CHAPTER «PEDAGOGICAL SCIENCES»

THE USE OF ARTIFICIAL INTELLIGENCE FOR ARABIC LEARNING

Lesia Viktorova[1]
Kostiantyn Mamchur[2]

Abstract. In the study the features of artificial intelligence use, the main advantages and disadvantages of this technology are analyzed; the aspects of such a pedagogical process in learning Arabic are substantiated, the results of research and scientific advances in cyberlinguistics are summarized. The relevance of the use of artificial intelligence technologies and chatterbots in the study of Arabic in higher education is highlighted. The current state of introduction of artificial intelligence technologies in the educational process of students of higher education institutions is analyzed. Examples of the use of artificial intelligence technologies in the study of Arabic are given. Categories of computer programs with the use of artificial intelligence technology for learning a foreign language are singled out and described. The advantages and debatable issues related to access to user data during the use of artificial intelligence technologies in the educational process are identified. The expediency of using chatterbots with a linear structure is substantiated. Scenarios for the use of chatterbots in the educational process during the study of a foreign language are identified: search script and content generation script. The tasks of a linear chatterbot for learning a foreign language are presented and described. The educational trajectories which will allow reaching the set purposes in training with use of chatterbots are allocated. Mandatory methodological

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[1] Doctor of Education, Professor,
Yevhen Bereznyak Military Diplomatic Academy, Ukraine
ORCID: https://orcid.org/0000-0002-4072-974X
[2] PhD in Education, Head of Foreign Languages Department,
Yevhen Bereznyak Military Diplomatic Academy, Ukraine
ORCID: https://orcid.org/0000-0003-1792-3349

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and content elements during the creation of a linear chatterbot are highlighted. The practical scenario of creating an author's chatterbot for learning a foreign language on the sendpulse.ua platform with its further use in Telegram is given. When creating a chatterbot, it was found that the chain constructor is the main tool for setting up a chatterbot. The practical advantages of using a linear chatterbot when learning a foreign language are presented. The study identified a promising direction for the creation of several linear chatterbots (without the use of artificial intelligence), which can be involved simultaneously at different stages of the development of the individual trajectory of education. Multiple chatterbots that provide different answers and ask different questions can significantly improve a learner's communication and other skills.

1. Introduction

Modern didactics, as a science that studies teaching methods, is constantly moving forward, so today foreign language teachers have many resources to improve their qualification. Nowadays the development of personal digital devices and information technologies and the trend of using mobile technologies in the modern educational process are no longer surprising. Today, almost every university student has his/her own mobile device with Internet access. This creates new opportunities for communication and exchange of information between teachers and students with the help of mobile applications and online services. One such possibility is the use of streaming technology, which allows almost real-time transmission and playback of audiovisual information from one user to another. Although the principle of almost instantaneous exchange of information in the interaction between teacher and student (e.g., in blended learning) is not new, we can observe that scenarios of using information technologies to form new educational models, which provide an opportunity to keep up with scientific and technological progress, significantly enrich and diversify the teaching of foreign languages, are insufficiently covered in the scientific literature. Due to the rapid development of intercultural communication and information technology, as well as due to the active development of computer-based learning, there is a possibility of using neural networks as a tool of Artificial Intelligence (AI) technologies, based on the theory of individualized foreign language learning.

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Areas of application of artificial neural networks are quite diverse: for the classification of information in the case of limited, incomplete and nonlinear data sources, in online translators, for working with text data, etc.

The use of computer neural network technologies in foreign language teaching through the construction of individual trajectories of knowledge acquisition provides an individualized approach to learning, expands the didactic capabilities of computer learning tools; enables the correlation the content, forms, and methods of teaching in accordance with educational needs; allows to carry out automatic adjustment for the account of dynamics of changes of a trajectory of training; focus educational material on different types and levels of mastery; takes into account students' psychological and personal qualities.

The relevance of the study is due to the following: the demand for professionals fluent in Arabic is quite high. The population of Arab nations is growing and with a huge GDP, it is a prime market for export of services and goods. Learning Arabic and the culture of the people who speak the language will make it easier to negotiate and conduct business. Fields that need Arabic speakers include diplomacy, consulting, banking and finance, education and journalism.

Thus, we can assume that the development of education, and in particular the learning of foreign languages will be faster and more efficient with the use of mobile and other modern technologies, including AI technology.

