

The Impact of Deepseek on China's Education Sector

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Abstract. DeepSeek, a leading Chinese AI technology company, has significantly transformed China's education sector through its advanced models like DeepSeek LLM and MoE architecture, which enhance language education, computational efficiency, and multimodal interactions. By integrating into teaching models, such as flipped classroom and virtual laboratories, DeepSeek has improved student engagement, problem-solving skills, and academic performance. Universities and K-12 institutions leverage its capabilities for automated lesson planning, intelligent admissions systems, and personalized learning, reducing costs and bridging resources gaps. However, challenges persist, including cybersecurity risks, technical limitations in complex reasoning, and disparities in AI adoption between regions, which exacerbate educational inequalities. Social concerns about academic integrity and data privacy further complicate its acceptance. To harness DeepSeek's potential, recommendations emphasize governance reforms, teacher-student competency development, and equitable AI integration. As DeepSeek accelerates AI-driven educational innovation, balancing technological advancement with ethical and inclusive practices remains critical for sustaining its transformative impact on China's education landscape.

Keywords: Artificial intelligence; Educational technology; DeepSeek; China education reform; AI ethics.

1. Introduction

DeepSeek, full name Hangzhou DeepSeek Artificial Intelligence Basic Technology Research Co., Ltd. is an innovative technology company that use data distillation techniques to obtain more experientially useful data. Models DeepSeek LLM, DeepSeek-Coder, DeepSeekMath, DeepSeek-VL, DeepSeek-V2, DeepSeek-Coder-V2 has been successively released from January 5 to June 2024. As for February 9, the cumulative number of downloads for DeepSeek has exceeded 110 million. On February 20, it was reported that over 200 companies have announced their integration with DeepSeek [1]. According to the OECD's assessment of AI capabilities, results indicate that as early as 2021, AI surpassed the average human level in reading, writing, and arithmetic. It is predicted that by 2026, AI may be capable of completing all reading, writing and arithmetic tasks, signaling an imminent disruption to the traditional education landscape [2]. Considering the comprehensive forecast and the practical background of modern development, its impact on various fields, especially education, has become increasingly evident. The emergence of DeepSeek heralds a broader application prospect of artificial intelligence in education, which is both an opportunity and a challenge. The application of DeepSeek in the field of education is quite promising. Its significant reduction in computational power requirements, coupled with high cost-effectiveness, makes it possible to develop AI tools in more primary schools and secondary schools, effectively promoting the universalization of high-quality educational resources.

In the global competition where the iteration cycle of artificial intelligence technology is rapidly compressed, the phenomenon and breakthrough of DeepSeek topping the APP Store download chart not only marked the first time that Chinese large-scale technology has surpassed Silicon Valley leaders, but also reveal profound changes in the paradigm of technological innovation in the era of digital civilization. However, in the discussions about the Sino-US AI competition, the focus often lies on technological breakthroughs, market dynamics, capital strength, and the race for global technological dominance. The true crux may transcend these aspects, centering on who can make deeper and more lasting contributions to the global community and who can provide more public goods and universal value to the world. This perspective not only challenges traditional viewpoints

but also prompts us to rethink the essence of international technological competition and to understand the value and the significance of DeepSeek from a broader perspective. The influence and construction of technology on educational relationships, fundamentally speaking, is a paradigm revolution at the level of educational ontology. The significance of this innovation lies in breaking the traditional epistemology of subject-object dichotomy and constructing a new intersubjective relationship through the mediating role of technology. When DeepSeek enters the educational process as the "tertiary element", the traditional "teacher-student" dual structure is dismantled into an interactive network of "teacher-technology-student". This reconstruction is not merely a simple accumulation of technological tools but a transformation in the ontology of educational interaction, becoming a field where inter-subjective meanings are negotiated [3].

