The use of innovative technologies in intelligent system of a university for the growth of communicative skills of students

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Abstract

The article demonstrates the need to use innovative technologies in the digital learning environment of higher education institution for the growth of communicative skills of students. The presented conceptual model justifies the implementing of technology in the digital learning environment of higher education institution. This study takes the strategy of digital transformation of the Russian Federation. The study presents technologies to improve the communicative skills of students in the Intellectual system of the digital educational structure of the university. The

study aims to present educational conditions and the use of tools to improve the communicative competence of learners in the Intellectual system of the digital educational structure of higher education institution. The scientific novelty is that the CybergenAI game will be created to teach applied computer science students about artificial intelligence technologies, and an automatic AI competence support model, "teacher behavior imitation", will be developed and implemented for the game.

Introduction

Effective implementation of professional activities and career growth of a person in the modern professional world requires developed communicative skills. Only those become competitive specialists who have social (emotional) intelligence and communicative literacy in addition to professional competence, which includes, among other things, the possession of business etiquette, which is based on moral values that allow a person to form a positive image and have an impeccable reputation.

The current research on the concept of developing AI competence in students through scientific gamification reflects the implementation of Presidential Decree of the Russian Federation "On the National Goals and Strategic Objectives of the Development of the Russian Federation for the Period up to 2024" No. 204 of May 7, 2018, the national program "Digital Economy of the Russian Federation," approved by the protocol of the Presidium of the Council under the President of the Russian Federation for Strategic Development and National Projects No. 7 of June 4, 2019, Presidential Decree of the Russian Federation "On the National Goals of the Development of the Russian Federation for the period up to 2030" No. 474 of July 21, 2020, and Presidential Decree of the Russian Federation No. 490 of October 10, 2019, "On the Development of Artificial Intelligence in the Russian Federation," which describes and approves the National Strategy for the Development of Artificial Intelligence from 2020 to 2030, including targeted activities to accelerate the implementation of digital technologies in the economy and social sphere of the Russian Federation. These regulatory documents fix the main directions of modernization of information and computer technologies.

The objective of the research is as follows: to examine the existing educational conditions in the Intelligent Digital Educational Structure of the university (IDESoU) for enhancing students' communicative competence; to analyze the effectiveness of using tools for enhancing communicative competence in the IDESoU; to develop recommendations for improving educational conditions and using tools for enhancing communicative competence in the IDESoU.

To achieve these goals, the next tasks have been set:

1. To study the theoretical foundations of communicative competence and its relationship with

educational activities.

2. To analyze the existing educational conditions and functionality of the IDESoU for enhancing students' communicative competence.

3. To evaluate the effectiveness of using tools for enhancing communicative competence in the IDESoU.

4. To develop recommendations for improving educational conditions and using tools for enhancing communicative competence in the IDESoU.

The research will be conducted using methods such as analysis of literature data, interviews, questionnaires, and observation. The literature review will examine the theoretical foundations of communicative competence and its relationship with educational activities. Interviews and questionnaires will help to identify the evaluation of the effectiveness of using tools for enhancing communicative competence and provide recommendations for improving educational conditions and using tools in the IDESoU. Observation will provide information about the behavior of students during using tools for enhancing communicative skills. The novelty is that the CybergenAI game will be created to teach applied computer science students about artificial intelligence technologies, and an automatic AI competence support model, "teacher behavior imitation," will be developed and implemented for the game [Gallini, 2022].

The main scientific innovation of this research is the development of an automatic AI competence support model for students, which will allow them to imitate the behavior of a teacher and thus improve the efficiency of learning.

Another significant scientific innovation is the CybergenAI game itself, which is unique in that it allows students to study artificial intelligence technologies by applying them to the management of a virtual robot. Thus, the game promotes increased student motivation and provides a deeper understanding of the basic principles of AI.

Overall, the growth and implementation of the automatic AI competence support model and the CybergenAI game are significant steps in the field of artificial intelligence education, and may lead to increased learning effectiveness and improved preparation of students in this area.

