

Opportunities, Risks and Countermeasures of Generative Artificial Intelligence Applied in Higher Education

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Abstract: *As a cutting-edge branch in the field of artificial intelligence, generative artificial intelligence (GAI) focuses on learning patterns and rules in data and creating brand-new content based on this. With its characteristics of originality, multimodality, interactivity, and emergence, GAI is profoundly changing the landscape of higher education and gradually becoming an important force in reshaping the ecological pattern of higher education. On the one hand, GAI brings enormous opportunities for the development of higher education: it can expand learning scenarios, transform teaching models, and optimize educational management, thereby promoting educational equity, improving teaching efficiency, and enhancing educational quality. On the other hand, GAI also poses certain risks and challenges to the development of higher education: technological dependence, technological abuse, and technological limitations have, to a certain extent, weakened the subjectivity of teachers and students, easily triggered potential ethical risks, and led to educational biases and discrimination. Based on this, efforts should be focused on promoting technological development, stimulating subjective awareness, and improving supervision mechanisms to contribute to the high-quality development of higher education.*

Keywords: *Generative Artificial Intelligence; Higher Education; Opportunities; Risks*

1. Introduction

With the rapid development of science and technology, artificial intelligence technology has gradually evolved from the initial rule-based logical reasoning to today's data-driven deep learning, and its connotation is constantly deepening and expanding from "imitating human behavior" to "exploring the essence of intelligence". Currently, generative artificial intelligence represented by ChatGPT and DeepSeek is accelerating its development, having become a crucial driving force leading the new technological revolution and reshaping information acquisition, application interaction, and industry ecology. Higher education, which is a professional and academic education provided by universities, colleges, higher vocational colleges, etc., on the basis of completing secondary education, is not merely a simple continuation of secondary school knowledge but a qualitative leap. It is more professional, academic, autonomous, and open. It is not only a key upgrading stage in an individual's life course but also a core engine and source of wisdom for the development of a country and society. Today, GAI has been widely penetrated into all aspects of higher education, profoundly changing the traditional models of education, teaching, and management, and putting forward new requirements and challenges for the development of higher education in the new era. How to accurately grasp the opportunities brought by GAI to higher education and effectively respond to its potential risks and challenges is an important issue that every higher education practitioner must consider.

2. Opportunities of Generative Artificial Intelligence Applied in Higher Education

Higher education, which is different from primary and secondary education, is a comprehensive and systematic project integrating advanced knowledge, professional education, academic research, personality shaping, and social responsibility, and it undertakes important responsibilities. GAI is not just a technology but an interdisciplinary subject integrating computer science, mathematics, psychology, linguistics, neuroscience, philosophy, and other disciplines. Applying it to higher education can effectively promote educational equity, improve teaching efficiency, and enhance educational quality.

2.1 Expanding Learning Scenarios and Promoting Educational Equity

Teaching scenarios in traditional higher education are mostly concentrated in classrooms, libraries, laboratories, and other places with relatively fixed time and space. Educational resources and teaching staff also show significant differences due to regional and identity disparities. High-quality educational resources are relatively scarce, which restricts educational equity to a certain extent. However, the application of GAI in higher education has one of the most revolutionary impacts: it can break the temporal and spatial boundaries and resource barriers of traditional higher education through technology, significantly expand learning scenarios, and effectively promote educational equity. "It seems likely that the diffusion—and continuous improvement—of GenAI tools will change the way research is performed and evaluated".^[1] On the one hand, it helps expand learning scenarios from "fixed classrooms" to "full-scenario learning". "Incorporating GAI tools such as ChatGPT into educational settings opens avenues for customized learning experiences, significantly benefiting students".^[2] GAI can not only generate customized learning content and provide personalized learning support according to students' knowledge foundation, learning progress, and interests but also make students' learning no longer limited to classrooms and textbooks, creating a highly flexible learning environment for students. On the other hand, it helps shift educational resources from "resource inclination" to "equal opportunities". The core of educational equity lies in enabling students from different regions and backgrounds to obtain educational opportunities and resources of the same quality. However, due to subjective and objective reasons, colleges and universities in central and western China and rural areas are often unable to obtain high-quality educational resources and teaching staff. GAI can just make up for the distribution gap of high-quality teachers and scarce resources among regions and groups, effectively promoting educational equity. In conclusion, GAI greatly expands the breadth and depth of learning scenarios by creating immersive experiences and dynamically generating content. At the same time, it promotes educational equity from multiple dimensions of "resource allocation", "process support", and "result achievement" by diluting high-quality resources, providing personalized support, and lowering participation thresholds.

