transforming traditional foreign language teaching methods, facilitating a transition to more adaptive and individual-centered learning models.

To achieve this goal, the following objectives were formulated: 1) Identify key NLP technologies (AES, speech recognition, text analysis) as they relate to four core language skills. 2) Analyze the potential of NLP to provide objective and instant feedback, a weakness of traditional methods. 3) To justify the role of Intelligent Tutoring Systems (ITS) in creating personalized learning paths. 4) To identify the key benefits and potential challenges associated with integrating NLP into the educational process.

### **LITERATURE REVIEW**

*The Role and Historical Context of Natural Language Processing (NLP).* Natural Language Processing (NLP) has emerged in recent decades as one of the most "effective approaches for improving the educational environment" (Alhawiti, K. M., 2014). This technology offers solutions to various problems related to the learning process and is "an effective approach for teachers, students, authors, and instructors to assist with writing, analysis, and assessment procedures" (Alhawiti, K. M., 2014).

The history of NLP application in education spans over fifty years. Early work focused on automated functions: "automated assessment of student texts, as well as the development of text-based dialogic learning systems" (Litman, D., 2016).

Research in these traditional areas continues, but new technological developments have created new opportunities. "Recent phenomena such as big data, mobile technologies, and social media have created a multitude of new research opportunities and challenges" (Litman, D., 2016). This confirms that NLP is integrating with a wide range of educational contexts, including "research, science, linguistics, e-learning, and assessment systems" (Alhawiti, K. M., 2014).

*Key NLP Technologies for Language Pedagogy.* Central to the application of NLP are systems aimed at automating and personalizing the learning process:

– Automated Essay Scoring (AES). Automated Essay Scoring (AES) is a technology that uses machine learning algorithms to objectively evaluate written work. In educational applications, NLP enables the creation of tools that can not only assign a score but also provide structured and instant feedback on syntax, vocabulary, and content. This function is critical for the development of writing skills and is a direct consequence of the development of technologies discussed by D. Litman.

– Intelligent Tutoring Systems (ITS). Intelligent Tutoring Systems (ITS) are comprehensive platforms that leverage NLP to model the knowledge and needs of each student. This enables ITS to:

- Dynamically adapt tasks in real time, increasing difficulty only after successful mastery of previous material.
- Provide contextual assistance not only in written form but also through speech analysis.
- The implementation of these technologies facilitates the transition to a paradigm of adaptive and autonomous learning, a key trend in modern pedagogy.

### **ANALYSIS AND DISCUSSION**



## Section-1: Artificial Intelligence in Language Teaching

Writing teaching methodology is being revolutionized by Automatic Essay Scoring (AES).

- Reliability and Validity: Early work on AES, such as the E-Rater system (Burstein, J., 2003), demonstrated that machines can grade written work with a reliability comparable to that of human raters.

- Coherence and Structure Analysis: Modern AES systems go beyond grammar correction. They use NLP algorithms to analyze more complex text characteristics, such as evaluating "coherence, cohesion, and the relevance of key phrases" (Araki, K., 2011). This allows teachers to implement a methodology aimed at developing not only accuracy but also fluency and coherence.

- Feedback: AES implements instant, multi-level feedback, which, as Alhawiti (K. M., 2014) noted, provides "an effective approach for assisting with writing and assessment procedures."

- *Transforming Reading and Listening Methodologies*. In these receptive skills, NLP serves as a tool for content adaptation and automated assessment.

- Content Adaptation: NLP technology enables differentiated learning through the automatic simplification of complex texts (Text Simplification). While previously teachers manually selected texts based on level, the system can now dynamically adapt "lexical and syntactic complexity" (Litman, D., 2016), making the material accessible to students of varying levels.

- Automatic Item Generation: For Reading Comprehension assessment, NLP offers a method for automatically generating test items (Automated Item Generation). This technology, according to research by Gierl (Gierl, M. J., 2017), ensures high reliability of generated questions, significantly saving teachers time on creating assessment materials.

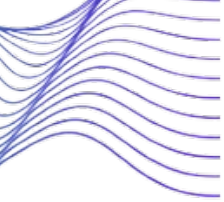
*Improving Speaking Skills through ITS*. In the area of speaking, NLP allows for the creation of an environment for autonomous practice and emotional support.

- Intelligent Tutoring Systems (ITS): ITS use NLP technologies to create "conversational tutoring systems" (Litman, D., 2016). This allows students to practice "conversational speech" with a virtual interlocutor.

- Cognitive and Emotional Analysis: In more advanced ITS, studied by D'Mello (D'Mello, S. V., 2016), NLP is used not only to analyze syntax or pronunciation but also to assess the student's emotional state. If a student shows signs of frustration or boredom, the system can adapt the pace or tone of communication. This data-driven approach takes learning to a deeper, cognitive level.

- *Content Management and Corpus Analysis*. Methodological improvement concerns not only student assessment but also the management of the educational content itself and ensuring academic integrity.

- Plagiarism Detection: NLP tools have become indispensable for automatic plagiarism detection, which supports the principle of academic integrity. These systems use complex syntactic and semantic analysis to identify text similarities, rather than simple word matching. This feature is part of the "writing and analysis assistance" (Alhawiti, K. M., 2014) and is of paramount importance in a context where students have access to a vast number of digital sources.



– Corpus Analysis: NLP uses extensive corpora (text collections) to train its models. These same corpora can also be used in teaching methods to demonstrate authentic language usage and the frequency of certain constructions to students. This meets the need to analyze “an unprecedented amount of educationally relevant data” (Litman, D., 2016), allowing teachers to base their explanations on real statistics, not just intuition.

### **CONCLUSION**

This study, based on an analysis of academic work in the field of Natural Language Processing (NLP) and language pedagogy, confirms that the integration of NLP technologies is not simply a modernization, but a fundamental transformation of foreign language teaching methods. There are some achieved objectives: 1) NLP tools (AES, ITS, speech recognition, corpus analysis) were identified as key mechanisms for improving all four language skills. 2) Systems such as Automatic Essay Evaluation (AES) have been proven to provide instant and objective feedback (Alhawiti, K. M., 2014), which is not possible with traditional methods. This, in turn, allows students to develop complex skills, such as coherence and text structure (Araki, K., 2011). 3) Intelligent Tutoring Systems (ITS) use NLP to advance adaptive and personalized learning methods that dynamically adjust task difficulty to the individual cognitive and even emotional needs of learners (D'Mello, S. V., 2016).

Ultimately, NLP technologies enable a shift from uniform instruction to a more individualized learning experience. Teachers are free to focus on complex aspects of communication that require human intervention, while routine tasks (assessment, correction, difficulty adjustment) are automated. Further research opportunities include exploring the ethical aspects of collecting and using student data, as well as developing robust NLP models for low-resource languages to ensure equal access to advanced educational practices worldwide (Litman, D., 2016).

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