2. DeepSeek's Technical Features and Educational Adaptability

2.1. Core Technical Advantages

The MoE algorithm can be regarded as an integrate learning technology applied in the field of ensemble learning. Deepseek's MoE architecture enhanced educational scenarios significantly. The resulting data stand out in the language education, especially grammar correction algorithms, it works better than mathematical reasoning [4]. While a group of laboratories compare DeepSeekMoE 16B with LLaMA2 7B, DeepSeekMoE 16B consistently outperforms models with a similar number of activated parameters by a large margin, and achieves comparable performance which has approximately 2.5 times the activated parameters [5].

2.2. Adaptable Educational Scenarios

NanJing Univerity use deepseek to help provide both teachers and students with more efficient and technological education system, the system will automatically generate a complete lesson plan framework including teaching objectives, teaching difficulties, classroom activity design, etc., so the lesson preparation time is shortened by more than 50% [6]. Meanwhile, DeepSeek can make the thinking process of a large language model explicit, allowing users to intuitively understand the reasoning process of a large language model and learn how to develop a structured thinking process in a variety of material [7].

3. Direct Impacts of DeepSeek on China's Education Sector

3.1. Innovation in Teaching Models

The DeepSeek-R1 model supports automatic generation of 3D scenes and multi-modal interaction, and has been applied to teaching scenarios such as virtual laboratories and historical scenes restoration [8]. The Onion Academy dismantled 600+ interview questions based on the competency model through Feishu, which is also cooperated with DeepSeek with its Metaverse Learning Ecosystem, and the pass rate of the initial examination increased from 28% to nearly 40% [9]. Another remarkable part of DeepSeek hybridizing with education is Flipped Classroom. A group of scientists did a survey with Flipped Classroom Teaching Mode in Animal Pharmacology Courses, the result data shows, compared with students from Traditional Teaching Class (class 1) and Flipped Classroom Teaching Class (class 2), the "Communication Skills" of class 2 is 23.7% higher than class 1, the "Ability of Active Inquiry" of class 2 is 14.8% higher than class 1, the "Ability to Analyze Problems" of class 2 is 11.1% higher than class 1, the "Self-directed Learning Ability" of class 2 is 16.6% higher than class 1 and the other ability of class 2 is 4.6% higher than class 1[10]. The result shows Flipped Classroom improves student's abilities in all parts significantly.

3.2. Intelligent Educational Management

In Futian District, Shenzhen, the first batch of AI "Smart Employees" developed based on DeepSeek has been launched, covering 11 categories of government scenarios including government processing, public services, emergency management and investment promotion. With the help of the AI "Smart Employees", the accuracy of document format correction exceeds 95%, the review time is shortened by 90%, and the error rate is controlled within 5% [11]. This shows DeepSeek help realizing the intelligent leap of the digital government. On the other hand, while DeepSeek is eventually accompanied with schools, it subtly changed the role that teachers playing. Teachers are gradually shifting from the roles of knowledge authority and knowledge transmitters to becoming students' learning companions, collaborators, guides, and supporters. When DeepSeek enters the field of education, it will take over the classroom in part and play the role of supporter, interlocutor, leader, evaluator and supervisor.

3.3. Research and Academic Support

The traditional information clinic teaching mode has problems such as insufficient teaching content, lack of modernity, insufficient teaching methods, and lack of interest, which is difficult to meet the personalized and in-depth learning needs of students. DeepSeek offers a new opportunity for enhancing information retrieval teaching services in university libraries. The brand activity XianYue (Living library) carried out by the Shanghai Jiao Tong University have been widely welcomed by the teachers and students, and won the first prize of the first National University Library Reading Promotion Case Competition [12]. DeepSeek can build users portraits based on users' borrowing history, browsing records, subject specializations and other information to provide readers with high-quality human library services. Therefore, many university libraries have used DeepSeek to build human library to promote reading activities. The existence of DeepSeek is also necessary to enhance the China's technology assets. In industrial quality inspection scenarios, DeepSeek's multimodal architecture combines image defect detection with equipment vibration data, boosting accuracy to 99.2% which is 12.2% higher than traditional unimodal model [13].