Rationale For The Study

The "communicative competence" term was first introduced by Dell Himes, it means "as internal knowledge of the situational appropriateness of language" [Yugdar Tófalo, 2020] on the basis of the concept of "language competence" defined by N. Chomsky, which the scientist used to call the internal mental grammar of a person. According N. Chomsky language is presented in the form of abstract sets of rules, which are most clearly reflected in the subconscious intuitive ideas of the individual about language [Chomsky, 1965, 45].

In the context of learning activities associated with future specialization, students encounter a huge number of specific words, common only in certain professional circles. Learning terminology is an extremely difficult process, especially in the first classes, for the simple reason that the lecturer operates terms that students do not yet know and the terms do not relate to the level of knowledge available to the student. In other words, mastery of specialized vocabulary is a primary task in the context of mastering the course.

In addition, communicative competence also involves the ability to use language effectively in different social and cultural contexts, including nonverbal communication such as body language and tone. It also involves the ability to understand and interpret different forms of discourse, such as written

and spoken language, and the ability to produce discourse in a way that is appropriate to the situation and audience. Developing communicative competence is essential not only for professional success but also for everyday social interactions. To achieve this competence, students need to focus not only on learning specific terminology but also on developing their language skills more broadly, including listening, speaking, reading, and writing.

Research Methods

This article is based on linguistic text analysis techniques: contextual analysis, which consists in the study of slang words by determining their meaning through their location in the text, and cognitive analysis, in which the focus is on the perceptions and sensations that arise when reading a particular word.

Often specialized vocabulary is universal, i.e. identical if different language groups are considered, but there are also those that are unique to particular language groups. English language is often the basis in the process of forming specialized vocabulary the because of its prevalence [Shimichev, Rotanova, 2021].

The transfer of specialized words to different language groups takes place through: transcribing, transliteration, calquing.

There are two types of calques: word-formation and semantic. Word-formation ones are directly connected with the translation of foreign words into Russian on the basis of their structure. Semantic ones, on the other hand, are based more on the meaning of the word.

It should be noted that the use of specialized vocabulary is not limited to academic or technical fields, but extends to various social and professional contexts. Effective communication in these settings requires not only the knowledge of specialized terminology but also the appropriate usage and intonation. Moreover, the understanding and usage of specialized vocabulary varies in different social and cultural groups, and may also change over time. Therefore, the study of specialized vocabulary should not be limited to memorization of terms, but should also involve an exploration of how language works in different contexts and how it evolves over time.

Problem Solving

Mastering specialized vocabulary in the learning process is possible in two cases: directly in classrooms and on-the-job practice. It is critical that by the time of practice the student must already have a certain base. Enrichmented educational process with IT can contribute to the growth of communicative skills of students in professional circles [Pashko, Pinchuk, 2019].

Chatbots are programs designed to communicate with people through text interfaces. They can perform various tasks, answer user questions, help solve problems, offer recommendations, and more.

In educational settings, chatbots can be used to train students' communication skills. They can simulate realistic communication scenarios, where it is necessary to use specialized vocabulary and highly specialized knowledge.

Communication with chatbots is based on algorithms and rules integrated into the program. They can use various methods and technologies to communicate with students, including voice commands, videos, images, etc.

The results of communication with chatbots can be recorded and used to analyze and evaluate students' language skills. This can help teachers adjust language learning and identify areas where

students need to improve their communication skills.

The use of technology in language learning has become increasingly popular, especially with the advent of artificial intelligence. Chat-bots, like the one mentioned above, can provide an interactive and personalized learning experience for students. They can not only assist in vocabulary acquisition but also provide feedback on syntax and grammar, helping students to improve their writing and communication skills. It is important, however, that such tools are integrated with a comprehensive language learning program, which includes not only the acquisition of specialized vocabulary but also the development of other essential language skills, such as listening, speaking and reading.

Chat-bot-based and interfaced with a smart assistant, working on the basis of artificial intelligence, Intelligent System "GPA Yalta Portal", it is possible to simulate working situations in the context of which specialized vocabulary is used.