Problem statement. In the scientific literature, we found enough publications that confirm the trends towards globalization and increasing penetration of AI into all spheres of human life [1–6]. There already present various scenarios for the use of AI technologies in the foreign language learning, and almost in all of these publications predominately positive prospects for AI use are described.

At the same time, we met the results of research that analyzed the privacy policies of software developers using AI (Google, Microsoft, Facebook, etc.), and demonstrated the data sets that developers collect about their users. Despite the depersonalization of these datasets, we can presume the possibility of identification the user with the help of obtained information by software developers.

Despite this, we believe that the topic of the use of AI in the educational process remains relevant. Of particular importance is the use of AI

technologies in the educational process of educational institutions that have internal policies for the confidentiality of data on students.

Analysis of recent researches and publications. Among the researchers of teaching Arabic N. Yushmanov, G. Sharbatov, M. Navrotsky, V. Chernov, S. Bin-Tahir, A. Albantani can be noted. But their works relate primarily to theoretical issues of grammar, phonetic structure of the Arabic language and are used in our study as sources of theoretical material.

General issues of application of AI technologies in the educational process are studied by V. Hrytsyshyn, N. Gabrusyeva [6], A. Shevchenko [7], G. Androschuk [10]. Areas of AI use in modern conditions are investigated by A. Dubchak, J. Litvinenko [1]. AI systems in adaptive learning are studied by V. Demyanenko [2]. The works of Y. Peruchok [3] are devoted to the issues of advantages and risks in the application of AI technologies.

In the works of researchers A. Banartseova, O. Eliseeva, L. Maligina. AI is considered as a multimodal linguodidactic system [4]. The multimodality of the AI system, according to Lee Weihua [4, p. 149], seems to be the most important condition for its successful application for teaching foreign languages. Exploring the trends in the use of chatterbots in the educational process, A. Turchyn identifies the functions and types of chatterbots [23] and proposes to consider chatterbots as assistant teachers.

The aim of the study is to determine the benefits and debatable issues regarding the use of AI technologies in the study of foreign languages in educational institutions that have their own privacy policies for the students. It is proposed to resolve the existing discussion issues regarding the violation of the confidentiality of students by creating a linear chatterbot without the use of AI: to provide a script and tools for its creation and a scenario of its use when students learn a foreign language.

2. Theoretical basis of research

It is believed that the first definition of AI was proposed in the work of Alan Turing, who is considered the father of modern informatics. Thanks to him, the notion of "Intelligent Machinery" [5] appeared and also his famous test – a method of inquiry in AI for determining whether or not a computer is capable of thinking like a human being. During the test, one of the humans functions as the questioner, while the second human and the computer function as respondents. The questioner interrogates the respondents within

a specific subject area, using a specified format and context. After a preset length of time or number of questions, the questioner is then asked to decide which respondent was human and which was a computer.

Analyzing scientific literature, we found a sufficient number of definitions and clarifications of the concept of AI [3]. In our work we rely on the research of A. Shevchenko, who defines AI as a set of universal procedures that allow you to consciously create algorithms for solving specific creative problems [7].

We agree with researchers who distinguish the following categories of AI:

– Artificial Narrow Intelligence or ANI is the first level of artificial consciousness that realizes a limited part of the mind, or as a narrow AI, focused on one narrow task. According to John Searle, this "would be useful for testing hypotheses about intelligence, but it would not really be intelligent" [8].

– General Artificial Intelligence or AGI is the second level of artificial consciousness: it is able to solve mathematical problems, compare and analyze data, quickly learn from personal experience [9];

– Artificial Super Intelligence or ASI is the third level of artificial consciousness. Basically, it is a hypothetical AI that not only can interpret and understand human behavior and intelligence, but ASI is a stage where machines would become self-aware enough to surpass the ability of human intelligence and behavioral abilities [10].

A chatterbot is a computer program that interacts with a user through auditory or textual methods. Chatterbots, or virtual interlocutors, are used in dialog systems for a variety of practical purposes, including customer service or information gathering.

Thus, we consider the chatterbot as an application program that receives information from the user and forms correct, logically sound answers, as well as offers tasks.

