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# THEORY AND PRACTICE: DIDACTIC POSSIBILITIES OF USING ARTIFICIAL INTELLIGENCE

**Khudayberdieva Zulfizar Mukhtorjon qizi**

1st-year Master's student, Department of Theory and Methodology of Primary Education National Pedagogical University of Uzbekistan named after Nizami

## ABSTRACT

The development of artificial intelligence technologies in the digital world is relevant – the rapid development and widespread application of artificial intelligence technologies in all areas of society, especially their implementation in education and teaching, opens up new didactic opportunities for optimizing individualized learning, increasing student motivation and engagement, and reducing teacher workload. Deep integration of artificial intelligence methods, such as natural language processing, speech recognition, and data mining, with foreign language teaching practices enables the construction of adaptive learning systems, the provision of personalized feedback and recommendations, and the development of interactive platforms for language training and the simulation of real-life communication situations.

**Keywords:** Primary school, modern lesson, mathematics, artificial intelligence, innovation, innovative technologies, integration, chatbot, interdisciplinary integration.

The Development of Artificial Intelligence Technologies in the Digital World The current state of development of artificial intelligence in the field of translation cannot be called satisfactory, and long-term efforts are required to stimulate the application of this technology. Despite significant progress achieved in artificial intelligence technologies in recent years, which has led to a significant increase in the quality and

efficiency of machine translation, a significant gap remains compared to human translation. [5, p. 16]. Machine translation faces numerous problems, such as semantic understanding, contextual awareness, and the transmission of linguistic style, the solution of which requires constant evolution and breakthroughs in algorithmic models. Modern machine translation systems cope poorly with processing complex syntactic structures, specialized terminology, and cultural differences; they often make grammatical errors, semantic distortions, and unnatural wording in translated texts, which seriously affects the quality of translation and user experience.Relevance: The rapid development and widespread application of artificial intelligence technologies across all areas of society, particularly in education and foreign language teaching, opens up new opportunities for optimizing individualized learning, increasing student motivation and engagement, and reducing teacher workload. Deep integration of artificial intelligence methods, such as natural language processing, speech recognition, and data mining, with foreign language teaching practices enables the development of adaptive learning systems, personalized feedback and recommendations, and interactive platforms for language training and simulation of real-world communication situations.

Achieving high-quality machine translation requires further significant technological breakthroughs in areas such as language understanding, knowledge representation, and reasoning. This is a long-term process that requires the tireless efforts of researchers and engineers. Take, for example, Google Translate, which uses an end-to-end machine translation model based on neural networks. By training on massive volumes of bilingual language data, it has achieved higher translation quality than traditional statistical machine translation. However, Google Translate still struggles with complex syntactic structures, specialized terminology, and cultural differences, and frequently introduces grammatical errors, semantic distortions, and unnatural wording into translated texts. This demonstrates significant potential for improving existing machine translation technologies in terms of language understanding and generation.

For example, when translating the English idiom "The cat is out of the bag," Google Translate gives the literal translation "The cat got out of the bag," completely ignoring the figurative meaning "the secret is out," which is clearly inaccurate. Similar examples are numerous and highlight the limitations of machine translation in terms of semantic understanding and pragmatic analysis. Another example: when translating the sentence "The White House promised to release the transcript of the president's call from April," Google Translate erroneously translates "release" as "free" instead of the correct "publish," reflecting the shortcomings of machine translation in resolving lexical ambiguity and understanding context. Another noteworthy example is Microsoft's multilingual neural machine translation system, which uses an encoder-decoder architecture and introduces an attention mechanism and subword fragmentation technique, achieving excellent results in multilingual translation tasks. [2, p. 343].

However, this system still faces challenges such as data insufficiency and difficulties in model transfer when working with resource-poor language pairs and small languages, which limits its practical application. [8, p. 10]. Obviously, achieving high-quality machine translation using limited language resources is a pressing issue that needs to be addressed. For example, due to the lack of language resources for the Tibetan language, existing machine translation systems find it difficult to provide high-quality two-way translation between Tibetan and Chinese. This requires research on the effective use of advanced transfer learning and active learning methods, fully leveraging knowledge from resource-rich languages such as Chinese, to improve the quality of Tibetan-Chinese machine translation.