Students, being at their home workplaces, not only get the opportunity to practice the use of specialized vocabulary, but they also receive metrics reflecting the coherence of the text, as well as the proportion of scientific vocabulary. Figure 1 shows the student's dialogue with the chat-bot.
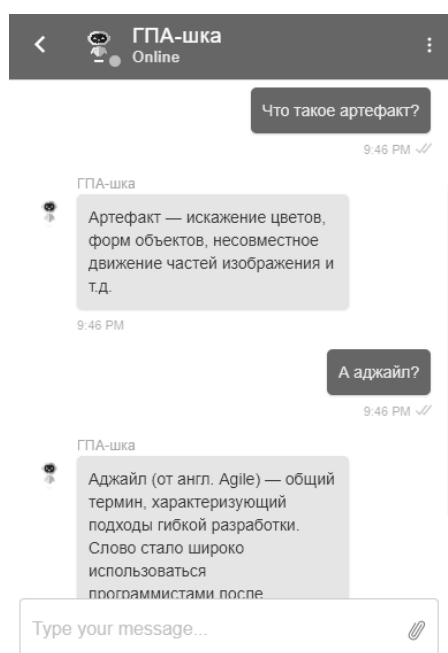
Picture 1 - Student's dialogue with the GPA chat-bot

Table 1 shows the knowledge base of the GPA chat-bot for 10 frequently used IT words. This knowledge base can be extended not only for IT technology, but also for definitions of various sciences.

Table 1 - 10 frequently used IT words

Keywords	Definition
Backup	Backup is a backup copy; to backup is to create one. Backups are needed as often as possible, to retrieve deleted data or to restore operation if a crash occurs.
GUI	GUI – graphical user interface
To commit	To commit – to save the code. For example, to commit the code in an application = to save the code to the repository.
Artefact	Artifact – distortion of colors, shapes of objects, inconsistent motion of image parts.
Agile	Agile – a general term that describes agile development approaches. The word became widely used by programmers after the Manifesto for Agile Software Development in 2001.

Keywords	Definition
Dropdown	Dropdown – a dropdown list – an element (widget) in the graphical user interface that allows selecting one of several predefined parameter values.
To debug	To debug – debugging a program; searching for errors in the program. You may often hear programmers say: I have got a couple of asserts, they must be debugged and fixed.
Walkaround	Walkaround – in programming, a quick "ugly" solution to an otherwise long-term and resource-intensive problem.
Legacy	Legacy code – very old code written by a previous team.
Framework	Framework (carcass, body, case, structure) defines the structure of the software system and facilitates the integration of the different components of a whole project.

GPA Yalta Portal is equipped with special simulators, which in essence resemble tutorials designed for learning not only a foreign language, but also programming languages. After going through the training material on the modules and then consolidating it through the use of a dictionary, students have access to exercises on word substitution, matching words and their meanings, as well as on memorizing words by matching pictures, text and pronunciation by a voice assistant.

Thus, the CybergenAI integrated game, whose home page is shown in Fig. 2, includes a tool to improve the communicative competence of students of applied computer science to improve knowledge of artificial intelligence technology.
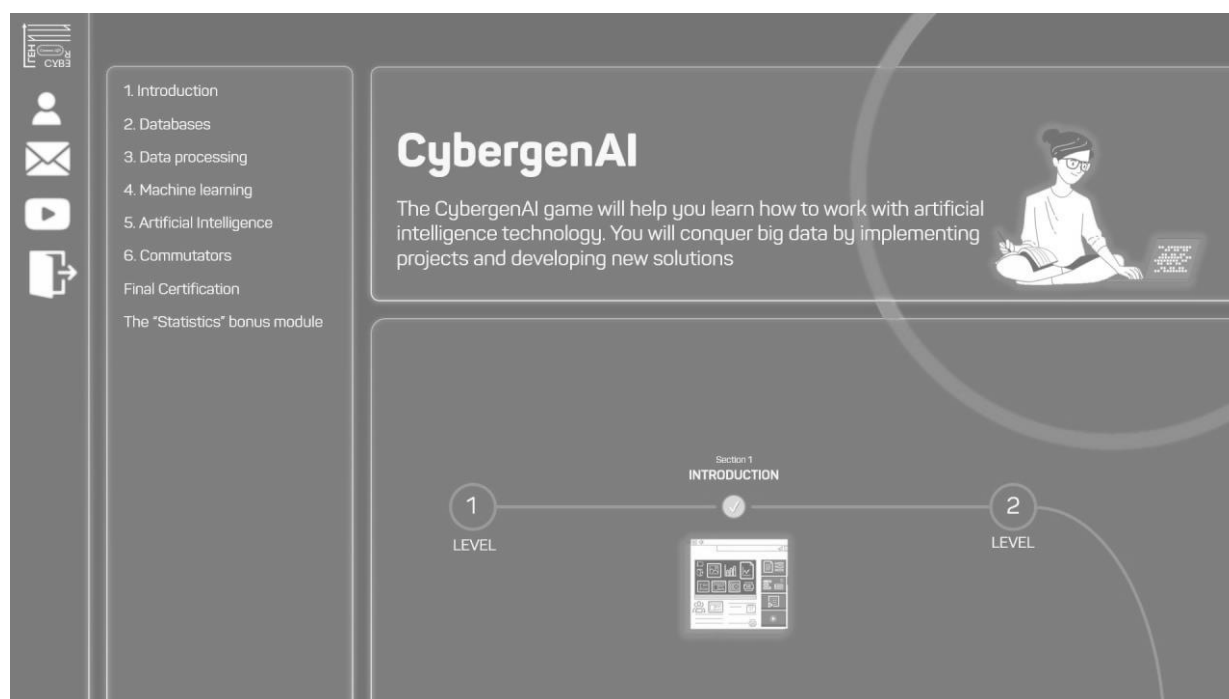
Picture 2 - CybergenAI game home page