3. Results
3.1. The use of artificial intelligence in learning a foreign language

The use of AI in education today is no longer a new "know-how". In scientific literature we found various scenarios of its application [1–4; 6; 7; 9–11]. Summarizing the experience of educationalists, we can identify the following areas of AI in education: assessment of knowledge

of students, updating students' knowledge, assessment of teacher activities, assistance to students in the educational process from a virtual assistant, personalization and individualization of educational process, adaptive learning. In the context of learning a foreign language, various services for translating a foreign text are of great help. The most popular is the well-known service Google Translate, which in 2016 integrated "Google Neural Machine Translation" (GNMT) technology. GNMT improves the quality of translation by using the example-based (EBMT) machine translation method, in which the system learns from information found in millions of Internet sources. With the large end-to-end framework, the system learns over time to create better, more natural translations.

One of the first successful attempts to systematically use AI in the educational process is the development of the Century educational platform. In March 2019, the British IT company CenturyTech signed an agreement with the government of one of the regions of Belgium to develop its learning platform based on the use of AI. According to the plan, all 700 municipal schools in the region will be equipped with it in five years. The Century system [13] is a computer program in which students at registration pass a small test for their interests and existing knowledge. Based on its results, the program identifies the strengths and weaknesses of the student, gaps in his/her knowledge, and then assigns tasks to fill them. Teachers have access to student data and track progress.

Today, there are interactive assistants and adaptive learning programs that allow AI to personalize the educational process and simplify certain technical tasks. AI can perceive much more information than a human-being. And, consequently, to perform tasks much faster and more accurately. Some educational software developers began to use these benefits to create programs that would suit the needs of each individual student. Thereby, the organization Enlearn [14] has developed an adaptive educational platform in which machine learning can prescribe personalized curricula that would speed up the acquisition of knowledge for each individual learner.

Traditional ways of learning a foreign language in such conditions of active penetration of AI into the educational process are now considered a resource-intensive process and require a lot of additional material, while digital tools that use AI can "provide" an individual learning plan to each student. Moreover, educational programs track personal achievements in

the study of education seekers by providing material that matches their level of knowledge and training course.

Numerous studies confirm that the use of AI provides ease and convenience of online learning a foreign language using foreign learning sites and AI applications such as Duolingo, Kahoot, Babble, Knowable, etc. They are able to attract and calculate the time required to master a foreign language. They are programmed so that you can get real results, so that learning is enjoyable and increases the level of knowledge.

The developers of the KnowbleReader educational platform for learning a foreign language [15] are convinced that the acquisition of new knowledge and learning a foreign language will become natural and learning will easily enter the daily activities of students. And now we are not talking about a certain time when a person spends on training, but on daily activities that are somehow related to the use of Internet resources. The AI platform analyzes the user's activities on the Internet and in everyday life with the help of "Internet of Things" that collect and transmit user data. The platform helps to significantly increase the individual capabilities of each person when learning a foreign language.

On a daily basis, KnowbleReader shows users personalized news that matches the user's training profile. It monitors the level of language acquisition and constantly offers new publications, the level of complexity of which increases, but is not too complex.

Another successful example of the use of AI in mastering a foreign language is the Knewton platform [16]. With the help of neural networks, the platform helps to draw up an individual plan for learning a foreign language, creates courses adapted to the user's learning goals. Knewton is an adaptive learning platform that allows you to personalize learning content. Knewton is a provider of adaptive learning technologies that allows others to create adaptive learning programs on their platform. Since 2016 the company began the development of training programs for higher education, using educational content to other companies and open educational resources. The use of AI allows the company to conduct "complex real-time analysis of data on student performance" [17].

Thus, we can state the following trend – due to the development of AI technology of individualized foreign language learning is formed in accordance with the requirements of informatization of education,

provides modeling of individual trajectories of knowledge, takes into account the individual characteristics of the learner in a dynamic model of its characteristics. AI systems even track the emotional destabilization of learning, notify tutors or independently adapt the program.

Possibility to study foreign languages using AI feature is the ability to solve poorly structured and poorly formalized tasks in computer technology is interesting both for the teacher and for the applicant education. The learner expands the set of pedagogical tools, which in some cases demonstrates greater efficiency, in contrast to traditional methods of teaching a foreign language, the learning process is more interesting and productive, in addition, AI allows the teacher to assess the progress of the student and quickly adjust his training needs. Moreover, AI allows you to assess the level of knowledge of the future student at the stage of his registration on the platform and choose the most effective format of his training at the initial stage.

