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How Can Generative Artificial Intelligence help Teachers in Early Childhood Education with their Teaching? Analyses from the Perspective of Teaching Methods

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Abstract

Importance: Generative Artificial Intelligence (GAI), including Chatgpt and Gemini, has become an important area of current technological development, and it permeates all aspects of people's lives, learning and work. This study focused on how Generative Artificial Intelligence can support teaching and learning in early childhood education. Methodology: This study adopted Systematic Literature Review method, which includes determining the topic, forming keywords, searching for literature, building & analyzing the themes, and forming conclusions. Findings: Generative Artificial Intelligence technology has a wide range of applications in curriculum and Instruction, educational psychology, educational management, educational technology and other educational fields. Kindergarten teaching has various characteristics, including focusing on comprehensive development, using games as the main form of activity, attaching importance to emotional education, focusing on personality development and attaching importance to comprehensive evaluation. Based on these circumstances, Generative Artificial Intelligence can improve and promote teaching methods in early childhood education in many ways, including Lecture, Discussion, Conversation, Reading guidance, Practice, Demonstration, and Discovery. Suggestions: Actively leveraging Generative Artificial Intelligence for early childhood education requires investment in user-friendly applications and tools tailored for this purpose. Educating teachers and educators on utilizing relevant technologies effectively is crucial to maximize their teaching potential. Establishing a collaborative framework between teachers and Generative Artificial Intelligence ensures personalized learning experiences for young children while maintaining data security and privacy compliance.

Keywords: Generative Artificial Intelligence, Chatgpt, Curriculum and Instruction, Teaching Methods, Early Childhood Education.

Introduction

In today's era of rapid digital development, Generative Artificial Intelligence technology, as an innovative tool, is gradually penetrating into various fields, including education.

Kindergarten teachers often face a variety of challenges in the teaching process, including how to better meet children's learning needs and provide personalised teaching support. The emergence of Generative Artificial Intelligence technology has brought new solutions and possibilities for teachers to become their right hand in the teaching process. In this paper, we will discuss various issues of Generative Artificial Intelligence in early childhood education.

Firstly, we will analyse the characteristics of Generative Artificial Intelligence in detail. Generative Artificial Intelligence is a technology that can mimic human thinking and creativity by learning a large amount of data to generate new content, such as text, images, music, and so on. Compared with traditional AI, Generative Artificial Intelligence is more flexible and versatile, capable of generating creative works on its own, which brings new possibilities for teaching.

Secondly, we will analyse the specificity of kindergarten teaching, which requires teachers to use a variety of teaching methods and techniques. Young children's cognitive abilities and learning styles are very different from those of adults, so teachers need to take into account the characteristics and needs of young children and flexibly use a variety of teaching methods to stimulate children's interest in learning and promote their overall development.

Next, we will explore the application of Generative Artificial Intelligence technology in kindergarten teaching. Generative Artificial Intelligence can provide teachers with rich and diverse teaching resources and tools, such as intelligent teaching assistants, personalised learning platforms, etc., to help teachers better meet the learning needs of young children and improve the teaching effect.
Finally, let's focus on analysing how Generative Artificial Intelligence can improve teaching methods. Generative Artificial Intelligence technology can help teachers discover and explore more effective teaching methods and strategies by analysing a large amount of teaching data and research results. For example, through intelligent teaching platforms and apps, teachers can tailor their teaching content to the learning characteristics and needs of each child, providing a more personalised and targeted learning experience.

In summary, Generative Artificial Intelligence technology provides kindergarten teachers with new teaching tools and resources to help them better meet the learning needs of young children and improve teaching effectiveness. In the future, with the continuous development and application of Generative Artificial Intelligence technology, it is believed that it will play an increasingly important role in the field of kindergarten education.

Characteristics of Generative Artificial Intelligence, and Education

In today's era of rapid digital development, artificial intelligence technology has become one of the key driving forces for the development of human society. Among them, Generative Artificial Intelligence, as an important branch of Artificial Intelligence technology, has unique characteristics and potentials and is leading the wave of technological revolution. In this paper, we will explore the characteristics of Generative Artificial Intelligence in depth from multiple perspectives, aiming to provide readers with a comprehensive and in-depth understanding.
Generative Artificial Intelligence (GAI), a deep learning-based AI technology, has the core capability of generating content such as new data, images, text, or audio by learning from

large amounts of data (Elastic, n.d.). They are usually based on techniques such as deep learning and neural networks, which use large amounts of training data to learn patterns and regularities. The basic principle is achieved by means of Generative Adversarial Networks (GANs), in which two modules, the generator and the discriminator, play with each other. The generator is responsible for generating fake data, while the discriminator is responsible for distinguishing between true and false data. Through constant competition and learning, the generator and discriminator can promote each other to achieve the purpose of generating high-quality data (Baidu, 2024).