While participating in the CybergenAI game coming Bachelor of Appl-Inf go through five levels (modules), which are summarized by the Final Assessment:

1. Introduction
1.1 CybergenAI. Our purpose, direction, and goals
1.2 Conquering DataScience and BigData
1.3 Playing with Python syntax and structures
1.4 Massive NumPy and calculating SciPy

The use of innovative technologies in intelligent system …

1.5 The Pandas Analyst

1.6 Visualizing data with Python

1.7 Flattened (C++)

2. Databases

2.1 Let's play together with GIT, CI/CD

2.2 The Great Scala

2.3 The Terrible PostgreSQL

2.4 SQL, join, union, and other Beggars.

3. Data processing

3.1 Distributed file systems: HDFS

3.2 Processing data in Spark

3.3 Commanding with Spark

3.4 Hadoop tools: Hue, Yarn, Hive

3.5 Data orchestrators: Airflow/oozie

3.6 Data Lakes

3.7. Managing flows and data, ClickHouse

3.8 Showcases, dashboards and graphs: Grafana, Prometheus

4. Machine Learning.

4.1 Machine learning and data processing

4.2 Machine learning on big data

5. Artificial intelligence

5.1 Artificial Intelligence

5.2 Documentation and teamwork

Final certification

A "Statistics" bonus level (module) can also be passed if desired.

By learning programming languages in a game form, the students improve their communicative skills at the high level. To determine the stage of the competence at the professional level, trainees take tests to identify the degree of mastery of programming languages [Skorobogatova et al., 2021; Tran, 2022; Harmer et al., 2018].

Whereas for revealing the level of communicative competence of social (emotional) intelligence and communicative literacy such tests were not provided, but were developed as a result of the formation of this study. This work is based on: the competence approach in the digital educational structure of higher education [Shimichev, Rotanova, 2022; Pryakhina, 2021]; communicative world of the learner's personality in virtual space; empirical foundations of students' communicative competence [Markus et al., 2021; Strogetskaya et al., 2020; Hymes, 1972].

Approbation of the main theoretical and practical provisions takes place at the Vernadsky CFU in Yalta.

The study involved 25 students of the research base of the bachelor's level of applied computer science training direction, and studying artificial intelligence technology in the game CybergenAI in the number of 25 people.

The students were tested according to five criteria, revealing three levels (high, medium and low) of communicative features:

− social intelligence – a scope of abilities that define the success of social interaction;

− attitude to activity – the internal content of the person, manifested externally through the actions, actions, activity;

– business etiquette – a set of rules and norms generally accepted in the business sphere;
– communicative literacy – a scope of proficiency due to a person builds effective communication regardless of various circumstances;
– awareness – revealing states directed at the current moment without thinking about the events of the past or future.