At the same time, it is necessary to study methods for generating parallel bilingual corpora for Tibetan and Chinese, increase the volume of training data, and improve the generalization capacity of models. In addition to general-purpose machine translation, machine translation for specific subject areas is being actively researched. For example, in the medical field, Fudan University developed a knowledge-based neural machine translation system that effectively improved the translation quality of medical

texts by incorporating medical domain knowledge. [7] In the legal field, Tsinghua University proposed a machine translation method that combines legal term alignment and syntactic structure information, significantly improving the translation results of legal documents.

These studies demonstrate that machine translation for specific subject areas requires the full use of domain-specific knowledge and linguistic features, which places greater demands on the development and training of algorithmic models. For example, patent texts typically contain a large number of complex technical terms and legal formulations, and have long and complex syntactic structures, which poses significant challenges for machine translation. [8].

This requires research into combining patent knowledge with deep learning methods, as well as optimizing models that take into account the linguistic features of patent texts to produce high-quality machine translation results. Furthermore, specialized tools for preprocessing patent corpora and evaluation metrics must be developed to improve the efficiency and quality of patent translation. Furthermore, collaborative human-machine translation is also a promising area of research. While fully automated machine translation offers high efficiency, it does not guarantee the quality of the translated text, while translation performed solely by humans is expensive and labor-intensive. Combining artificial intelligence technologies with the professional skills of human translators, leveraging their complementary strengths, can improve translation efficiency while ensuring its quality. For example, Alibaba's human-computer collaborative translation platform generates preliminary translations using machine translation, which is then edited and corrected by human translators, significantly improving translation efficiency and ensuring the readability and accuracy of the translated text. Similarly, Tencent has also launched a human-computer collaborative translation platform that continuously improves translation quality and user satisfaction through human-computer interaction and iterative optimization. These studies suggest that human-computer collaborative translation may become a significant development area for machine translation in the future.

However, existing human-computer collaborative translation systems still have shortcomings in terms of task allocation, translation quality control, and optimization of human-computer interaction, requiring further improvement. Future research should focus on creating more intelligent and efficient paradigms for human-computer collaborative translation that ensure deep integration of artificial and human intelligence, complementarity, and continuous evolution. Despite significant progress, the application of artificial intelligence in translation remains far from practical. Future research should focus on achieving major breakthroughs in algorithmic models, knowledge representation, domain adaptation, and continuous improvement of machine translation's ability to understand and generate language. At the same time, attention must be paid to exploring models of human-computer collaborative translation, combining artificial intelligence technologies with the professional skills of human translators to complement each other's advantages and provide high-quality translation services more closely aligned with human linguistic habits. Only with the dual promotion of technological innovation and the practical application of artificial intelligence in the field of translation will it truly reach maturity and contribute to interlingual communication and global development. Of course, this requires close collaboration between industry, academia, research institutes, and end users, long-term investment and the accumulation of experience, and firm confidence and determination. We must build on the current situation, look to the future, and persistently advance the research and application of artificial intelligence technologies in the field of translation, contributing to the construction of a community with a shared future for humanity. In the digital age, various devices and applications continuously generate vast amounts of data, including text, images, audio, and video, creating a reliable foundation for the development of artificial intelligence technologies. [6] The advent of cloud computing has made it possible to store and process these massive amounts of data, and its powerful computing and storage resources provide the necessary infrastructure for the efficient operation and optimization of artificial intelligence algorithms[12, p. 39]. The combination of big data and cloud computing

creates favorable conditions for rapid progress in artificial intelligence. Machine translation is one of the most striking examples of breakthroughs achieved by artificial intelligence technologies supported by big data and cloud computing. Machine translation systems require the processing of large-scale language data, including parallel bilingual and monolingual corpora, the volume of which often reaches terabytes and even petabytes. Efficient processing of such enormous data sets is difficult using traditional storage and computing methods, while the implementation of cloud computing technologies such as distributed storage and parallel computing provides powerful support for machine translation.

Moreover, neural network-based machine translation models that have emerged in recent years have hundreds of millions of parameters, placing even greater demands on computing resources. High-performance computing, such as GPU clusters on cloud platforms, provides the necessary computing power for training and deploying these large-scale translation models. Despite significant support from big data and cloud computing, modern machine translation technologies still face numerous challenges in practical application. First, there is a shortage of high-quality parallel bilingual corpora, especially for some small languages and specialized domains. [10].