During the educational process, AI identifies where difficulties arise, forms and sends the necessary materials to improve skills. Adaptive learning uses the basic AI algorithm. In addition, education at any convenient time is undoubtedly a huge advantage for the learner.

Summarizing the experience of colleagues [1–4; 6; 7; 10; 23], we can distinguish the following categories of computer programs using AI technology in foreign language learning:

– programs for assessing the educational activities of the student. It provides not only the receipt and evaluation of answers to test questions of the closed type (which provide an answer «yes» or «no»), but also the evaluation of essays of students who have created them in the electronic educational environment.

– Interval activity programs that test already existing knowledge with a certain interval. The length of this interval depends on the level of successful mastery of the educational subject: the weaker level of mastery of the subject (topic), the more often it will appear for the learner.

– Feedback programs provide not only automation of messages from the teacher to students, but also their personalization depending on the specified variables, such as performance, length of stay on the platform, duration of viewing certain material, quality of tasks, etc. Most often, these are chatterbots that are able to collect the views of students through a dialog interface.

– Virtual assistant programs not only provide feedback to the user, but also provide appropriate assistance (advice, instructions, necessary training materials, etc.) depending on the user's request and educational purpose.

– Learning personalization programs.

– Adaptive learning programs that interact with the user in real time. They automatically provide individual support for each user. Adaptive learning programs collect data about the user's activities on the platform analyze it and respond – form an appropriate individual training program. Depending on the user's interaction with the material on the platform, the content of the training material for this user changes – it becomes adaptive.

– User identification programs (Proctoring or Proctored Test) [18]. This is a method of ensuring academic integrity. The program allows users to compose tasks online remotely, without the participation of a teacher as an observer. The user confirms his / her identity and can be monitored with a help of a video camera. This video is then used to indicate any irregular user behavior.

– Data collection and personalization programs. Today, AI is already able to offer each Smartphone user the nearest cafe, depending on his / her preferences and geolocation data. Similarly, platforms with the use of AI in mastering a foreign language offer personalized texts in accordance with the data that the user leaves about himself. This machine-generated data is formed and distributed when a user's digital devices interact with each other or with their servers. Usually Big Data comes from three sources: the Internet (social networks, forums, blogs, etc.); corporate document archives; data collected by Internet of Things sensors.

3.2. A debatable issue of the privacy policy of user data when learning a foreign language using artificial intelligence

Our study of the use of AI technologies in foreign language learning would be incomplete if we did not identify the risks that we believe lead or may lead to the use of these technologies. The advantages of using these technologies in the educational process, mentioned above, are, of course, significant and deserve their active implementation. But, in our opinion, the decision-making process of their application, the choice of scenario, methodology and other criteria should be conscious and responsible.

The use of AI technology involves the openness of Internet user data. And although today these data are depersonalized, the results of recent research on cybersecurity force us to make more informed decisions about the use of AI technology in the educational process.

The more data users conveys about themselves (social networks, web search history, geolocation, visits to web resources, etc.), the more personalized will be the content of the curriculum that AI will offer.

In accordance with the Privacy Policy, Google [19] collects the following information about users: keywords of all queries in the Google search engine and the language of their input; keywords and search results, watching videos on YouTube with the duration of watching each video; content created or used with Google applications – personal data with login and password, even when viewing product data without entering a login and password; information about applications, browsers and programs, including IP-addresses of Internet access; shopping history; geolocation and reference to certain geolocation objects (museum, shop, cinema, shopping center, etc.), etc.

Microsoft has also made its users' data privacy policy publicly available [20] and provides for the possibility of using their resources without collecting information about user actions; it is also possible to control the collection and storage of information about user actions.

Based on the above, we still consider it useful to use AI technologies in the educational process, in particular when learning a foreign language. However, we are convinced of the need for a systematic approach to the use of AI technologies in education, namely:

– awareness, understanding and agreement about the content and scope of personal storage space, possibly confidential and other data to be used by the AI during the educational process;

– compliance with the corporate standards of the educational institution regarding access to personal and confidential user data.

3.3. Choice of model, application scenarios and development of chatterbots for learning a foreign language

A systematic approach, a comprehensive analysis of various scenarios for the use of AI in the study of foreign languages and taking into account the corporate policies of the educational institution and the specifics of the

educational process of the educational institution, we considered various scenarios for chatterbots.

