

The Assistance to Education Digital Transformation by ChatGPT: The Prospective Teachers' Training Strategy for Cultivating Informatization Teaching Ability

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Abstract: The generative artificial intelligence technology represented by ChatGPT is developing rapidly and has caused multiple controversies in the field of education. As the main source of teachers' power in basic education in China, students' information-based teaching ability has a directly effect on the quality of basic education in the future. Therefore, in the context of the digital transformation of education, this paper adopts the literature research method to analyze the significance and value of generative AI such as ChatGPT in promoting the digital transformation of school education, and focuses on trying to respond to the major practical problem of "information-based teaching ability cultivation strategy of normal university students" in the era of industrial intelligence from four aspects. It improves the information-based teaching ability of normal university students.

Keywords: ChatGPT; Prospective Teachers, Training Strategy; Informatization Teaching Ability

1. Introduction

With the development of artificial intelligence technology, the wave of digital transformation of the industry is sweeping the world, and the focus on the education industry is mainly reflected in the digital transformation of school education; From an international perspective, school education informatization and education digital transformation in countries around the world show an overall trend of rapid rise, this transformation is not only reflected in the use of multimedia teaching in the classroom, network classroom and other new situations to achieve personalized teaching and learning, but also reflects the application of a large number of artificial

intelligence technologies. Such as robots, big data analysis support etc, which makes the role of artificial intelligence in various fields of school education continues to strengthen[1]. Normal university students are the reserve force of the future teachers, and the future digital teachers are the new direction of the training of normal universal students, whose information-based teaching ability is directly related to the future education reform of our country. Therefore, normal universal students need to be the "fresh force" in the new era, and strive to improve their information-based teaching ability[2].

Aron Levy notes, "The ChatGPT format is perfectly suited to demonsate how AI can be a useful assistant for almost every type of job," notes Alon Levy. Indeed, ChatGPT is having a significant and profound impact on a wide range of industries, including school education. School education should seize the opportunity to explore a new information-based training model for normal university students type. However, how to better combine ChatGPT and other artificial intelligence with school education, and how to cultivate normal university students' information-based teaching ability in the era of artificial intelligence, which is exactly the direction of this paper from the discussion of ChatGPT's role in boosting the digital transformation of school education, to respond to the artificial intelligence era of normal university students' information-based teaching ability training strategy course question.

2. Digital Transformation of Education and the Potential of ChatGPT Applications

2.1 Definition and Characteristics of Digital Transformation in Education

(1) Under the guidance of value demand orientation and strategic vision, the digital

transformation of education is a process of creating an ideal education model that adapts to the digital culture by using digital technology drive and new capability empowerment, through reconstructing the education value network, reshaping the education value and benefit, rebuilding the education paradigm, and finally forming a good education ecology[3].

(2) In the process of deep integration of digital information technology and education, the digital transformation of education has the following three characteristics: First, Digitization of educational resources: It refers to consolidating the external infrastructure conditions for the digital transformation of education based on information and network around the center of “teaching” and “learning” in the process of education; Second, the empowerment of educational technology: this full application of the main index technology in the field of education and education links; Third, the innovation of educational methods: refers to the full use of new technology in education to create a new mode of education, and the emergence of a new scene of education[4].

2.2 ChatGPT Basic Principles and Functions

ChatGPT is a neural network-based natural language processing model that works on the basis of a natural model based on the Transformer regression language, aiming to generate natural language-like responses to make human-machine conversations more fluid and natural. Specifically, ChatGPT first learn the statistical distribution of text data using a set of pre-trained parameters, which means that it takes in a large amount of natural language text data and learns the structure and rules of the language from these data centers. Thus, when ChatGPT receives an input, it can generate a response based on what it has already learned[5].