Communicative characteristics of students in percentage terms are shown in Fig. 3.
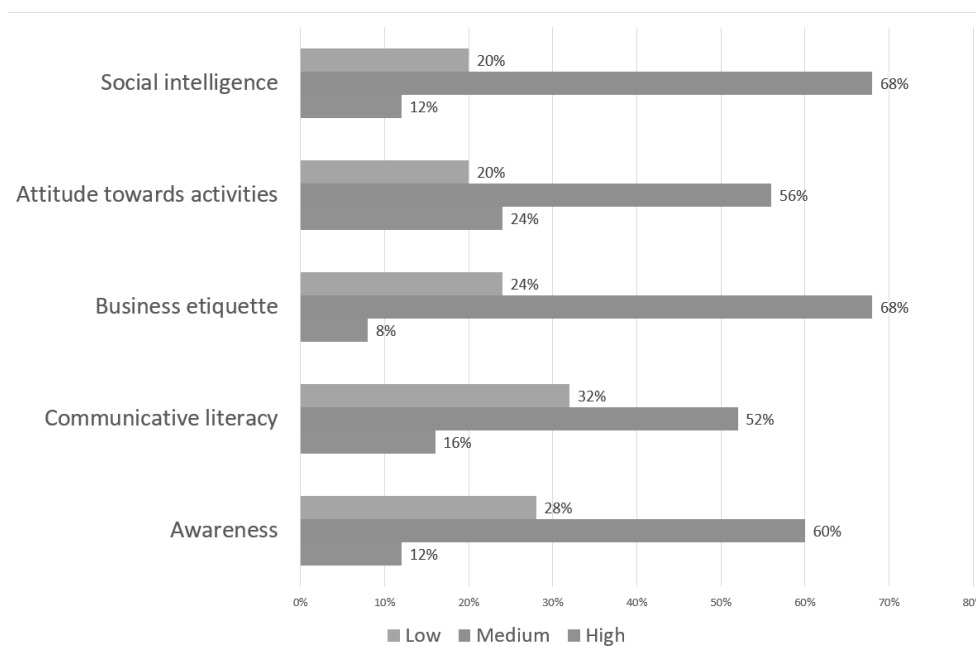
Picture 3 - Communicative characteristics of students (in percentage terms)

It is important to note that when identifying the criteria of communicative competence characteristics of students' high level of 24% was shown of the attitude towards the activities, while the lowest high level was identified by the criterion of business etiquette, which amounted to 8%. The highest medium level was revealed by the two criteria of social intelligence and business etiquette and amounted to 68%. The highest low was 32% for the criterion of communicative literacy. Based on the findings, the CybergenAI game should include a technique to help improve the level of communicative literacy, business etiquette, and communicative competence of students in general [Zhong, 2021; Wang, 2022; Gallini et al., 2021; Kazachkova et al., 2022; Xin, 2020; Shabunina, 2020; Huang, 2022; Ma, 2022; Zhang, 2021].

Based on the above material, the authors proposed that the sixth level (module) of the CybergenAI game be called Commutators and that five sublevels be added to work through all of the criteria highlighted in this study:

Conscious. This sublevel will develop a state in which the learner focuses on the task at hand in the nowadays without being distracted by thoughts of past or future events. This state is called mindfulness and is a key element of meditation. Mindful approach helps the learner to develop cognitive and emotional functions, improve concentration, and enhance learning effectiveness. It also helps to reduce stress levels and improve overall well-being. To achieve mindfulness, it is recommended to practice meditation and exercises for mindful presence in everyday life.

Literate. Acquisition of knowledge, skills, and abilities of communication with which the learner

builds effective communication regardless of various circumstances. A literate approach to communication allows the learner to achieve different goals in communication, create trust and closeness in relationships with others, find compromises and conflicts resolution, persuade and influence other people. To achieve this, it is necessary to have skills in active listening, formulating one's thoughts and ideas, expressing emotions and feelings, and considering the partner's communication style. A literate approach to communication enables understanding and collaboration in any situation, strengthen personal and professional relationships, and achieve success in life.