The development of chatterbots is currently one of the popular areas in the field of machine learning and artificial intelligence [22]. In one form or another, they are found in almost any modern gadget (mobile phone, tablet, Smartphone, smart devices, etc.), as well as on most Internet resources.

Today in the market of electronic educational services there are two types of chatterbots for learning a foreign language: specially created for learning a foreign language and virtual assistants that check the level of proficiency (do not teach) a foreign language in real situations [23; 24].

The advantages of using chatterbots are the usual format for the user (the usual Telegram interface, similar to live communication with elements of gamification) and its availability (learning anywhere and anytime).

Duolingo (https://www.duolingo.com), Mondly (https://www.mondly.com), Andy (https://andychatbot.com), FluentU (https://www.fluentu.com), Hipmunk (https://www.concur.com/en-us/concur-hipmunk-faq), Mona (http://www.monahq.com) are the examples of existing today in the market of educational services chatterbots that are specialized in learning a foreign language or contribute to the development of communication skills.

After analyzing the available AI opportunities for learning a foreign language, the method of collecting and using AI user data and comparing it with the corporate standards and policies of our educational institution, we decided to create chatterbots for our students learning a foreign language.

Depending on how "smart" the assistant should act, certain approaches to their implementation are used. To solve the problem of assistance in learning foreign languages, it is necessary to choose a chatterbot model that will allow the assistant in the early stages to answer users' questions correctly and then logically related to the context of the user's request.

We've analyzed the available chatterbot models and agree with their developers on the following application scenarios: search script and content generation script. The script for generating chatterbot content is more interesting – it does not have ready-made answers. Answers are generated in real time after the user's request. The main advantage is the ability to analyze the context and generate a response based on previously obtained information. The main disadvantage is the difficulty in learning, availability

of grammatical errors in the answers and the existence of a huge number of training data.

We have chosen a chatterbot that will help students learn Arabic as a foreign language. During the development we were guided by the following methodological tasks:

– mastering the skill of Arabic writing;

– mastering the skill of using a dictionary. For other languages, the skill of using a dictionary is less important. However, when learning Arabic, the use of the dictionary has certain features and is an important factor in mastering the language.

– Mastering the principles of Arabic grammar.

– Mastering communication skills.

– Learning vocabulary. We stopped at 500 words, although, according to our estimates, 200-300 words of vocabulary are enough for everyday communication at the survival level.

– Development of Arabic listening comprehension skill.

– Development of the ability to record speech to the written text.

In the algorithm of our chatterbot, we built three separate trajectories of the student's movement. Each trajectory depends on the purpose of learning Arabic.

The first trajectory is for tourism seekers. This trajectory allows students to master vocabulary, sufficient for everyday communication at a survival level, communication when visiting cultural sites.

The second trajectory is for religious education seekers who want to read religious publications. In this trajectory, language skills will be less important than the skills of understanding and applying grammar.

The third trajectory is for students with professional education. So far, we have focused only on the professional trajectory for research and teaching staff. The rest of the professions require the involvement of certain third-party specialists and do not have a mass demand compared to previous trajectories.

We used https://sendpulse.ua platform to develop a chatterbot. Our choice was made based on the usability of the interface, clear instructions for creating chatterbots, 24/7 technical support and a free package for creating 3 bots. A similar chatterbot can be created on other platforms using the same algorithm.

As we have already mentioned, we created a chatterbot for Telegram. First, we registered it in Telergam. You used the official bot @BotFather to register. Our bot which can be found in Telegram is called @EducationForLife. During registration, @BotFather creates a key (token) that is needed to continue working with the chatterbot.

Using the received key (token) we registered our chatterbot on https://sendpulse.ua platform. All further instructions for creating a bot are on the platform and are intuitive to create a chatterbot on your own, without involvement of programming specialists.

Chain Designer is the main tool for setting up a chatterbot, which will greet new users, advise and inform the teacher about the user's questions in the chatterbot. It is possible to collect data and send them to the teacher for further processing, but we did not use this functionality in the absence of such a need.

We have identified keywords and defined the structure of the chatterbot. The chatterbot algorithm starts with a "welcome message series" that the user receives after running @EducationForLife in his / her Telergam.

