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USING AI TO DEVELOP STUDENTS' SCIENTIFIC SKILLS IN CHEMISTRY: FROM RESEARCH TO INNOVATION

Abstract

The article discusses the use of artificial intelligence (AI) to develop students' scientific skills in chemistry, its role in promoting innovative research and technology. AI opens up new opportunities for students of chemical faculties, allowing them to effectively analyze large amounts of data, simulate chemical reactions and predict experimental results. The use of AI in research activities helps students develop critical thinking, research skills and promotes the creation of new chemical compounds and materials. The article also discusses prospects of AI in the development of new drugs, environmentally friendly technologies and sustainable chemical processes. Despite the many advantages, the introduction of AI into chemical education and research is associated with a number of challenges, including the need to train specialists. In conclusion, the importance of further introducing AI into chemical education is emphasized in order to improve the quality of scientific research and stimulate an innovative approach in chemistry.

Keywords: artificial intelligence, chemical research, innovation, machine learning, chemical education.

Introduction

Modern educational technologies, including artificial intelligence (AI), are being actively introduced into chemical education and scientific research. AI opens up new horizons for students, allowing them to develop scientific skills, participate in innovative projects and solve complex problems that traditional teaching methods cannot cope with. This article discusses ways to use AI to develop the scientific skills of students of chemical faculties, as well as the opportunities that these technologies open up for research and innovation in chemistry.

With the rapid development of technology, artificial intelligence (AI) is becoming an integral part of many fields of science, including chemistry. The use of AI in chemical education and scientific research can significantly accelerate the processes of data analysis, modeling chemical reactions and predicting the properties of new materials. The use of AI in teaching chemistry students is especially important, as it helps to develop key scientific skills such as analytical thinking, research abilities and an innovative approach to solving complex problems. The introduction of AI into chemical education opens up new horizons for the development of scientific projects, improving the quality of research and accelerating the development of new substances and technologies, which is extremely important in the context of global challenges such as climate change, sustainable development and the creation of environmentally friendly technologies. At the same time, for the successful implementation of AI in chemical education and research, it is necessary to solve a number of problems related to the training of specialists, accessibility of infrastructure and ethical aspects of the use of these technologies. Thus, the study of the use of AI in chemical education is an urgent and important task for the development of science and technology.

Theoretical part

1. AI in the research activities of students of chemical faculties

The use of AI in chemical research allows students to process large amounts of data faster and more efficiently, simulate chemical reactions and predict experimental results. This is especially true in chemistry, where conducting experiments can be an expensive and time-consuming process. Students can use machine learning algorithms to analyze experimental data and build models, which

helps in the search for new chemical reactions, materials, and even in predicting the properties of substances before their synthesis.

One of the most striking examples is the use of machine learning to analyze experimental data. Students can use AI algorithms to find hidden patterns in chemical reactions, optimize experimental conditions, and predict the properties of new molecules. For example, AI is actively used to develop new materials and chemical compounds with desired properties, such as resistance to external influences or improved catalytic properties [1][2].

In addition, AI allows for virtual experiments and simulations, which gives students the opportunity to study chemical reactions and interactions of substances without having to conduct physical experiments. AI-supported virtual laboratories offer students a safe and effective environment for practical training, and also allow them to conduct numerous experiments with minimal time and resources [3]. The use of AI in such laboratories makes it possible to simulate complex reactions that are impossible or difficult to reproduce in a real laboratory, thereby expanding the range of possible studies.

2. Development of scientific skills through the use of AI

AI provides students with the opportunity to develop critical scientific skills such as analytical thinking, research abilities, and critical understanding of scientific data. The introduction of AI into the educational process makes it possible to create new forms of educational resources that help students not only master theoretical knowledge, but also apply it in real scientific projects. For example, students can use AI to perform predictive analyses based on existing data, which helps them better understand the mechanisms of chemical processes.

The use of AI in chemistry also contributes to the development of scientific communication and collaboration skills. Students can interact with intelligent systems, use AI for collaborative projects and data exchange, and apply the results obtained in real scientific research. An example is the application of AI in the field of chemical informatics, where students use algorithms to analyze databases of chemicals and create new molecules with unique properties [4][5].

AI-based systems can also serve as effective tools for critical evaluation of scientific research and experimental data. Students can use AI to analyze and interpret scientific publications, find patterns in large amounts of data, and generate new hypotheses. This contributes not only to the development of scientific data analysis skills, but also stimulates creative thinking and an innovative approach to solving scientific problems [6].

3. AI and innovations in chemical research

One of the most important aspects of the application of AI in chemistry is the creation of new ideas and solutions that can lead to breakthrough scientific discoveries. AI promotes innovation in chemical science by accelerating the development of new substances and materials. An example is the use of machine learning algorithms to predict the properties of new chemical compounds and molecules, which helps scientists to quickly find effective solutions in the fields of medicine, energy and ecology [7].

AI is also actively used in the development of new drugs and biomaterials. Students working with such systems can explore molecules that have potential medical applications, as well as predict their biological activity and interaction with other substances. Such technologies can significantly speed up the drug development process and minimize the cost of clinical trials [8]. It also opens up opportunities for the development of more environmentally friendly and efficient chemical processes, which contributes to sustainable development.