Intellectual. Development of abilities for success of social interaction of students. Development of intellectual abilities for successful social interactions is an important component of the educational process that helps learners become successful in their professional and personal lives. This includes growing communication skills, emotional intelligence, teamwork, conflict resolution, critical thinking, and decision-making ability. Developing these skills helps learners better understand and express their thoughts and feelings, as well as optimize their behavior in various situations [Harmer et al., 2018].

These skills are important for the development of personal culture and help learners find common ground with others, build quality relationships, and achieve success in life. The educational process should contribute to the formation of these skills and allow learners to apply them in practice in various social situations. Therefore, the intellectual development of abilities for successful social interaction is an important element of the educational process and is a necessary condition for successful socialization and realization in life.

Business. Studying the rules and norms accepted in the business sphere. Business development is the process of studying the rules, norms, and principles that are accepted in the business world for successful work and achieving high results. Business development includes familiarizing oneself with the rules of business etiquette, the basics of corporate culture, legislation regulating business activities, and resource management practices. Certain rules and norms regulate contractual relationships, the process of concluding a contract, fulfilling obligations, and resolving disputes. In addition, business etiquette, such issues as time management, presentation skills and communication skills, financial analysis, and project management, are also important aspects of business development. Studying the rules and norms accepted in the business world helps develop such professional competencies in learners as awareness of terms and methods of work, knowledge of professional competencies and the ability to use them in practice, as well as a general understanding of the business environment and the relationships between its participants.

Active. Forming a serious attitude towards the activity and the inner content of the personality, manifested externally through actions.

An active personal style is a characteristic of people who take their activities seriously and strive to achieve their goals. Such people are characterized by high motivation, initiative, confidence in their abilities, and readiness to take action.

The inner nature of an active personal style is reflected through strong personal qualities, such as responsibility, determination, endurance, perseverance, and self-control. People with an active style are inclined to constant self-education and development. They strive to improve their skills and knowledge, do not afraid to experience something new and take risks.

The external expression of an active personal style is reflected in actions. Such people work quickly and can achieve significant results in a short time. They often initiate changes in their environment and can coordinate the actions of a team to achieve a common goal.

The formation of an active personal style begins in early childhood and can be influenced by many factors: family upbringing, having a role model of successful activity in the environment, love for a

particular type of activity, etc. However, anyone can become active if they consciously develop their personal qualities and learn to use their potential effectively in action.

Discussion

In researching neural networks used to simulate teacher behavior, several aspects were analyzed initially.

First, it must be understood that a neural network is a computer system capable of learning and adapting to new situations. To do this, it uses various machine learning algorithms, such as back propagation of error and genetic algorithms.

Second, it is necessary to study how neural networks work in the context of simulated teacher behavior. For example, how the model should be configured to effectively solve specific learning tasks and what methods and techniques can be used to train the neural network so that it learns to adequately simulate teacher behavior.

The third aspect to consider is the performance of the neural network in practical tasks. That is, what accuracy can be achieved when using a neural network to simulate teacher behavior, whether there are limitations in its use, and what possible problems may arise in the process.

Finally, it is important to consider examples of using neural networks to simulate teacher behavior in different domains and contexts. For instance, the examples of how neural networks can be used in online schools or in distance learning systems and what benefits teachers and students can gain from using such technology.

A variety of neural networks can be used to teach communication skills to students, depending on the task at hand and the availability of data. Here are a few examples:

1. Recurrent Neural Networks (RNNs) with LSTM cells. RNNs are good for tasks involving sequence processing. They can be used to create models that will analyze dialogs between students, both in real time and afterwards. LSTM cells allow you to store information about previous dialogs and use it to generate subsequent responses that will be as context-sensitive as possible.

2. Generative Adversarial Neural Networks (GANs). GANs are used to generate new data that does not yet exist. They can be used to train communication skills training systems that can generate new test questions, assignments, or different scenarios of interaction between students.

3. Feedforward networks. This type of neural networks is well suited for classification tasks, such as classification of students' communication strategies or identification of mistakes in dialogues.

4. Transformer models. These models are the most advanced in classifying textual data related to natural language processing. They do a good job of generating responses based on textual input and can handle multiple sentence contexts.