Generative Artificial Intelligence is amazingly creative and imaginative and can autonomously generate creative and unique content by learning and imitating human creativity and imagination (Huaweicloud, 2023). Generative Artificial Intelligence technologies can generate realistic images, text, audio, and other content, demonstrating amazing creativity. For example, through Generative Adversarial Networks (GAN), the generator can generate realistic images, while the discriminator can judge the authenticity of these images, and through continuous confrontation and learning, the generator can generate more and more realistic images, which is extremely creative and imaginative.
Generative Artificial Intelligence has a strong learning ability and can continuously improve its performance by learning a large amount of data. Through techniques such as deep learning and neural networks, Generative Artificial Intelligence can learn various patterns and laws from data and use them to generate new content. For example, in the field of image generation, Generative Artificial Intelligence can learn various image features, such as edges, textures, colours, etc., and then use these features to generate realistic images (Wang, 2019). Through continuous learning and training, Generative Artificial Intelligence can continuously improve its performance and generate more realistic and diverse content.

The content generated by Generative Artificial Intelligence usually has diversity and variability, and the generated results may be different even with the same input data. This diversity and variability allows Generative Artificial Intelligence a great deal of flexibility in terms of creation and innovation. For example, in the field of text generation, Generative Artificial Intelligence can generate diverse articles, stories and even poems, thus providing creators with colourful creative inspiration (Zhang & Du, 2021). Through continuous generation and creation, Generative Artificial Intelligence can continuously expand its own creative space and generate richer and more diverse content.

The content generated by Generative Artificial Intelligence usually has a high degree of fidelity, and it is difficult for humans to distinguish the real from the fake. For example, in the field of image generation, Generative Artificial Intelligence can generate photo-realistic photos, landscapes and other images, making it difficult for people to tell the difference between them and real photos (Li, 2023). This high degree of realism makes Generative Artificial Intelligence widely applicable in the fields of virtual reality, simulation and emulation. The content generated by Generative Artificial Intelligence can provide realistic scenes and environments for virtual reality applications and real data and scenarios for simulation, thus improving the realism and fidelity of the system.

Generative Artificial Intelligence has a wide range of applications covering various fields, including art creation, content generation, video game development, virtual reality, and

medical image processing (Deloitte, 2023). For example, in the field of artistic creation, Generative Artificial Intelligence can generate artworks, such as paintings, music, etc.; in the field of content generation, it can generate content such as articles, news reports, etc.; in the field of video game development, it can generate game scenarios, characters, etc.; in the field of virtual reality, it can generate realistic virtual environments; and in the field of medical science, it can help doctors and experts to make judgements and analyses. Generative Artificial Intelligence technology has a wide range of applications in various educational fields, and below we will analyse its specific applications in educational fields such as Curriculum and Instruction, educational psychology, educational management and educational technology:

(1) Curriculum and Instruction

In the field of Curriculum and Instruction, Generative Artificial Intelligence techniques can help teachers design and plan intelligent course content and lesson plans. By analysing students' learning needs and course objectives, some Generative Artificial Intelligence can automatically generate course content and lesson plans that are suitable for them, thus improving the quality of the course and its teaching effectiveness (Planitteachers, n.d.). For example, some intelligent course design tools can automatically generate challenging and interesting course content and lesson plans based on course objectives and students' learning needs, which can better meet students' learning needs and improve teaching effectiveness (Bissoondath, 2023).

(2) Educational Psychology

In the field of educational psychology, Generative Artificial Intelligence technology can help researchers gain insight into the psychological mechanisms and laws of the learning process. By analysing a large amount of learning data and behaviours, Generative Artificial Intelligence can discover learners' learning patterns and psychological characteristics, thus providing new perspectives and methods for educational psychology research. For example, some platforms based on Generative Artificial Intelligence can analyse a series of students' behaviours and use multi-dimensional indicators for mental health evaluation, which can achieve the transformation of mental health monitoring from static monitoring to dynamic management, and mental health evaluation from subjective evaluation to big data algorithmic evaluation, and help researchers better understand the psychological changes and developmental patterns in the learning process (Pang et al., 2022).