ChatGPT's functions are mainly reflected in the following aspects: First, Powerful knowledge acquisition and information retrieval capabilities. ChatGPT not only has a simple consulting function in the way of content production, but also be able to solve problems at a certain level with students through dialogue and cooperation; the huge quantization of information data, strong

content creativity and a certain degree of cognitive and interactive capabilities, making ChatGPT has a rich knowledge base and can carry out real-time autonomous content generation to answer a variety of questions; at the same time, ChatGPT is also able to go through continuous learning and updating of its own knowledge base in order to adapt to the ever-changing demand for information and knowledge; Secondly, a strong cognitive intelligence that understands human contexts and possesses a rigorous linguistic logic. "On the basis of the development of big data, the language model not only understands human language by incorporating human context, but also obtains rigor and even surpasses human stronger language logic through the deep cultivation of machine learning of big data." [6] ChatGPT integrates big data into the human context, and strengthens the human context included in big data without learning from human feedback, so as to optimize the computer's understanding of the human context. This enables ChatGPT to remember and summarize the content of the dialogue, and make logical reasoning to give reasonable answers in line with the context, showing machine translation. Significant advantages in speech recognition, text analysis and chatbots; Thirdly, the ability to continuously train and fine-tune, continuous optimization in the human-machine mutual question and answer. An important feature of ChatGPT is that it can give different answers to the same questions each time, with similar fluency, naturalness, and flexibility as humans do. This makes ChatGPT's human-machine dialogues more flexible, enabling continuous dialogues, avoiding meaningless repetitions, fully understanding users' intentions and preferences, realizing personalized content customization, and at the same time being able to reject inappropriate requests based on the training model[7].

2.3 Potential Application of ChatGPT in the Field of Education

As a powerful artificial intelligence tool, ChatGPT can effectively improve the quality of teaching and learning, Its application potential is mainly reflected in five aspects: First, it can create customized learning plans and learning content for students according to their needs, which helps students learn in an

environment that meets the direction of their learning interests, and grasps their own pace of learning, so that they can better understand and assimilate the knowledge, and improve their learning efficiency. Secondly, it can automatically perform repetitive tasks, such as creating quizzes and study guides, providing educational resources according to students' individual needs, etc., saving students' time and energy; Thirdly, it can create an automated learning assessment system to provide students with instant learning feedback and suggestions, it can also identify the weaknesses of students' knowledge systems and abilities, and adjust the learning plan accordingly, finally improve the learning effect; The fourth is that it can improve teachers' work efficiency, provide assistance in test scoring, homework correction, teaching feedback and teaching content production, etc., saving teachers' time and energy, and help teachers focus more on providing students with humanistic care, emotional support and academic guidance; Finally, it can be used to create all kinds of educational resources to help teachers and students be free of time and space constraints, and carry out teaching and learning activities in a more convenient way.

3. The Significance and Value of ChatGPT to Boost the Digital Transformation of University Education

As a chatbot technology based on natural language processing, ChatGPT has taken the world by storm in just a few months since its introduction, not only has it generated unprecedented attention in the tech world and a great deal of discussion around the impact of AI on education, but it has also caused widespread concern in the education community around the world about its negative impact. Therefore, "what ChatGPT really means to school education" will be explored in this paper in terms of its educational significance and value for the digital transformation of school education[8]. In general, the significance and value of ChatGPT for the digital transformation of school education can be summarized from the following four aspects.

3.1 Reducing the Burden of Routine Work and Enhancing the Sense of Completion and

Creativity in Teaching and Learning Outcomes

ChatGPT has attracted widespread attention and concern from the global education community, an important point is that it is able to use its own data reserves to automatically generate text, that can creatively help users to answer questions. It can provide users with targeted advice and suggestions, which can help reduce a series of repetitive tasks, in order to realize the technological value of reducing workloads and increasing efficiency. Especially when ChatGPT is used in combination with other generative AI technologies, it can also generate images, videos and other forms, or help realize other more complex functions. Focusing on the field of education, at the level of teacher teaching, ChatGPT can effectively improve the quality and effectiveness of teachers' teaching, empowered by artificial intelligence, some traditional and highly repetitive business will be automated, which will reduce the teachers' daily work pressure to a certain extent. For example, teacher can let ChatGPT create a basic teaching plan, including teaching objectives, teaching content, and teaching evaluation, etc. Teachers can also ask ChatGPT to provide additional extracurricular extension materials and teaching materials for reference, etc. At the level of student learning, ChatGPT can provide students with some unique examples of learning resources, which can help inspire students to create more creative content; at the same time, it can also encourage students to study more deeply and improve their critical thinking through prompts.