During the construction of the algorithm of the above-described learning trajectories for students, we used the following functionality in chains: text, image, video, file. The platform provides the use of hyperlinks to third-party resources and data collection from the user (for example, open answers to questions, geolocation, e-mail, phone number, etc). But, as we noted, in accordance with the corporate policies of the educational institution and the goals of training, we did our best to avoid personalizing our users.

Figure 1 shows the user-side interface for using the "Test" and "Image" features, which allows the students to enter an answer to the question – the user must identify the national currency of the United Arab Emirates (UAE) shown in the figure.

Figure 2, 3, 4 shows the user-side interface for using the "Text", "Image", "Video", "File" functionality. Figure 2 shows the task for the user – to listen to a podcast of the official UAE radio company and answer the questions.

Figure 3 shows a task to watch a video of an official UAE television program and provide an answer.

Figure 4 shows the @EducationForLife interface on the user's side, where the student has to send the file for review to the teacher (completed CV in this case according to the scenario of the learning trajectory shown in the figure).

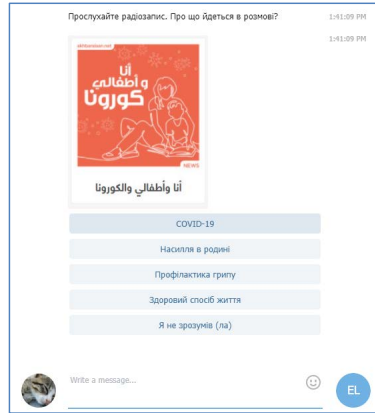**Figure 1. @EducationForLife user-side interface with Text and Image functionality**

Figure 2. @EducationForLife user interface for using the File functionality

So, our chatterbot @EducationForLife to help acquiring Arabic allows you to personalize learning, which is based on the analysis of data of a particular student. The created chatterbot allows us to measure the progress of learning, quickly and accurately analyze data on success and track progress in learning a foreign language – from global tasks to the smallest, daily things.
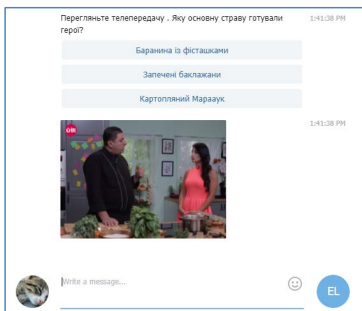

Figure 3. @EducationForLife user-side interface with Video functionality

Figure 4. @EducationForLife user-side interface

The chatterbot allows you to maintain a fairly stable high motivation through gamification, as well as the ability to structure a long training program into clear short components, thus outlining both short-term and long-term perspective. This chatterbot can be easily integrated not only into Telergam, but also into other messengers (Viber, Facebook).

We believe that the future lies in personalized education with customized products, such as chatterbots, which allow us to implement the concept of lifelong learning with minimal resource costs. Students can get new knowledge, answers to questions; perform tasks anywhere with a Smartphone. We live in an era when you can discuss with a chatterbot the nuances of translating a new word in one chat messenger, and clarify homework – in another chat with the teacher. And our practical experience of using the chatterbot @EducationForLife while learning Arabic proves such a possibility and demand in the coming years.

4. Conclusions and prospects of further research

The practical value of the work lies in the possibility of using its practical material in the preparation of general theoretical and special courses on teaching Arabic, in the theory and practice of translation, in the creation of programs for teaching Arabic.

After creating the @EducationForLife chatterbot and launching its work among our students, we agree and support colleagues who believe that communication with the chatterbot is for the most part only a linear deployment – getting answers to questions.

It is clear that the use of AI, that an access to user's data on the Internet, will solve this problem (expand the range of chatterbot capabilities). However, compliance with the corporate policies of the educational institution itself and the user's desire for such actions will remain open.

And if chatterbots involving AI (Duolingo, Mondly, for example) can significantly narrow the focus of the content of the subject of foreign language study (for example, increasing the number of repetitions in case of gaps on a particular topic; or periodic repetition of material that is considered fixed and mastered, but has not been fixed by the user for a long time), the chatterbot @EducationForLife will not be able to solve this problem.

In our opinion, it may be interesting to study the impact on the quality of knowledge and determine the ability to learn different languages (English,

Arabic), create and use several similar chatterbots (without AI), which can be involved simultaneously at different stages deployment of the individual trajectory of education of the applicant.

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