(3) Education Management

In the field of education management, Generative Artificial Intelligence technology can help schools and educational institutions manage and optimise educational resources. By analysing students' learning data and behaviours, Generative Artificial Intelligence can provide decision-making support and management advice to educational administrators, helping them to better formulate educational policies and plan for educational development. Xie (2021) argues that Artificial Intelligence has been widely used in three areas, namely, teaching management, moral education management, and general management, and has great advantages, with a strong development trend and outlook, and it should be maximised to realise the benefits of The application of artificial intelligence in campus management and classroom teaching should be maximised.

(4) Education Technology

In the field of education technology, Generative Artificial Intelligence can help developers of education technology to design and develop intelligent education products and services. Under the background of artificial intelligence, deep learning, personalised learning, adaptive learning and human-computer collaborative learning have gradually become the mainstream learning modes, and the change of learning modes directly promotes the transformation of curriculum and teaching paradigm. As far as the curriculum is concerned, the technological paradigm of the curriculum is becoming more and more prominent, and with the help of artificial intelligence and other technologies, more attention is paid to the intersection and integration of different disciplines in the orientation of the curriculum; in the form of the curriculum, it has begun to change from static, paper-based, and monotonous to dynamic, online, and networked; in the content of the curriculum, it has gradually shifted from a kind of fixed, unified, and limited to private customisation, unlimited, and open; in the case of teaching, it has become more and more important for the teaching and learning paradigm to be changed. In terms of teaching objectives, more attention is paid to the cultivation of students' soft skills and core literacy; in terms of teaching methods, the focus has begun to be on the integration and application of new technologies and media; in terms of teaching content, there has been a shift to pay attention to and teach emerging fields such as artificial intelligence; and in terms of teaching evaluation, more attention is paid to the process of evaluation, accuracy, data, and personalisation, and so on (Qiu et al., 2020).

In summary, Generative Artificial Intelligence technology has a wide range of applications in Curriculum and Instruction, educational psychology, educational management, educational technology and other educational fields. With the continuous development and application of technology, it is believed that Generative Artificial Intelligence will play an increasingly important role in the field of education, providing more possibilities for educational reform and teaching innovation.

Characteristics of Teaching in Early Childhood Education

Next, we will discuss what exactly are the characteristics of teaching and learning in early childhood education, and these will help us to further analyse what role and significance Generative Artificial Intelligence can play in it.

Focus on holistic development

Kindergarten teaching focuses on the holistic development of young children, which is one of its most distinctive features. In kindergarten education, not only focusing on the teaching of subject knowledge, but also focusing on the cultivation of children's comprehensive literacy. Teachers should combine the age characteristics of young children, the education of young children in the form of 'inspiration', and cultivate the overall quality of young children in various aspects, including but not limited to social skills, scientific literacy, and the basic ability of life (Liang, 2019).

Play as the main form of activity

Kindergarten teaching uses play as the main form of activity, which is a major feature of early childhood education. Play is a natural way of learning for young children, through which they can explore, experience and discover the world on their own, stimulate their curiosity and desire for knowledge, and cultivate their thinking ability and creativity. In kindergarten

teaching, teachers create colourful learning environments and situations for children through various games and play activities, and guide them to actively participate in the learning process. Early childhood game education has the characteristics of fun, entertainment, competition, purpose and education, which can better stimulate children's interest in learning and improve the effectiveness of early childhood teaching. The essence of game education is the organic combination of games and teaching, which is a stage innovation achievement of teaching reform, and it has far-reaching value and influence, becoming a powerful teaching mode for educators (Zhou, 2015). For example, through role-playing games, young children can imitate the behaviours and roles of adults and cultivate their social interaction and emotional cognitive abilities; through block building and jigsaw puzzles, young children can exercise their spatial imagination and hand-eye coordination, and improve their logical thinking and problem-solving abilities; through music games and dance activities, young children can feel the beauty of music and the rhythmic of the music, and Through music games and dance activities, children can feel the beauty of music and rhythmic rhythms, and cultivate their musical expression ability and aesthetic taste. Games are not only a kind of recreational activity, but also an effective way of learning, which can help stimulate children's interest and motivation in learning, and improve their learning effect and performance.

