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Application of chatbots based on NLP technology for more effective learning of foreign languages, using English as an example

The paper describes the working principle of chatbots based on Natural Language Processing (NLP) technology. It describes the mechanisms of chatbots' understanding of user requests, evaluation of user's foreign language proficiency level, as well as the mechanism of introducing chatbots into the curriculum for group and individual student's work.

Key words: Artificial Intelligence; chatbot; language level; Natural Language Processing; technology.

Today, virtually no one who has observed artificial intelligence (AI) at work in any of its manifestations has any doubt about the ever-increasing effectiveness of computer intelligence. There are many definitions of AI considering the field of its use, but they all boil down to one: AI is such an artificially created system that imitates human intellectual and creative activity.

Natural Language Processing (NLP) technology is a branch of computer science and AI that uses machine learning to enable computers to understand and communicate in human language. Recall that machine learning is the ability by which a computer draws conclusions using insights it has gained from examining large amounts of data, rather than programmed instructions.

Nowadays, the most well-known chatbot technology is NLP technology. A chatbot is a special program that emulates communication with the user. Since the active use of the technology by the general masses as chatbots, chatbots show high efficiency. The effectiveness of chatbots is shown by the finances involved in their use/development. The global chatbot market size was valued at \$5.1 billion in 2022 and \$6.3 billion in 2023. Worldwide retail spending on chatbots is set to soar from \$12 billion in 2023 to \$72 billion by 2028 [6].

Most of the best known chatbots and virtual assistants are based on NLP technology. Among them: Siri (Apple), Alexa (Amazon), Google assistant, ChatGPT, etc. To better understand why chatbots developed this way is so effective, let's briefly look at how it works. This is the technology that explains the growing effectiveness and popularity of chatbots using NLP. There are several mechanisms NLP technology based on:

- 1) Attention mechanism. This mechanism allows the computer to analyze words in order to find keywords among them. This is necessary to find the most relevant information in the text that the computer receives [6];

- 2) Transformer architecture. Allows the computer to simultaneously consider the context of each word in a given text. The transformer consists of an encoder and a decoder. The encoder takes in the input text, converts the words of the text into a set of vectors. Each vector contains the context of a separate word of the source text. The decoder accepts the encoder data and generates a response [3];

- 3) Status storage helps to track current context of dialogue;

- 4) Contextual embedding helps to put words at final answer in the most logical order.

In order to demonstrate an ability to determine user's personal language level by chatbots, the following experiment was conducted.

The experiment is as follows: to determine the English proficiency level of the examinee using traditional methods and afterwards using chatbots based on NLP technology. In this case, the obligatory condition is the need for chatbots to generate their own tests independently, without using or borrowing ready-made variants. If the language level defined by a chatbot corresponds to the level defined in the traditional way, chatbots are able to adequately analyze the capabilities of an individual user. In addition, if there is a match, the chatbots will also be able to help with problematic topics based on the individual user's mistakes and context.

Several tests were taken to assess the general level of English. Three assessment ones from the most famous websites were taken as a basis. Namely, the official website of Cambridge University Press & Assessment, the official website of The United Kingdom’s international organization for cultural relations and educational opportunities (British Council), the official website of the EF Standard English Test (EF SET) assessment. After that, chatbots based on NLP technology were used to estimate the level of English. The chatbots were given the following conditions to generate tests [1]:

- To generate a test to check the level of English language proficiency according to the European system (CEFR);
- The chatbot should generate the questions itself, rather than offering ready-made tests from the Internet;
- The complexity of the questions of the questions varies;
- The test includes grammar and vocabulary check.

ChatGPT-4o (OpenAI) and Gemini (Google AI) chatbots participated in the experiment. After taking a test created by them, the estimated English level is B2 (Fig.). The same result was shown by the tests taken on the mentioned above platforms.

Here's the table of scores and corresponding CEFR levels applicable to this test:

Score (out of 20)	CEFR Level	Level Description
0-4	A1 (Beginner)	Basic level, minimal knowledge.
5-7	A2 (Elementary)	Basic knowledge for simple situations.
8-10	B1 (Intermediate)	Intermediate level, understanding of basic aspects of the language.
11-13	B1+ (Intermediate+)	Upper-intermediate, confident language skills.
14-16	B2 (Upper-Intermediate)	Above-average level, good command of the language.
17-18	C1 (Advanced)	Advanced level, fluent in complex aspects of the language.
19-20	C2 (Proficient)	Near-native proficiency, complete understanding.