2.2 Transforming Teaching Models and Improving Teaching Efficiency

The application of GAI in higher education essentially reconstructs the relationship between "teaching" and "learning" through "human-machine collaboration". The traditional teaching model is a one-way transmission led by teachers. Teachers need to spend a lot of time completing teaching tasks, and classroom teaching mostly follows the process of "pre-class preview - in-class teaching - after-class homework", which is difficult to adapt to the learning rhythm of different students, resulting in low learning efficiency. The application of GAI in higher education is revolutionary in transforming teaching models and improving learning efficiency: it shifts the teaching model from "one-way transmission led by teachers" to "student-centered adaptive learning", and the improvement of teaching efficiency is a direct result of this model transformation. This not only frees teachers from repetitive work but also makes students' learning more accurate and efficient. Specifically, GAI can realize the transformation of the teaching model from "teacher-centered" to "student-centered", and achieve the improvement of efficiency on both the "teacher side" and the "student side". On the one hand, "when teachers are the primary users of GAI tools, GAI helps them create course outlines, develop the necessary resources, and support various teaching activities, such as design-based teaching",^[3] allowing teachers to invest more energy and time in creative teaching design and thinking guidance, thus effectively improving teaching efficiency. On the other hand, GAI can undertake low-level tasks such as memory, searching, and formatting, and adapt to the learning rhythm of different students through data analysis, making personalized learning a reality and effectively improving learning efficiency. In summary, the empowerment of GAI to teaching models and efficiency is essentially a transformation of production relations. It reconstructs the process of teaching and learning through personalization, interaction, and simulation, and at the same time greatly releases the productivity of both teachers and students through automation and dataization.

2.3 Optimizing Educational Management and Enhancing Educational Quality

Educational management is a huge system involving enrollment, course scheduling, student status, finance, personnel, logistics, and other aspects. The traditional management method is often slow in response and fragmented in data. The involvement of GAI has brought fundamental changes to the management method of higher education. On the one hand, the optimization of educational management by GAI mainly focuses on replacing repetitive manual work and excavating data value,

shifting management from "passive response" to "proactive prediction", covering core scenarios such as administration, resource management, and teacher-student management. In the administrative work of colleges and universities, a large number of procedural tasks such as document processing, approval, and notification occupy human resources but have limited value. GAI can directly take on such work, significantly improving management efficiency and pertinence. On the other hand, after GAI optimizes educational management, it does not stop at "efficiency improvement" but further enhances educational quality fundamentally through "accurate resource supply", "early problem intervention", and "targeted ability training", realizing the core goal of "management serving quality". In conclusion, the application of GAI in the management and quality improvement of higher education can be summarized as follows: it transforms educational management from an experience-dependent "reactive logistics service" to a data-dependent "forward-looking strategic engine", thereby systematically enhancing educational quality.

3. Risks of Generative Artificial Intelligence Applied in Higher Education

While bringing opportunities for the development of higher education, GAI also inevitably brings a series of potential risks and challenges due to technological dependence, technological abuse, and technological limitations. These risks not only involve the limitations of the technology itself but also relate to ethics, safety, quality assurance, and other aspects in the educational process.

3.1 Technological Dependence Weakens the Subjectivity of Teachers and Students

The application of GAI in higher education, while transforming the teaching model and improving teaching efficiency, may also lead to excessive technological dependence and weaken the subjectivity of teachers and students. In the context of higher education, subjectivity is an essential attribute of teachers and students as core participants in educational activities. When GAI is applied to higher education, the weakening of the subjectivity of teachers and students essentially means that "technological dependence" replaces the "active construction role" of teachers and students in education. Excessive dependence on GAI in the teaching and learning process will make teachers degenerate from "dominant designers of knowledge and teaching" to "passive users of AI achievements", which will weaken their teaching creativity, on-site resourcefulness, and dominance in education. Students, on the other hand, will degenerate from "active explorers of knowledge" to "passive receivers of AI answers", which may easily lead to the degradation of their independent inquiry ability and the lack of critical thinking ability. In the end, the most core subjectivity in education will be covered by the instrumentality of technology, which is not conducive to the long-term development of students. In conclusion, excessive dependence on GAI technology will lead to the degradation of students' core cognitive abilities such as critical thinking, in-depth research, writing conception, and memory consolidation; for teachers, it will lead to the weakening of their professional teaching abilities such as curriculum design, on-site adaptability, and individualized teaching; for colleges and universities, it will directly weaken the subjectivity of teachers and students, alienating the "wise people" that should be cultivated into "vassals of technology", which runs counter to the fundamental purpose of education.