3.2 Education and Teaching Tend to be Personalized and are Expected to be Adapted to the Needs of the Students

Differentiated, individualized and personalized learning is one of the ideals and ultimate goals of human school education. ChatGPT can help students achieve personalized learning by customizing learning plans and learning contents according to students' needs. With the iterative upgrading of ChatGPT, it can keep focusing on the characteristics of users, so as to make it adapt to their behavioral preferences. ChatGPT can realize accurate analysis of learners' learning status and personalized diagnosis of learning needs based on different

questions raised by each learner, provide students with more targeted learning support services, and provide students with a learning environment that meets their learning interests and enables them to grasp the pace of learning, thus helping them to better understand and assimilate knowledge, and improve their learning efficiency. Teachers can use the data analysis and teaching design materials provided by ChatGPT as support to grasp students' learning in real time and adjust their teaching plans in a timely manner, they can also customize different learning requirements according to the mastery of different students to help teachers differentiate their teaching for different students, so as to realize tailored teaching. Teachers and students can screen and match the diversified teaching and learning programs provided by ChatGPT. Different educational subjects can help optimize the data and algorithm model of ChatGPT's own intelligent services while adjusting their own needs. The realization of large-scale personalized learning in the field of education becomes possible.

3.3 A More Prominent Role for Critical Thinking, Creativity, Human-Computer Collaboration, etc.

William Poundstone has raised a number of important questions that are of great value in the age of artificial intelligence: what is the true value of knowledge in the age of the mobile Internet, where facts and information are readily available? How do we seek knowledge in order to become real winners? What knowledge can make us richer and happier? Should we be a specialized "hedgehog" or a knowledgeable "fox"? How can we reap more knowledge dividends in lifelong learning?

In this era of knowledge explosion, we can see that people are less and less willing to spend their time and energy on factual knowledge that has no temperature, and even with the development of artificial intelligence, some skills are less important today. what's more, the generative artificial intelligence represented by ChatGPT is turning many high skills into low skills or even worthless skills. Therefore, in such an educational ecosystem, it is even more important to develop the ability of critical thinking, creativity,

human-computer collaboration in different educational subjects.

3.4 AI-Related Technical Ethics, Privacy Protection and Data Security Issues Need to be Given High Attention

As mentioned earlier, the training that ChatGPT receives is based on public texts and data from the Internet, which also inevitably leads to data security risks. When the language dataset used by ChatGPT contains sensitive information such as the design of personal privacy, commercial secrets, and so on, once the dataset has not been properly protected by security, the attacker can obtain such sensitive information by means of hacking and so on and use it to threaten human security; And regarding the large amount of text and works generated by AI are considered original knowledge products or not, and to whom do their copyrights and authorships belong? This also challenges traditional copyright and privacy protection issues; Moreover, some critics have asserted that ChatGPT is nothing more than "a nonsense chatbot". Indeed, ChatGPT, like other systems based on large-scale language models, sometimes generates incorrect information, and even when the user inputs sensitive information such as racial discrimination, ChatGPT has difficulty in judging the information, and may output "toxic" information with reactionary and anti-human meanings. Therefore, while enjoying the convenience of skills brought by ChatGPT, it is also necessary to pay great attention to the related technical ethics and privacy protection issues.

4. Status of Teacher Trainees' Information-Based Teaching Ability

4.1 Information-Based of Teaching Skills

The so-called information technology teaching ability refers to the ability of teachers to effectively implement modern teaching concepts in the information technology environment, and at the same time, integrate information technology into teaching scientifically and reasonably, so as to form a new type of teaching ability, in order to achieve the ability to improve the teaching efficiency [9].