Emphasis on Emotional Education

Kindergarten teaching attaches importance to emotional education, cultivating good emotional qualities and social interaction ability of early childhood education, which is one of the important tasks of early childhood education. The early childhood stage is a key period of social development, and good interpersonal relationships and interpersonal skills have an important impact on the physical and mental development of young children as well as the role of knowledge, ability and wisdom (Dong, 2018). In kindergarten teaching, teachers focus on cultivating young children's emotional cognitive ability and emotional expression ability, helping them establish positive and healthy emotional attitudes and values, and cultivating their empathy and sense of responsibility (Ma, 2021). For example, teachers can guide young children to know and express their own emotions, learn to understand and respect the emotions of others, and cultivate their emotional cognitive ability and emotional expression ability through emotional education courses and emotional storytelling; through emotional experience activities and emotional interactive games, teachers can create a warm and harmonious educational environment, promote emotional exchanges and emotional communication among young children, and cultivate their social interaction ability and the spirit of co-operation. Emotional education is not only to cultivate the emotional quality and social interaction ability of young children, but also to promote their all-round development and healthy growth, and lay a solid emotional foundation for their future.

Focus on Personality Development

It is one of the basic principles of early childhood education that kindergarten teaching focuses on personality development and respects the individual differences and developmental characteristics of each young child. Each young child is a unique individual with his or her own unique interests, specialities and needs, teachers should respect the personality and rights of young children, respect the physical and mental development and learning characteristics of young children, pay attention to individual differences, and promote the development of each young child in a personalised way (Yuan, 2015). For example, in terms of teaching content, teachers can flexibly adjust the teaching content and

teaching methods according to young children's interests and learning needs, so as to make them closer to young children's actual situation and learning ability; in terms of teaching methods, teachers can adopt diversified teaching methods and means to satisfy young children's different learning styles and learning habits, and to stimulate their learning interests and learning potential; in terms of teaching evaluation, teachers can, through observation, record-keeping and assessment, gain a comprehensive understanding of young children's learning and developmental level, provide them with personalised learning suggestions and learning guidance, and promote their all-round development and healthy growth. Personalised development is not only about respecting the individual differences and developmental characteristics of young children, but also about meeting their learning and developmental needs and promoting their all-round development and healthy growth.

Emphasis on Comprehensive Evaluation

Kindergarten teaching attaches importance to comprehensive evaluation. Through observing, recording and evaluating the learning behaviour and development of young children, we can get a comprehensive understanding of their learning and development level, and provide a scientific basis and effective support for education and teaching. The comprehensive evaluation of kindergarten teaching focuses on both young children's learning performance and learning attitudes, as well as their learning achievements and learning progress (Li, 2018). For example, teachers can learn about young children's learning attitudes and learning behaviours, such as active participation, active inquiry, independent thinking, etc., through observation and recording; learn about young children's learning achievements and learning effects, such as drawing works, handmade works, oral expression, etc., through the display of works and achievements; and learn about young children's learning level and learning progress through regular tests and comprehensive assessment, such as mid-term exams, final exams, Semester summary, etc. Comprehensive evaluation is not only to understand children's learning and development level, but also to guide teachers' teaching practice and education management, and to provide scientific basis and effective support for children's comprehensive development and healthy growth.

To sum up, kindergarten teaching is characterised by many aspects, including concern for all-round development, the use of games as the main form of activity, the importance of emotional education, the emphasis on personality development and the importance of comprehensive evaluation. These characteristics reflect the importance of kindergarten teaching to the comprehensive development of young children and are of great significance to the promotion and facilitation of early childhood education. In the future, we should continue to study in depth the characteristics and laws of kindergarten teaching, and constantly improve education and teaching, so as to provide better protection for the healthy growth and comprehensive development of young children.

Generative Artificial Intelligence for teaching methods in early childhood education

Generative Artificial Intelligence can provide multiple improvements and support for different teaching methods in early childhood teaching. Lecture, Discussion, Conversation, Reading guidance, Practice, Demonstration and Discovery methods will be discussed in detail below.

Lecture

Despite a range of weaknesses, such as weakened interaction, the traditional Lecture method still has a role to play in student teaching. With Generative Artificial Intelligence, lecturing can

become more personalised and interactive. GAI can provide customised content based on each student's learning level and interests. By analysing a student's learning history and behavioural patterns, GAI can adapt teaching strategies to make instruction more relevant to the student's actual needs. In addition, GAI can also use natural language generation technology to present teaching content in a more vivid and interesting way, increasing students' learning interest and engagement. For example, as a famous Generative Artificial Intelligence, Wenxinyiyan, through speech synthesis and natural language processing technology, can help teachers transform various knowledge points and teaching contents into vivid and interesting language expressions to attract students' attention and improve teaching efficiency. For example, teachers can make a beautiful PPT presentation of the key points in the course syllabus or textbook, and use Wenxinyiyan's speech synthesis technology to turn it into audible and watchable voice content, so that students can understand the course content more intuitively (Edu Guideline, 2023).