4. Case Studies

4.1. University Applications

4.1.1 Examples

As a strategic high ground for ideological work and a core field of talent cultivation, the efficiency of ideological and political education is related to the national ideological security and the quantity of strategic talent reserve. DeepSeek technology, leveraging multi-model data fusion, drives a paradigm shift in ideological and political education through three mechanisms: constructing cognitive maps, adapting content, and evaluating effectiveness. This shift transforms the field from experience-based to data-driven, from group-oriented to precise, and from vague outcomes to controllable results. This technology empowerment reshapes interactive relationships and triggers multidimensional changes in education. On March 4, 2025, Henan University of Technology's Intelligent Enrollment Q&A System officially upgrades and integrates Deepseek [14]. On March 6, 2025, Tianjin University's Intelligent Enrollment Q&A System officially upgrades and integrates Deepseek [15]. On March 14, 2025, 20 universities including East China University of Science and Technology, Shanghai Maritime University, Shanghai Ocean University and Shanghai University of Engineering Science etc., has also upgraded their Intelligent Enrollment Q&A System and integrated DeepSeek [16]. Besides these universities, there are many other universities who choose to integrate DeepSeek into their admission system.

4.1.2 Influence

Their choices certainly come with significant advantages. First, with the support of DeepSeek, the consultation responses will be more accurate. When it comes to complex college admission policies or minor questions about campus life, now it's only need to consult the intelligent Q&A system. It leverages the powerful semantic understanding capabilities of the DeepSeek large language model to quickly identify the inquiry and provide precise answers. Second, with the support of DeepSeek, the consultation responses will become more intelligent. Firstly, it supports smoother multi-round dialogs interactions. Not only does it enhance intent recognition, but by deeply integrating DeepSeek, the intelligent admissions Q&A system can better support multi-turn conversation. This allows for continuous communication during the consultation process and provides coherent, logical answers based on the context of the dialogs, addressing the needs of continuous questioning from students and their parents. Secondly, the intelligent admission inquiry system not only directly addresses doubts but also, while responding to questions, smartly links to related professional introductions and campus culture, providing students and parents with a comprehensive, multi-angled understanding of the school. Thirdly, the DeepSeek empowered consultation responses are more empathetic. The DeepSeek version of the intelligence enrollment Q&A system also knows how to listen and care, and can flexibly adjust the tone and content of the response based on the context of the question. It will provide support and companionship to candidates with the warmest and the most encouraging words, walking through this important journey together.

4.2. K-12 Education Scenarios

4.2.1 Data Collected

The definition of K-12 Education is "Kindergarten through 12th grades", it means the educational period from a child's kindergarten till his graduation of high school, it encompasses the golden period of children's growth, the most critical learning stage in life. According to the statistics, China's K-12 education industry market size exceeded 500 billion yuan in 2018, a figure that amply demonstrates the vast potential and development space of K-12 education market [17]. Take an example of mathematics, by 2023, AI had already surpassed human levels in competitive-level exams, let alone the further enhanced reasoning capabilities of DeepSeek. This is not only indicating that AI's performance in high-difficulty exams has exceeded that of humans but also reflects significant advancements in its ability to integrate knowledge and reason. This fact implies to parents that in terms of the knowledge volume contained in K-12 education, DeepSeek comprehensive capabilities is larger than human teachers. Another fact of these days is the gradual restoration of the two-day weekend system for high school students, which is actually bad news for some parents.

4.2.2 Reasons

As for the reason is pretty simple, if high school students are staying at school, the only difference among them would be their learning abilities. Even though it might be difficult to improve, the overall expectation is manageable. However, after the two-day weekend been restored, there are more variables, most of the families do not have the ability to hire a private tutor. DeepSeek however, as a free tool, stands out for its superior cost-effectiveness compared to paid tutoring. Students can leverage DeepSeek to obtain instant and systematic solutions. This fact offers parents insight DeepSeek can not only provide educational assistance that exceeds average standards, but more importantly, its cost is significantly lower than human teachers. Nowadays, there are also more educational tutoring institutions choose to add DeepSeek into their teaching systems, famous companies like Shengtong Education use robots to teach classes, which is basically focused on children in kindergarten, primary school and high school. Zhonggong Education use DeepSeek as the core of education system, provide targeted courses based on students' levels, makes them improve their weakness even faster than regular learning. Many educational fund-raising institutions like Duolingo, Youdao, iFlytek, Jiafa Education and Good Future have incorporated DeepSeek into their

own series of self-developed AI models, achieving deep integration of business data and applications in the education industry [18].