3.2 Technological Abuse Triggers Potential Ethical Risks

As a new type of information technology, GAI is applied in various links and fields of higher education, such as teaching, scientific research, and management. Due to the imperfection of the corresponding normative system, technological abuse may easily trigger potential ethical risks. It should be noted that "technological abuse" is not "using technology" but "excessively relying on, improperly using, or maliciously exploiting technology". The ethical risks it triggers precisely impact the core values of higher education. The technological abuse of GAI in higher education essentially means that the use of technology deviates from the core goal of "serving the essence of education", breaks through ethical bottom lines such as academic integrity, data privacy, educational equity, and humanistic values, and ultimately triggers the potential risk of "tools alienating education", which is not an inevitable result of the technology itself. On the one hand, in terms of academic integrity, the "high efficiency" of GAI makes it easy to become a "shortcut" for students to complete homework and papers, leading to the proliferation of academic misconduct. "Academic pressures drive students toward instrumental utility over authentic learning".^[4] On the other hand, in terms of data privacy, the operation of GAI relies on massive data. If teachers and students in colleges and universities lack data

protection awareness during use, it may easily lead to the leakage of their own privacy or the abuse of data. In conclusion, these ethical risks are not isolated from each other but are interrelated. The core issue is how we can ensure that technology always serves as a tool for "educating people" rather than the other way around, allowing human nature to be eroded by technological logic.

3.3 Technological Limitations Lead to Educational Biases and Discrimination

The application of GAI in higher education relies on the process of "data training - algorithmic decision-making - scenario implementation". Technological limitations in any of these links will be amplified into biases and discrimination. The core chain is: technological limitations (data, algorithms, design) - output of biased educational content - disadvantaged position of specific groups in learning, evaluation, and resource acquisition - solidification of educational biases. Specifically, GAI models often learn by training on massive Internet data. These data inevitably contain stereotypes and biases in terms of gender, race, region, etc. which exist in the real world. During the learning process, algorithms will inevitably absorb and internalize these biases, and the content they generate will inevitably be biased. In addition, another technological limitation of GAI lies in the "opacity" of its algorithms, which makes it difficult to identify and correct biases. These technological limitations, when projected onto higher education, will have substantial impacts of biases and discrimination at multiple levels, posing a serious threat to educational equity and diversity. In conclusion, biases and discrimination are harmful in any field, but in education, their consequences are more destructive and long-term. Technological limitations often make artificial intelligence, although presenting an image of "technological neutrality" and "data-driven", systematically replicate, amplify, and even solidify existing biases and discrimination in society, putting discriminated groups in a more disadvantageous position in the educational process and ultimately widening the social gap in reality.

4. Countermeasures for Applying Generative Artificial Intelligence in Higher Education

Facing the risks and challenges brought by GAI to the development of higher education, the government, colleges and universities, society, and other parties need to work together. Starting from promoting technological development, stimulating subjective awareness, and improving supervision mechanisms, efforts should be made to resolve the potential risks brought by GAI to the development of higher education.

4.1 Stimulating Subjective Awareness and Improving Digital Intelligence Literacy

The potential risks of GAI in higher education are seemingly technical issues, but they are actually human issues, that is, whether teachers and students, as the main bodies of technology application, have the awareness and ability to effectively respond to risks. "GenAI integration requires a baseline level of creativity, self-discipline, and digital literacy, on the part of students as well as teachers".^[5] As core participants in educational activities, many potential risks of GAI are essentially caused by the lack of subjective awareness and low digital intelligence literacy of teachers and students in colleges and universities. "If without training or introduction to GenAI tools, faculty may struggle to recognize their benefits, leading to low adoption rates".^[6] Therefore, stimulating the subjective awareness of teachers and students and improving their digital intelligence literacy are the keys to resolving the potential risks brought by GAI to the development of higher education. On the one hand, efforts should be made to guide teachers to focus more on areas that are difficult for artificial intelligence to replace, such as emotional communication, thinking inspiration, and personality cultivation, in daily teaching, and promote the transformation of teachers' roles from knowledge imparters to "designers, guides of learning and shapers of values". On the other hand, it is necessary to focus on cultivating students' critical thinking, guide students to recognize the instrumental attribute of artificial intelligence, encourage students to remain cautious about the content generated by artificial intelligence, and regard it as a tool for inspiring thinking rather than a provider of standard answers. In conclusion, addressing the risks of GAI cannot rely solely on external regulation but must seek internal solutions: responding to risks by awakening the subjective awareness of teachers and students and enhancing their digital intelligence literacy.