The lack of language data limits further improvements in the performance of machine translation models. Secondly, machine translation application scenarios are becoming increasingly diversified, including both general translation needs and those in professional fields such as law, medicine, and finance. Translation requirements vary significantly across fields, and general-purpose translation models struggle to meet the high standards of professional fields. [11]. Thirdly, it is necessary to improve the controllability and explainability of machine translation results; errors made during the translation process are difficult to track and correct, and the translation results lack human qualities and individuality. These problems, to some extent, limit the practical effectiveness of machine translation. Case study analysis is an important way to understand the current state of machine translation technologies. Take Google Translate, for example. Using massive corpora of multilingual web pages, it trains

powerful neural machine translation models in an unsupervised manner, supporting mutual translation in over 100 languages. Google Translate demonstrates outstanding results in general domains, but translation quality in professional domains still needs improvement. Microsoft's Bing Translator and Baidu Translate face similar challenges. Another example is cross-border translation for e-commerce, such as Amazon's machine translation system. This system uses data such as user reviews and product descriptions on the e-commerce platform to train translation models suitable for e-commerce scenarios.

However, while improving translation quality, it faces challenges such as data privacy protection. These cases demonstrate that despite significant advances in machine translation technologies supported by big data and cloud computing, there are still shortcomings in their practical application. The causes of these shortcomings are multifaceted and include limited data resources, immature modeling algorithms, and the complexity and variability of application scenarios. Addressing these issues requires long-term research and optimization in areas such as data, algorithms, and scenarios. On the one hand, it is necessary to continue to expand the scale and quality of language corpora, particularly by strengthening the creation of corpora for small languages and specialized domains. On the other hand, translation model algorithms must be continuously improved, enhancing their generalization and adaptability, as well as strengthening their explainability and controllability. Furthermore, customized translation solutions must be developed to suit various application scenarios, providing more professional and personalized translation services. Big data and cloud computing provide powerful data and computing resources for machine translation, stimulating the rapid development of machine translation technologies. However, to realize large-scale machine translation applications, continuous optimization and innovation in aspects such as data, algorithms, and scenarios is necessary.

This is a long-term process that requires the combined efforts of academia, industry, and research institutes, as well as close collaboration between researchers, technology developers, and industry users to jointly advance the progress and

application of machine translation technologies. Only through continuous research and optimization will machine translation gradually overcome its current limitations and bring greater value to broader areas. Artificial intelligence, as a key technology in the digital economy and the construction of an intelligent society, is continuously expanding its scope of application and penetration. In the era of the digital economy, the deep integration of artificial intelligence technologies with traditional industries is giving rise to a range of new business forms and models, becoming a new driver of economic growth. [13].

At the same time, the application of artificial intelligence in areas such as urban management, public services, and social regulation also brings new opportunities and challenges for building an intelligent society. However, the use of AI technologies also raises social issues related to employment, privacy, and security, requiring the joint efforts of all stakeholders to address them. In the digital economy, AI is transforming production methods and business models in traditional industries. For example, the implementation of AI technologies in smart manufacturing facilitates the continuous increase in the level of intelligence in production equipment and processes, ensuring automation, flexibility, and production efficiency.

This not only improves productivity and product quality but also creates new growth opportunities for businesses. Another example is intelligent retail, where artificial intelligence facilitates the implementation of new service models such as personalized recommendations, intelligent customer service, and unmanned stores, significantly improving the user experience and operational efficiency. These transformations not only stimulate the transformation and modernization of traditional industries but also give rise to a number of new industries, such as artificial intelligence chips, intelligent robots, and others, becoming new drivers of the digital economy. In terms of building an intelligent society, artificial intelligence demonstrates broad application potential in areas such as urban management and public services. A smart city is an important application scenario for artificial intelligence, where by collecting, analyzing, and using urban data, artificial intelligence can optimize the efficiency of

urban systems such as transportation, energy, the environment, and others, enhancing the city's capacity for sustainable development. [14].