5. Challenges and Controversies

5.1. Technical Limitations

5.1.1 Risk Experiences

While the DeepSeek series models have gained immense popularity, they have also faced significant cybersecurity threats. In response, several domestic cybersecurity companies have released security reports. According to 360 security experts speaking to the Global Times, the attacks targeting DeepSeek have been diverse and characterized by high organization and scale, which can be roughly divided into three stages. According to monitoring data from 360 Security Big Model, the first stage saw DeepSeek frequently targeted by Distributed Denial of Service (DDoS) attacks, primarily involving minor HTTP proxy attacks. From January 20th, reflective amplification attacks using NTP, SSDP, CLDAP, and other protocols began to emerge. The second stage commenced at noon on January 27th, with a significant increase in HTTP proxy attacks against DeepSeek, escalating the difficulty of defense and deepening the impact, ultimately affecting the stability of DeepSeek's business services until early morning. In response, DeepSeek urgently switched service IPs in the early hours of January 28th. The third stage began in the early hours of January 30th, with the attacks intensifying. Botnet gangs such as RapperBot and HailBot, which profit from providing DDoS attack services, started participating in the attacks. Data from the 360 Security Big Model shows that the number of botnet attack commands captured surged within three hours of the early morning of January 30th, focusing DeepSeek to add another service IP [19].

5.1.2 Inflection on Educational Field

This demonstrates that the openness and scalability of large models expose them to various security threats during training and inference, including data poisoning, backdoor implantation, adversarial attacks, and data leakage. If this phenomenon occurs in the education sector, it inevitably raises concerns about the potential leakage of student and teacher data and privacy. This poses a critical security risk for students and parents, as it could lead to identity theft, who could fake application materials and malicious registration of educational system accounts, which in turn could negatively impact a student's school admissions prospects. Another problem would be the predicament of large models in surpassing human capabilities on open-ended questions. Despite their remarkable performance across various tasks, large models still face significant challenges in complex problems requiring deep reasoning and specialized knowledge. Taking the GPQADiamond benchmark dataset as an example, this dataset is specifically designed to assess reasoning capabilities and expertise level of models in complex scenarios. Even for humans with doctoral academic training, the accuracy rate in answering these questions typically ranges between 65% and 70%. Currently, the performance of the largest models on such questions remains considerably below human standards [20].

5.1.3 Model Problems

There's another problem is large models are currently undergoing a double-helix evolution characterized by the intertwining of two curves. The ascending curve focuses on achieving general intelligence by pursuing comprehensive cognitive, perceptual, and behavioral capabilities. This involves competing in overall brain-like abilities in terms of understanding, including thinking, meta-thinking, holistic comprehension encompassing vision, spatial intelligence, and real-world models, as well as scientific models such as physics. Multimodal capabilities are also a given. The core of current frontier research lies in exploring chain-of-thought reasoning, cortical computing, and different model principles. The descending curve, on the other hand, aims to enhance data quality, improve the efficiency, and significantly reduced inference costs. Within this double-helix framework,

DeepSeek demonstrates potential in the downward trajectory but remains limited in its upward progression [21].