Discussion and Conversation

Discussion and Conversation methods are an important way to promote thinking development and communication skills. GAI can promote students' thinking skills and communication skills by posing questions and leading discussions. GAI can provide feedback and suggestions based on students' answers and the content of the discussion, helping them to think deeply and understand the issues. Su mentioned a case back in 2018 where a professor, in his online course placed a chatbot as his teaching assistant. The chatbot was so powerful at answering questions in the background that students didn't even notice they were chatting with a bot. In addition, GAI can be used to enrich the content and format of discussions through multimedia resources and virtual scenarios, increasing student participation and learning outcomes.

Reading guidance

Reading guidance promotes students' reading ability and emotional awareness through reading stories and books. As an important part of cultivating students' comprehensive literacy, reading education has been facing various problems such as one-size-fits-all reading content and inefficient reading process. With the advent of the era of education informatisation 2.0, Chinese graded reading research is more in-depth, and the new mode of reading education of artificial intelligence + graded reading can effectively improve students' reading ability and cultivate their interest in reading (Zhao, Ren & Gao, 2018).The GAI can provide personalised reading guidance, recommend suitable books according to the students' interests and levels, and provide relevant discussions and activities. GAI can analyse students' reading behaviour and feedback to understand their reading habits and preferences, and provide teachers with targeted teaching suggestions. Through virtual reality and augmented reality technologies, GAI can create an immersive reading experience for students, increasing their reading motivation and comprehension.

Practice

The Practice Approach emphasises hands-on learning and development in young children. GAI can provide virtual experiments and simulated environments that allow students to engage in hands-on exploration in a safe environment. Through virtual experiments, students can visualise and understand abstract concepts and develop problem-solving and practical skills. GAI can provide real-time feedback and guidance to help students master practical skills

and methods to facilitate their learning and growth. In this process, big data strengthens the autonomy of students' choices, human-computer interaction enhances students' cognitive mobility, and the Internet of Everything enhances the creativity of students' practice (Yang, 2023).

Demonstration

Demonstration method emphasises the promotion of students' learning and growth through demonstration and sharing. GAI can help students to produce demonstration works and provide demonstration platforms and opportunities. By displaying their works, students can enhance their self-confidence and expression skills, as well as learn and borrow from others' works to promote common progress. At the same time, GAI can provide students with guidance on the design and production of display works, helping them to show their creativity and achievements.

Discovery

The discovery method emphasises student learning and development through self-directed exploration and discovery. Botpress (2023) suggests that Chatgpt provides on-demand access to knowledge. Whether reviewing previous lessons or seeking clarification on a particular topic, ChatGPT provides students with immediate access to relevant information at any time. This accessibility allows students to take control of their learning by getting accurate answers at any time. Through personalised learning paths and feedback mechanisms, GAI can guide students in continuous exploration and discovery, fostering their problem-solving skills and innovative thinking.

In summary, Generative Artificial Intelligence can improve various teaching methods in student teaching through personalisation, interactivity and diversity, and promote comprehensive development and lifelong learning for young children.

Conclusion

Generative Artificial Intelligence technology has a wide range of applications in Curriculum and Instruction, educational psychology, educational management, educational technology and other educational fields. Kindergarten teaching has various characteristics, including focusing on comprehensive development, using games as the main form of activity, attaching importance to emotional education, focusing on personality development and attaching importance to comprehensive evaluation. Based on these circumstances, Generative Artificial Intelligence can improve and promote teaching methods in early childhood education in several ways, including Lecture, Discussion, Conversation, Reading guidance, Practice, Demonstration, and Discovery.

We should take active measures to make full use of Generative Artificial Intelligence to assist teaching in early childhood education. Firstly, we need to invest resources and energy in developing and optimising applications and tools for early childhood education to ensure that they are functional and easy to use. Second, we should train teachers and educators so that they are proficient in the use of relevant technologies and tools and give full play to their role in teaching. At the same time, we also need to establish a mechanism for close cooperation between teachers and Generative Artificial Intelligence, so that GAI can be better adapted to the learning needs and characteristics of young children through teachers' guidance and direction. In addition, we should strengthen the management of the protection of young

children's personal information and data security to ensure the legal compliance of Generative Artificial Intelligence in the teaching process and protect the privacy rights of young children.

Conflict of interests

In this research, we have no economic relations with other people and external organizations. We don't receive the funding from any organizations.

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