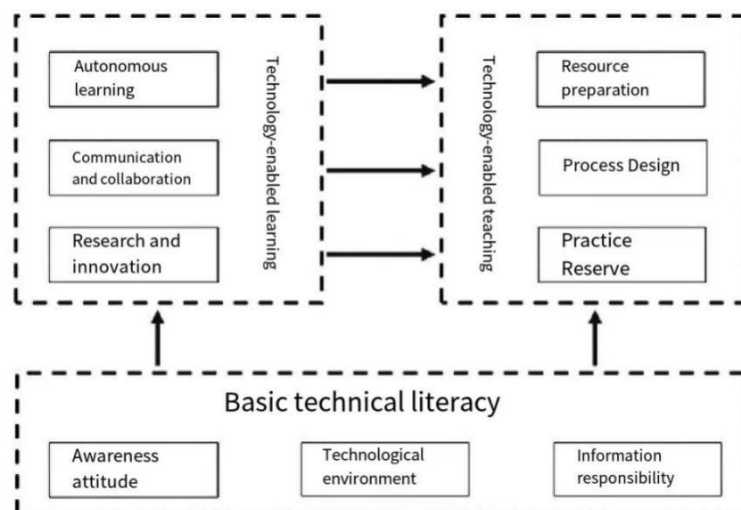


Figure 1. Teacher Training Students' Informatization Teaching Ability Standard

4.2 Standardized Framework for Teacher Trainees' Information-Based Teaching Competence

Based on a large number of empirical studies, the research team of East China Normal University (ECNU) has taken the lead in formulating the "Standard of Informatization Teaching Competence for Teacher Training Students" and passed the universal validation. The standard is oriented to the industry's talent demand specifications, taking into account the dual perspectives of "future teachers" and "students", and contains three dimensions and nine categories. The specific content is shown in Figure 1.

4.2.1 Basic technical literacy

This dimension, as a necessary basic competency for teacher trainees, includes three categories: active learning and active use of information technology awareness and attitude; mastery of technological environments such as hardware and software equipment and platforms related to teaching and learning, and information responsibility and literacy related to information ethics and information security.

4.2.2 Technical support learning

The further integration of generative AI technologies such as ChatGPT with education has prompted this dimension to become another essential competency for teacher trainees. It consists of three main categories: the ability to use information technology to carry out self-directed learning; the ability to use information technology to proactively communicate, share, and collaborate with others in an effective manner, and the ability

to use information technology to identify and analyze problems, in order to be able to solve them creatively.

4.2.3 Technical support for teaching

This dimension is the skills necessary for teacher trainees to engage in the teaching profession, including the resource preparation skills that refer to planning, designing and producing, evaluating and managing, and using and optimizing digital teaching resources, process design ability to comply with relevant theories of information-based teaching design, adopt methods and strategies of information-based teaching design and evaluation methods of information-based teaching process design and through simulation. There are three categories of practical reserves of practical skills that can be transferred to the real teaching skills needed in the future teaching time.

4.3 The Current State of Literature Research on Teacher Trainees' Information-Based Teaching Competence

In the journal database of China Knowledge Network, we input the subject word "teacher trainees' information teaching ability" to conduct an accurate matching search, and as the end of July 2023, after deleting the conference notices, competition reports and articles with weak relationship with teacher trainees' information teaching ability, we obtained a total of 297 relevant papers, including core journals and 28 CSSCI journals, 8 doctoral dissertations, and 103 master's dissertations (See Figure 2).