5.2. Social Acceptance

Most schools, particularly primary and secondary institutions, are constrained by hardware resources, technical proficiency, and operational costs, rendering them reliant on the public platforms provided by DeepSeek. However, these platforms frequently encounter issue due to high concurrent access, resulting in unattainable responses. This disparity in technical accessibility exacerbates the existing gap in artificial intelligence resources between regions and schools, intensifying inequalities in educational opportunities and widening the education divide. Additionally, varying levels of emphasis on artificial intelligence technology and the information literacy of teachers and students across different regions and schools contribute to disparities. In remote areas, the inability or suboptimal use of AI tools by educators and students can hinder comprehensive development in the era of intelligence, leading to a secondary digital divide. From an alternative perspective, a significant portion of students currently prefer to utilize DeepSeek to assist in completing their assignments and computational processes, with some even employing it to conduct their academic research. This practice, to a certain extent, constitutes an academic dishonesty, posing not only a detriment to the students themselves but also to the institutions and the academic community at large. The institution guides students in utilizing AI for learning while mitigating dependency, alternatively, it develops interactive teaching modules, such as the DeepSeek component. Consequently, students fail to acquire the knowledge they are expected to learn within the educational system, which may hinder their potential achievements and contributions in society. Moreover, this could potentially impact the thoughts and behaviors of future generations. In this regard, it may lead to misunderstandings and resistance among some parents and educators towards DeepSeek and other advanced technological tools.

6. Future Prospects and Recommendations

DeepSeek-V3, ChatGPT-o1, Grok3, and similar models represent the future direction of large-scale models. We collectively refer to these as DeepSeek-type large models. To capitalize on the opportunities presented by generative artificial intelligence while mitigating the potential risks associated with DeepSeek-type large models, and to better facilitate the construction of a powerful educational nation, efforts should be focused on five key areas: improving governance systems, innovating talent cultivation models, enhancing teachers and student competencies, refining application scenarios, and establishing consortia. Enhancing the construction of the "National Platform for Online Collective Lesson Preparation among Ideological and Political Theory Teachers in Higher Education Institutions", the initiative aims to refine the online lesson preparation support system for such faculty. A mechanism for vertical interdisciplinary and horizontal cross-disciplinary exchange and professional development will be established, fostering in-depth teaching exchange and discussion among ideological and political theory teachers across adjacent educational stages. Efforts will be made to promote an exchange mechanism between ideological and political theory teachers and faculty from other academic disciplines. Significant strides will be taken in reforming teaching methods for ideological and political theory courses, enhancing teachers' information literacy, and integrating modern technologies such as artificial intelligence into the teaching of these courses. The establishment of series of national virtual simulation experience teaching centers for ideological and political theory courses is also planned [22]. DeepSeek's "high-energy" contribution to personalized learning surpasses that for teachers, demonstrating significant superiority in learning depth, breadth, and efficiency. Consequently, the relationship between teaching and learning will undergo a transformation, with learning progressively evolving into a self-directed, conscious, and planned activity for students. The educational ecosystem will essentially transition towards a learner-centric paradigm. In response to this shift, schools should productively integrate DeepSeek and other AI

technologies to construct a "learning-centered" classroom ecosystem in anticipation of the advent of the learner-centric environment.

7. Conclusion

With the sequential integration and deployment of DeepSeek by multiple universities, educational think tanks, and information platforms, including the continuous promotion of DeepSeek application training in policy formulation and practical use within the education sector, the surge in DeepSeek integration continuous to gain momentum. This phenomenon indicates that society has increasingly accepted and recognized DeepSeek at various conceptual and ideological levels. The relationship between DeepSeek and human education is gradually being scientifically revealed and widely knowledge. The phenomenon and rapidly popularity of DeepSeek in the education sector has also accelerated the deployment of artificial intelligence (AI) in educational contexts. This has led to a more systematic and profound adaption of China's educational management systems and research frameworks to evolving trends of AI-driven education. Although the integration process of DeepSeek is advancing rapidly, it is essential to recognize that this transformation is not instantaneous but requires a sustained and relatively lengthy period. Given the extensive nature of the education system, this transformation not only pertains to education but also impacts national and societal development in the future. Therefore, for both integrating China into the global modernization track and enhancing convenience in our daily lives and learning experiences, we should embrace DeepSeek's arrival with an inclusive attitude, facilitate its integration into our educational systems and daily lives, actively align with national policies, and promote educational reform accordingly. Concurrently, DeepSeek should identify its shortcomings and address various technological deficiencies to expedite and enhance its assistance in both academic and daily life, aiming ti facilitate the adaption to a high-tech lifestyle through the most convenient means, thereby ensuring continuous alignment with globe advancements.

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