However, in order to choose the right model, the specific tasks to be solved and the availability of the data to train the neural network are needed to be analyzed.

To implement a neural network simulating teacher's behavior in the intelligent system of the digital educational environment of the university, the following steps should be taken:

1. To define the goals and objectives of neural network implementation. For example, to improve the quality of education, to increase the interactivity of the learning process, to reduce the time spent on checking the assignments.

2. To collect the data necessary for training the neural network. It can be recordings of lectures, examples of correct answers to tasks, test results and other materials which can be used for training neural network which simulates teacher's behavior.

3. Prepare the data for training neural network. The data must be clean, structured, and put into a format understandable to the neural network. The data must also be broken down into parts: training, test, and validation samples.

4. Train the neural network. To do this, an approach called "training with a teacher" is used. During training, the neural network must learn to mimic the teacher's behavior in order to later use this experience to perform tasks.

5. Integrate the neural network into the digital educational environment of the university. For example, this can be done through an API that will allow the system to interact with the neural network.

6. Test the system's performance and improve it. In this process it is important to monitor the accuracy of the neural network, its efficiency, and improve it if necessary

Digital learning environments in universities play an important role in the world of education. The introduction of neural networks used in teacher behavior simulation is a new approach to help improve the quality of education in higher education institutions.

In addition to neural networks, machine learning algorithms such as SVM, Random Forest, Naive Bayes, and others can also be used to teach students communication skills. These algorithms work well with different types of text data and can be used for classification, clustering, prediction, and other text processing tasks.

Graphical models such as Bayesian networks can also be used to teach students communication skills. They represent a probabilistic model that allows modeling the dependencies between variables and taking into account the uncertainty of the data.

Finally, reinforcement learning techniques, such as Q-learning, can also be used to train models capable of making real time decisions based on feedback received from students.

Selection of the right model depends on the requirements of the project, the availability of data for training, and the desired accuracy of the results.

Conclusions

Thus, based on the approbation of the methods to improve students' communicative competence considered in the article as well as metrics obtained as a result, the authors are able to draw conclusions about the current level of future specialists' preparedness to conduct activities involving interaction with other representatives of the professional circle. The application of information technology in the modern conditions of ubiquitous digitalization is a necessity, because the aspect of globalization in this case is mixed with the aspect of professional formation. Despite the fact that, according to the results of the study, the vast majority of students have an average level of communicative competence, which, in turn, indicates some trend not so strongly dependent on the institution of higher education, a vector in which the above mentioned institution should conduct systematic work appears.

It is important to note that the improvement of students' communicative competence is not only the responsibility of educational institutions, but also requires individual efforts from students. For this reason, self-directed learning and the use of various educational resources, such as online courses and language exchange programs, should also be encouraged. Additionally, interdisciplinary projects and group work can foster collaborative communication skills and provide students with real-world experiences that they can apply in their future careers. Ongoing assessment and evaluation of students' communicative competence should also be conducted in order to identify areas for improvement and adjust teaching methods accordingly.

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Использование инновационных технологий в интеллектуальной системе вуза для развития коммуникативной компетенции обучающихся

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Аннотация

В статье показана необходимость использования инновационных технологий в цифровой образовательной среде вуза для развития коммуникативной компетенции обучающихся.

Представленная концептуальная модель обосновывает внедрение технологии в цифровую образовательную среду вуза. В данном исследовании учитывается стратегия цифровой трансформации Российской Федерации. В исследовании представлены технологии развития коммуникативной компетенции обучающихся в Интеллектуальной системе цифровой образовательной среды вуза. Целью данного исследования является представление технологии улучшения коммуникативной компетенции обучающихся в Интеллектуальной системе цифровой образовательной среды вуза. Научная новизна исследования заключается в том, что для обучения технологиям искусственного интеллекта студентов прикладной информатики будет создана игра КибергенИИ, для которой, в свою очередь, будет разработана и внедрена модель автоматического сопровождения ИИ-компетенции студентов «имитации поведения преподавателя».

Для цитирования в научных исследованиях

Ключевые слова

Инновационные технологии, цифровая образовательная структура вуза, коммуникативная компетентность студентов.

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