In the field of sustainable technologies and environmentally friendly processes, AI helps students analyze chemical reactions aimed at improving energy efficiency and minimizing environmental impacts. Machine learning makes it possible to simulate reactions, optimize their conditions and develop environmentally friendly production methods, such as the creation of alternative energy sources and materials with low carbon emissions [9]. Such research is of great importance in the context of global challenges of climate change and sustainable development.

4. Advantages and challenges of using AI in chemical research

The use of AI in chemical research provides students with many benefits, including speeding up analysis processes, improving prediction accuracy, and improving the quality of results. However, the introduction of AI also poses a number of challenges. One of the main obstacles is the need to prepare students and teachers to use these technologies, which requires significant efforts and resources.

In addition, the availability of the necessary computing power and software is an important issue. Some universities and research institutions may lack the appropriate infrastructure for the full implementation of AI in the educational process [10]. It is also worth noting that despite the huge potential of AI, technology cannot yet completely replace human creativity and intuition, especially in the field of scientific discoveries.

Conclusion

The use of artificial intelligence in chemical research opens up new horizons for students, allowing them to develop research and innovation skills, improve the quality of scientific projects and accelerate the development of new materials and technologies. AI contributes to the creation of personalized educational trajectories, helps students apply their knowledge in real scientific tasks and makes learning more interactive and accessible. However, for the effective use of AI in chemical education, it is necessary to solve problems related to the training of specialists and the availability of technologies. In the future, AI is expected to become an integral part of educational and scientific processes in chemistry, contributing to the achievement of new scientific and technological breakthroughs.

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СТУДЕНТТЕРДІҢ ХИМИЯДАҒЫ ҒЫЛЫМИ ДАҒДЫЛАРЫН ДАМЫТУ ҮШІН ЖАСАНДЫ ИНТЕЛЛЕКТТІ ҚОЛДАНУ: ЗЕРТТЕУДЕН ИННОВАЦИЯҒА ДЕЙІН

Түйін

Мақалада студенттердің химия саласындағы ғылыми дағдыларын дамыту үшін жасанды интеллектті (AI) қолдану, сондай-ақ оның инновациялық зерттеулер мен технологияларды ілгерілетудегі рөлі қарастырылады. AI химия студенттеріне үлкен көлемдегі деректерді тиімді талдауға, химиялық реакцияларды модельдеуге және эксперимент нәтижелерін болжауға мүмкіндік беру арқылы жаңа мүмкіндіктер ашады. Ғылыми - зерттеу жұмыстарында жасанды интеллектті қолдану студенттерге сыни ойлауды, зерттеу дағдыларын дамытуға көмектеседі және жаңа химиялық қосылыстар мен материалдарды жасауға ықпал етеді. Мақалада сонымен қатар жаңа дәрі-дәрмектерді, экологиялық таза технологияларды және тұрақты химиялық процестерді дамытудағы AI перспективалары талқыланады. Көптеген артықшылықтарға қарамастан, жасанды интеллектті химиялық білім мен ғылыми зерттеулерге енгізу бірқатар мәселелермен байланысты, соның ішінде мамандарды даярлау қажеттілігі. Қорытындылай келе, Ғылыми зерттеулердің сапасын арттыру және химиядағы инновациялық тәсілді ынталандыру мақсатында химиялық білімге жасанды интеллектті одан әрі енгізудің маңыздылығы атап өтілді.

Кілтіік сөздер: жасанды интеллект, химиялық зерттеулер, инновациялар, машиналық оқыту, химиялық білім.

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ИСПОЛЬЗОВАНИЕ ИСКУССТВЕННОГО ИНТЕЛЛЕКТА ДЛЯ РАЗВИТИЯ НАУЧНЫХ НАВЫКОВ СТУДЕНТОВ В ХИМИИ: ОТ ИССЛЕДОВАНИЙ ДО ИННОВАЦИЙ

Аннотация

В статье рассматривается использование искусственного интеллекта (ИИ) для развития научных навыков студентов в области химии, а также его роль в продвижении инновационных исследований и технологий. ИИ открывает новые возможности для студентов химических факультетов, позволяя им эффективно анализировать большие объемы данных, моделировать химические реакции и прогнозировать результаты экспериментов. Использование искусственного интеллекта в исследовательской деятельности помогает студентам развивать критическое мышление, исследовательские навыки и способствует созданию новых химических соединений и материалов. В статье также обсуждаются перспективы ИИ в разработке новых лекарств, экологически чистых технологий и устойчивых химических процессов. Несмотря на множество преимуществ, внедрение ИИ в химическое образование и научные исследования связано с рядом проблем, включая необходимость подготовки специалистов. В заключение подчеркивается важность дальнейшего внедрения искусственного интеллекта в химическое образование с целью повышения качества научных исследований и стимулирования инновационного подхода в химии.

Ключевые слова: искусственный интеллект, химические исследования, инновации, машинное обучение, химическое образование.

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