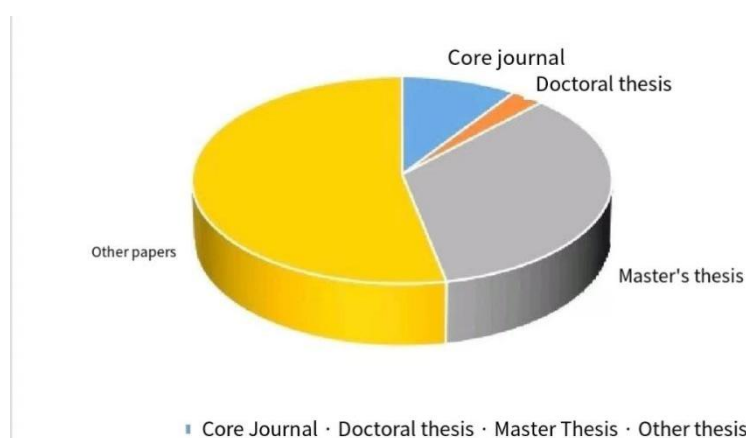


Figure 2. Literature Source Map of "Teacher Trainees' Information-Based Teaching Competence"

4.4 The Current Situation of the Problems of Teacher Trainees' Informatization Teaching Ability

At present, the overall level of the information teaching ability of local college teacher trainees is still not optimistic, and there are still have problem such as the basic technical literacy needs to be improved, the application level of information technology is not good and the information teaching design and implementation ability needs to be strengthened. There is still a lack of attention to colleges universities, and other inadequacies[10].

4.4.1 Basic technical literacy needs to be improved

With the further development of artificial intelligence technology, most of the teacher trainees at this stage have the awareness and attitude of using information technology for problem solving and active learning, have better information literacy, and can actively comply with network ethics and network security guidelines. However, they are not sufficiently sensitive to and concerned about information technology, have little awareness of the application of information technology, and their familiarity with and knowledge of current teaching hard- and software equipment need to be further improved.

4.4.2 Poor level of application of information technology

Most of the teacher trainees are still at the superficial level of using IT as a tool and means of application, while they do not perform well at the higher level of using IT for innovative research, they still have difficulties

in truly experiencing the charm of IT in facilitating learning and innovation.

4.4.3 Information-based teaching design and implementation capacity needs to be strengthened urgently

At present, there are problems in the cultivation of teacher trainees' information technology teaching ability, such as single curriculum, weak information technology teachers, insufficient practical teaching, and lack of subject teaching software and practice platforms, which lead to the inability to meet the needs of the cultivation goal of teacher trainees' information technology teaching ability, and there are deficiencies at different levels from the design of information technology courses to the organization and implementation of the teaching process.

4.4.4 Teachers' colleges do not pay enough attention to and invest in the construction of information-based teaching environment

Although there are rich and diversified teaching resources in the network at present, through the understanding of the teaching of some teacher trainees, it can be learned that some teacher trainees said that in the process of professional learning, there are fewer specialized teaching equipment, and there are not many resources for promoting the professional development of teacher trainees. According to the relevant survey data, due to the lack of advanced information technology teaching infrastructure in some colleges and universities, these colleges and universities are unable to effectively meet the current needs of teacher training students in information technology teaching capacity development.

5. Strategies for Cultivating Information-Based Teaching Ability of Teacher Training Students

The cultivation of information-based teaching ability is a systematic project, to improve the teacher trainees' information-based teaching ability can not only rely on a single training mode, but also need to make efforts on "double driving force", through stimulating the internal motivation of the teacher trainees and improving the external environment of the teacher training colleges and universities, in order to continuously improve the internal and external driving force of the teacher trainees, and then promote the development of the teacher trainees' information-based teaching ability.

5.1 Enhancing Internal Motivation: Strategies for Improving the Personal Competence of teacher Educators

First, learning information technology knowledge and enhancing basic information literacy. Thought is the precursor of action. Firstly, teacher trainees should actively learn the basic knowledge of information technology, pay attention to the development of information technology, and cultivate and improve the sensitivity and attention to information technology. Secondly, teacher trainees should frequently operate information technology teaching equipment, try to apply new technology, strive to better apply new technology to the future design of subject teaching, and constantly explore the fusion point between subject teaching and modern technology, and promote the deep integration of subject teaching and technology. In addition, teacher trainees can establish a "learning community" to improve their interpersonal communication and collaboration skills through full communication and learning with their classmates and formulating clear rules of collaboration; Lastly, teacher trainees should always maintain the awareness of information security, improve their ability to identify bad or false information, and make legal use of information technology tools; they should actively engage in teaching practice to improve their information teaching ability. Teacher trainees can realize in-depth learning of technology by participating in teaching competitions, micro teaching, educational

internships and other teaching practice activities. At the same time, they should promote the effective integration of technology and subject teaching, look for ways and methods suitable for their own teaching in the future, and improve their ability to support teaching with technology.