Your score of 16 corresponds to the **B2 (Upper-Intermediate)** level, indicating strong language skills that allow for effective communication on various topics and the use of complex structures.

Fig. The result gained from ChatGPT-4o

In this way, the chatbots were able to calculate a valid level of English based on the generation of their own tests. This proves that at the current level of development chatbots are able to determine the level of language proficiency quite accurately based on contextual data. Consequently, they are able to help with improving language proficiency.

More people took a part in the experiment (see Table).

The experiment revealed the following advantages of using NLP-based chatbots for language proficiency assessment:

- 1) The ability to quickly generate pass/fail tests on the required grammatical or lexical topics;
- 2) The ability to generate tests of different difficulty levels;
- 3) The ability to adapt existing tests to different language proficiency levels. For example, it is possible to take a test or even separate questions of C1 level and adapt them to A2 level;
- 4) Possibility to get recommendations from the chatbot immediately after passing the test, whether it is theoretical material or advice on how to pass unlearned topics;
- 5) Possibility to create additional tests on specific points that need to be worked out (a consequence of point 4 and the ability of the chatbot to memorize the previously received information);
- 6) The ability to create and conduct assessments for a large number of users, which makes this approach effective for large groups, such as on educational platforms or in companies with large staffs.
- 7) Ability to apply a large number of scripts for test generation due to the huge database. The chatbot is able to create lexical tests to check the level of language proficiency in a specific area of life, whether it is traveling or language proficiency on a technical level.

Table

The results of the certificates given

№	English level estimated by common way	English level estimated by ChatGPT-4o	English level estimated by Gemini
1	Upper-Intermediate/B2	Upper-Intermediate/B2	Intermediate+/B1+
2	Intermediate/B1	Intermediate+/B1+	Intermediate/B1
3	Beginner/A1	Beginner/A1	Beginner/A1
4	Intermediate/B1	Upper-Intermediate/B2	Intermediate/B1
5	Intermediate/B1	Intermediate/B1	Intermediate/B1
6	Elementary/A2	Elementary/A2	Elementary/A2
7	Advanced/C1	Advanced/C2	Advanced/C1
9	Upper-Intermediate/B2	Upper-Intermediate/B2	Upper-Intermediate/B2
10	Beginner/A1	Elementary/A2	Beginner/A1

In addition, the following deficiencies were identified during the experiment:

- 1) Difficulty in recognizing language dialects and idioms. For example, if the chatbot works mainly with American English, it may not understand the

British idiom «I'm feeling knackered» (in particular, the problem with such a construction during the described experiment with ChatGPT-4o);

2) Limited oral assessment. In the conducted experiment, the option of evaluating the user's speaking skill through pre-loaded audio files of the user's speech was considered. The result showed that chatbots are not able to perceive the recorded speech completely correctly, as well as to give quality recommendations to improve the skill;

3) Weak perception of non-standard answers. Chatbots usually do best with «predictable» answers and standardized patterns. In non-standard situations when a user offers an unexpected answer or send non-standard messages, a chatbot can become confused and give incorrect feedback.

The use of chatbots is advisable both for basic and advanced studies. There are several options chatbots can provide a better language training taking into account user level. In an effort to help students to train the language more efficiently, the following mechanism is recommended based on the results of the study described. Using chatbots is possible both for individual and group lessons. The general mechanism includes the following principles:

1) Planning a chatbot's role during a lesson. The rules of use are discussed before the lesson. The goals, tasks and time of using the chatbot for the lesson are defined. The questions and tasks that the chatbot can help to solve are specified;

2) Curriculum integration. In other studies, for example [7], the chatbot was integrated directly into the university's Moodle management system. The chatbot was available both in lectures and in practice. Students received answers to questions on the material being covered;

3) Monitoring and regulation of use. The instructor monitored students' use of the chatbot, making adjustments as they used it. If necessary, answered questions that the chatbot was not able to explain properly. After completing the independent work together with the chatbot assessed the quality of the learned material.

Algorithm for learning a foreign language with a chatbot:

1) Determine the purpose of learning. On this stage student should choose the topic of (grammar or vocabulary). Set a time frame for learning (e.g. 1 week for each topic).