In public services, artificial intelligence can be applied to intelligent question-answering, intelligent planning, intelligent decision-making support, and other applications, providing more accurate, efficient, and personalized services. In education, artificial intelligence opens up new possibilities for personalized learning, intelligent teaching, and more [9]. These applications not only improve the management and service levels of government and public organizations but also provide citizens with a more convenient and comfortable life experience. Along with opportunities for economic and social development, artificial intelligence technologies also bring a number of problems and challenges. First, artificial intelligence may impact traditional jobs, causing structural unemployment [3].

This requires government and society to take timely responses, strengthen vocational education and skills training, and facilitate workforce transition and reemployment. Secondly, the use of AI may violate privacy and data security, raising ethical and legal concerns. This requires stronger industry self-regulation and government oversight, as well as the development of appropriate laws, regulations, and ethical standards to protect individual rights and ensure social justice. Furthermore, the opacity and unexplainability of AI systems also pose challenges to their application in key areas. This calls for increased research into the explainability and controllability of AI, as well as ensuring the safety and reliability of AI systems.

Artificial intelligence offers vast application prospects and enormous value in building a digital economy and intelligent society. It stimulates the transformation of traditional industries and the development of new ones, optimizes social governance and public services, and improves people's quality of life. However, at the same time, it is necessary to recognize that the development and application of AI technologies still faces many problems and challenges that require joint discussion and resolution by all of society. Only by maintaining a cautious and inclusive development approach, adhering to a human-centered approach, and ensuring the safety and controllability of

its application can AI better serve human society. This requires the joint efforts of government, industry, academia, and the public. While developing AI, they must also strengthen regulation and governance, promoting the healthy and sustainable development of AI technologies.

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human-centered approach, and ensuring the safety and controllability of its application can AI better serve human society. This requires the joint efforts of government, industry, academia, and the public. While advancing AI, they must also strengthen regulation and governance, promoting the healthy and sustainable development of AI technologies[9].

As an important branch of artificial intelligence, the development of machine translation technologies is also inseparable from supporting national strategies and developing the industrial ecosystem. We must build on our own strengths, strengthen international exchanges and cooperation, and continue to invest in areas such as talent training, data accumulation, modeling innovation, and application scenarios, constantly improving the technological level and service capabilities of machine translation to contribute our wisdom and strength to building a community with a shared future for humanity.

In the context of globalization, proficiency in foreign languages has become an essential and key skill for specialists working in the field of artificial intelligence.As a highly internationalized field, cutting-edge technologies and the latest advances in artificial intelligence are primarily published in English and other foreign languages in leading international journals and conferences. A strong command of foreign languages is essential for accessing this cutting-edge information in a timely manner. Furthermore, foreign language proficiency also serves as an important foundation for AI specialists to participate in international academic exchanges and conduct joint international research. Only with good communication skills in foreign languages can one establish themselves on the international stage and showcase their research results. Take Chinese scientist Li Fei-Fei, who works at Google, as an example[13].

She has achieved a number of important results in computer vision and cognitive neuroscience, many of which were made possible by her studies and work at international universities, such as Stanford University and Princeton University. Her strong command of English allowed her to successfully communicate and exchange experiences in international academic circles, absorb cutting-edge knowledge, and hold

positions at leading global tech companies such as Google, participating in the development of major projects. It can be said that her knowledge of foreign languages has been a key catalyst for her success in the field of artificial intelligence.

Another example is Microsoft Research Asia's Chief Scientist, Zhou Ming. His team has achieved a series of important breakthroughs in natural language processing, knowledge graphs, dialog systems, and more. These achievements are largely due to their close collaboration with Microsoft headquarters and other overseas research institutions. The foundation of such international collaboration is proficiency in English for communication. In an interview, Zhou Ming noted that one of the important reasons Microsoft Research Asia can maintain a high level of research productivity is its emphasis on developing its employees' international perspectives and language skills, encouraging their participation in international scientific conferences, and networking with leading global scientists. [12, p. 36].

The paper also discusses in detail the application of artificial intelligence at various stages of teaching: intelligent tutoring systems can automatically generate personalized learning content and learning paths based on students' learning behavior and performance, significantly improving the focus and effectiveness of teaching; natural language processing technologies are used to check homework, which not only allows for quick and accurate diagnosis of language errors and provision of detailed feedback, but can also encourage students to actively correct errors, fill in gaps, form favorable interactions, and significantly improve teacher efficiency and teaching quality; intelligent dialogue systems provide students with a real-world interactive language environment, helping to enhance students' ability to use language.

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