5.2 Enhancing External Motivation: Optimizing the Environment for Cultivating Teacher Trainees' Information-Based Teaching Ability

The cultivation environment is an important factor affecting the development of teacher students' information-based teaching ability. Teachers' colleges should continuously optimize the cultivation environment and reform the cultivation mode and curriculum, etc., in order to help effectively enhance the students' extrinsic drive.

First, quality teaching resources are introduced in teaching and the teaching environment of information-based is optimized. Teachers' colleges should timely update multimedia teaching equipment, upgrade teaching software, establish some advanced teaching environments such as multimedia laboratories, micro classrooms and information-based platforms, and make full use of new technologies such as artificial intelligence to promote the education of teacher trainees. In addition, classrooms should also take the initiative to introduce new teaching methods such as micro teaching, MOOC flipped classroom and so on in the process of teaching to help teacher trainees cultivate their awareness of new technologies and new environments[11]. Secondly, build the curriculum system for teacher trainees' information-based teaching ability cultivation. The course content system should be organized around information-based teaching, and the lectures should be hierarchical and step by step, through the setting of courses to improve the basic information literacy and learning emerging technologies as the center of your courses to let teacher trainees get to know the technology, master the method of using the technology reasonably, then learn how to utilize the specific technology in the discipline learning, and then advanced to learn how to better integrate the technology into the teaching design, and deeply understand the relationship between technology and students,

technology and education, and finally reach the realm of skillfully applying emerging technologies to the future teaching of disciplines; Third, strengthen the construction of teacher training students' information-based teaching faculty. Teachers are an important driving force in cultivating teacher trainees' information-based teaching ability. Therefore, the TPACK-based information-based teaching ability of teachers in teacher training colleges should be continuously strengthened. Teachers can continuously improve their information literacy and information-based teaching ability to adapt to the requirements of the times, better extend their professional technical knowledge to the students' disciplines in the process of teaching, pay attention to the in-depth integration of information technology and teaching, and skillfully apply the information-based teaching tools to the classroom, so as to become a role model for the integration of information technology and teaching for the teacher trainees; Fourthly, increase the cultivation of teacher trainees' information-based teaching practical ability. The cultivation of information-based teaching ability not only needs the learning of basic knowledge of information-based, but also needs the deepening of information-based teaching practice. In professional practice, teachers should make full use of micro teaching to let teacher trainees master various emerging teaching techniques and the whole teaching process, and also let teacher trainees continuously improve their information-based teaching skills in simulation training; in the practice of educational internship, teachers can know teacher trainees' reasonable choice of information-based teaching tools, and fully apply the information-based teaching resources to practice.

6. Concluding Remarks

ChatGPT provides unlimited creative space for school education, and it will also reshape the mode and form of school education, giving a brand new connotation to the goal, form and organization of school education, which has a greater advantage in improving the teaching effect of teachers and customizing the personalized learning aspect of students and other school education work. School education must keep an open mind, embrace technological change, and optimize the

environment for the cultivation of teacher trainees' information-based teaching ability. Teachers, on the other hand, should actively introduce advanced teaching concepts in the teaching process, provide good guidance and encouragement for teacher trainees, and keep teacher trainees abreast of the development of the times. Teacher trainees, as future teachers, should take ChatGPT as their future assistants, actively learn and master the theory and skills related to the reasonable use of artificial intelligence technology and education, so that they can assist themselves in their future work to carry out creative work, practice teaching according to students' abilities to meet the needs of the digital transformation of education and consciously and actively cultivate and improve their own information-based teaching ability to adapt to the needs of the development of the times.

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