2) Select an appropriate chatbot. Research available chatbots and their functions. For example, ChatGPT, Duolingo, etc;

3) Starting new topic. Ask the chatbot for an explanation of a grammatical structure or vocabulary topic. Ask for examples of how to use the new grammar or vocabulary in context;

4) Grammar study. Ask for rules explanations (e.g., «The rules of past tenses usage ») and request examples (e.g., «Write 3 examples of the past tenses sentences »);

5) Vocabulary work. Ask the chatbot to provide a list of words on the chosen topic (e.g., «Name 10 words about traveling») and request examples [2];

6) Practical work. Request exercises on the chosen topic (e.g., «Give me exercises on past tense formation»). Solve the suggested exercises and send the answers for checking.

Algorithm for learning a professional foreign language with a chatbot:

1) To identify the topic of lesson. For example, improving business communication skills;

2) Assessment of prior knowledge in order to determine areas for improvement;

3) Request a specialized dictionary in order to start learning professional words. For example, «Give a list of 10 the most important words for business communication»;

4) Request some examples for the chosen topic. For instance, «Write me scripts where the business terms are used»;

5) Practical work. Request exercises on the chosen topic (e.g., «Give me relevant exercises where business vocabulary should be used»). Solve the suggested exercises and send the answers for checking.

It is proposed to realize additional conditions on practical lessons with the participation of a chatbot in the following way:

– Group work. Students divide into groups and use a chatbot to complete tasks. One part of the group works directly with the chatbot to find information, the other part applies it in practice and also uses the bot for support;

– Answer discussion. Students compare given answers by a chatbot with their own knowledge and decide if the information AI gained is relevant;

– Session with the teacher. After interacting with the chatbot, students discuss aspects of the work together with the teacher, negotiating the most successful and controversial ones.

Other studies support the results of the experiment conducted, as well as the conclusions drawn from it. For example, «Students who used ChatGPT [4] as a feedback tool demonstrated a 15–20% improvement in the quality of their academic texts compared to a control group. This was measured in terms of grammar, text organization, and vocabulary usage» [5]. Also, «Students who used chatbots for vocabulary learning increased their vocabulary at a rate 30–35% faster compared to those who used only textbooks and traditional methods. This included both active and passive vocabulary» [5].

So, the main advantages of using chatbots based on NLP technology when learning a foreign language are their ability to quickly and quite qualitatively give an initial assessment of language proficiency, make a personalized summary based on the test results, give recommendations for working through problematic grammatical and lexical topics of language proficiency. If necessary (user's

request), the chatbot is able to generate new tests based on the information received from a particular user. Based on the user's requests and information already received from the user, the chatbot is able to compose organized blocks of tasks. As the user learns, the chatbot will be able to assess the quality of learning in even greater detail and even make changes to the tasks it composes.

The use of chatbots in foreign language assessment and lessons has several disadvantages. Chatbots are often limited in context and cannot adequately take into account the nuances of the language, which can lead to misinterpretation of user queries and, consequently, errors in assessment. In addition, chatbots may not provide sufficient feedback at the level necessary for deep understanding of the material, making it difficult to correct errors and develop skills. Another disadvantage is the risk of a one-sided approach to learning: chatbots often use standard algorithms, which can lead to a lack of variety in assignments and exercises, as well as ignoring the individual needs of the student. In addition, the limited interaction with a chatbot can reduce motivation, as communicating with a machine cannot always replace live interaction with a teacher or fellow students. Finally, there is the risk of dependence on technology: students may rely on chatbots to the detriment of independent learning and critical thinking, which may negatively affect their language skills in the long run.

Today chatbots are far from perfect, you should realize that by constantly learning from the data it receives, it is becoming more and more efficient. The last few years have seen a quantum leap in AI development. Further improvements will make chatbots a full-featured, multifunctional tool for helping students learn a foreign language, which will increase the efficiency of classroom instruction and reduce the burden of routine tasks associated with organizing material for lessons.

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**Teaching Intercultural Communication at lessons of English
for students in higher education**

In the era of globalization, English teaching needs to take Intercultural communication competence as the goal for learners. This article presents an overview of Intercultural Communication and demonstrates a new direction of intercultural teaching: teaching Intercultural Communication at English classes for university students. Methods of teaching Intercultural Communication in higher education are also suggested in this work.

Key words: globalization; intercultural teaching; Intercultural Communication; Intercultural communicative competences; teaching methods; university students.

In an increasingly globalized world and an international integration context, Intercultural Communication (IC) is becoming increasingly important. Because the greatest significance of learning about cultural diversity is to help us know how to connect with the international community, thereby expanding our worldview. With the popularity of English as a global language, teaching IC at English classes will be a good way to help university students develop comprehensively for their language skills and intercultural communicative competences.

The concept of Intercultural Communication is still quite new to many people. In this field, many linguists and scientists have different definitions.