4.2 Improving Supervision Mechanisms and Strengthening Ethical Awareness

Avoiding the potential risks of applying GAI in higher education is inseparable from improved

supervision mechanisms and strengthened ethical awareness. Improved supervision mechanisms and strengthened ethical awareness are not separated but form an organic whole that is "complementary and indispensable". On the one hand, supervision provides a guarantee for ethics; ethics without supervision are often fragile. The core of supervision is heteronomy, which aims to establish order, clarify responsibilities, and punish violations through external forces. Its core is to clarify rules, define the bottom line of what cannot be done, and avoid the unordered spread of risks. For this reason, the state needs to issue special laws and regulations for educational AI, clarify data privacy protection and anti-discrimination clauses, and strengthen supervision and standardization. At the school level, it is necessary not only to formulate a detailed Campus Guidelines for the Use of Generative AI to clarify the boundaries of AI use but also to strengthen technical monitoring and data governance covering the three scenarios of teaching, scientific research, and management, and do a good job in early prevention, process control, and post-event accountability. On the other hand, "ethics endow the soul to supervision". The core of ethical awareness is self-discipline, which is related to values, culture, and internal moral judgment, and is a deeper and more fundamental force for resolving risks. As the leader of ethical construction, colleges and universities need to make teachers and students internalize ethical norms through system design and cultural communication. As the direct disseminators of AI ethics, teachers need to actively practice ethical principles in teaching, scientific research, and management, and guide students to establish correct cognition. As the direct users of AI applications, students need to make ethical awareness an active choice rather than a passive constraint through education and practice. In conclusion, supervision and ethics complement each other and together form a dynamic and resilient governance system. Only by combining the improvement of supervision mechanisms with the strengthening of ethical awareness can we effectively respond to the risks brought by GAI to the development of higher education.

4.3 Promoting Technological Development and Eliminating Algorithmic Biases

To resolve the potential risks of GAI in higher education, especially to eliminate its algorithmic biases, "promoting technological development is the key". This is not about pursuing absolute neutrality of technology, but about directly repairing the technical defects that lead to risks through "conscious technological development, prudent data governance, and continuous algorithm optimization", minimizing the impact of biases, and ensuring that technology applications are "more fair, reliable, and beneficial", rather than relying solely on external supervision or ethical constraints. Most risks of GAI in higher education are essentially caused by technical deficiencies, and the algorithmic biases of GAI mainly stem from its learning materials and learning methods. Therefore, multi-dimensional and systematic interventions and optimizations should be carried out at the technical development level: it is necessary to build high-quality and diversified education-specific datasets, focus on "constructing and selecting high-quality educational data that is more representative of diverse cultures, regions, genders, and disciplinary perspectives for training", and establish a clear review mechanism, "develop bias detection tools to accurately identify and effectively eliminate content that is obviously discriminatory or stereotyped", and focus on building a fair, transparent, and inclusive educational algorithm. In short, promoting technological development and eliminating algorithmic biases need to always focus on the essential goals of higher education rather than simply pursuing advanced technology, so that artificial intelligence can shift from passively adapting to education to actively serving education. In conclusion, technical defects can be compensated by more advanced and responsible technologies. Regarding the problem of algorithmic biases caused by technical limitations, the core is to combat technical limitations through active technological development, which requires coordinated promotion from multiple levels such as data, algorithms, evaluation, and transparency, and strive to make GAI a fair, inclusive, transparent, and reliable learning partner.

5. Conclusions

In conclusion, as an emerging science and technology, the integration of GAI into higher education is not simply adding a tool to traditional teaching, but triggering a systematic transformation from teaching concepts, models to ecology, and bringing unprecedented opportunities and challenges to the development of higher education. In terms of opportunities, GAI has injected new vitality into the field of higher education, and its opportunities are comprehensive and profound, which are concentrated in reshaping teaching models, empowering learning experiences, promoting educational equity, and optimizing educational management. In terms of challenges, due to factors such as technological dependence, technological abuse, and technological limitations, GAI has brought potential risks to the

development of higher education in aspects such as the maintenance of academic integrity, algorithmic biases and data privacy, and the weakening of the subjectivity of teachers and students. Looking forward to the future, we must deeply recognize that the application of technology is ultimately to serve the development of people. GAI is not a subversion of traditional higher education but a catalyst for promoting its development. It requires us to embrace these opportunities while clearly recognizing the accompanying challenges, and through the joint efforts of the government, colleges and universities, and society, jointly promote the digital transformation of higher education and realize the harmonious and progressive development of humans and technology.

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