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Research Article

Impacts on Teachers with AI Educational Applications

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Abstract

In this article, the author uses historical analysis methods to decompose the AI technology into three factors and predicts the fields in education adaptable for AI applications. On the basis of existing AI educational applications, the reasons why AI can be applied to education were analyzed. In these derivation steps, the author dissects AI technology into three pillars using factor analysis methods, and then predicts the mainstream of AI educational applications. Next, the theory of Language-oriented Approach of Teaching is borrowed. Based on the comprehensive analysis on education development and prediction of various roles of educational professional, the trend of future educational transformation is described, the challenges and opportunities brought by the application of AI technology to the teaching group are further demonstrated, and future developments of each branch of teacher groups are forecasted. Finally, the author conducts a further analysis of AI's impact on the various teacher roles. In these analysis processes, some specific viewpoints are put forward, such as future mode of Knowledge Gaining Tools-centered Teaching, three nodes of teaching process, the replacement of the language function of manual labor teachers by AI, the fractal impact of AI on the teaching staff, and the positioning of the future role of teachers, etc.

Keywords

AI Impact on Teaching System, AI Application for Education, Language Oriented Approach of Teaching

1. Contemporary AI Applications in Education

AI's role in education has been propelled by breakthroughs in large language models (LLMs). Based on LLMs, application software like DeepSeek, GPT-3, BERT, and Claude, developed by companies such as OpenAI, Google, and Anthropic have enhanced the dialogue function, which is performed just like humans. Moreover, they are more efficient than human conversations. These applications software have implemented AI educations ranging from personalized tutoring to automated content generation. AI educational applications can be classified into the following three major categories.

1.1. Personalized Learning and Student Development

AI enables adaptive learning systems that tailor content to individual student needs. For example: AI-Powered Tutors: South Korea's AI-driven digital textbooks adjust learning pace and difficulty based on student performance, while the U.S. uses tools like "My Math Academy" to provide one-on-one guidance, improving test scores significantly [1].

AI enables Learning Analytics. China's national education platforms use AI to track students' learning trajectories, diagnose weaknesses, and recommend personalized study plans [2].

AI can perform Creativity Enhancement. Studies show AI tools boost creativity by fostering engagement and offering

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dynamic learning environments, particularly when students possess foundational AI literacy [3].

1.2. Teacher Support and Workload Reduction

AI alleviates administrative burdens, allowing educators to focus on pedagogy. Such as Automated Grading and Feedback developed tools like Edsby's AI Assistant generate report card comments, critique student writing, and create quizzes, saving teachers hours weekly [4].

AI can do Curriculum Design. Beijing's AI applications assist teachers in lesson planning and resource matching, while South Korea's transcription tools streamline classroom workflows [5].

AI can enhance Professional Development: Indonesia and the Philippines use AI-driven platforms to train teachers in digital literacy and ethical AI use [6].

1.3. Administrative and Institutional Efficiency

Smart Campus Management has sprung. Beijing's "campus brain" integrates AI for tasks like attendance tracking, security monitoring, and resource allocation [5].

Data-Driven Governance has employed in Education. UNESCO and China emphasize AI for policy analysis, student health monitoring, and optimizing educational equity [7].

2. Reasons for AI Can Be Employed in Education

Today. AI is transforming education by facilitating learning and teaching, and making education more accessible, and it changes education greatly in methodological aspect. AI is rapidly entering the field of education and showing signs of changing the future development of education. All these effects have their inherent causes. The same reason is that AI has some functions that can replace human intelligence. To study this issue, we have to start with the essence of AI.

2.1. The Basic Components of AI Technology

Artificial Intelligence (AI) has evolved over decades, from theoretical concepts to today's powerful applications. It can be dated from 1943, Warren McCulloch & Walter Pitts propose a computational model of neural networks. Their research erects the Neuron model, which become the cornerstone of the AI building. Their work is based on the new trend of computer invention in that times. The first electronic computer is often credited to John Vincent Atanasoff and his graduate student Clifford Berry, who developed the Atanasoff-Berry Computer (ABC) by 1942. In 1956, the Dartmouth Conference (Organized by John McCarthy) was a pivotal event that marked the birth of artificial intelligence (AI) as a distinct field of study. In fact, that was just a change in the name. The core technological issue remains the neural network model.

Based on Walter Pitts' Neuron model, in 1986, Hinton et al. proposed the Backpropagation algorithm, breaking through the limitations of single-layer networks. In 2006, Hinton proposed the Deep Belief Network (DBN), initiating the revival of deep learning. This creation has ushered in a new era of AI in human society. Hinton's work pointed out a new direction for the efforts in the design of AI algorithms. It has greatly promoted the development and research of the algorithms. The rapid improvement of various learning algorithms, optimization algorithms, language function algorithms and visual function algorithms has led to the explosive development of AI technology. Some experts say that humanity has entered the AI era. Because in this era AI can learn like human, AI software can substitute human brain to learn, think and react to the outside world.

This series of algorithms forms the first pillar of AI. The other two pillars are the ultra-high speed of computing chips and the extremely large storage capacity. These three pillars have supported the current AI edifice. Artificial intelligence was proposed about seven or eight decades ago, but it has never developed well. The recent rapid progresses are attributed to the completion of these three pillars.

As for the speed of chips, since the invention of the computer, the operating speed of chips has developed rapidly in accordance with Moore's Law. In the last two decades, the speed of chips has continued to increase with multi-core parallelism. As of 2024, the highest CPU clock speed achieved in a commercially available processor is 8.79 GHz by the AMD FX-8370 (overclocked), set in 2022. This record was verified by CPU-Z Validator and achieved using extreme cooling (liquid nitrogen).

The operational efficiency of computer chips has far exceeded the limit of the computing speed of the human brain. The computing speed of the human brain has lagged far behind the operational speed of computer chips. To solve a math problem, 1+1, it takes the human brain half a second, while a computer only needs one nanosecond. The surpassing advantage of computers' speed determines that humans will inevitably use computers as computing tools to replace the work of the human brain.

As for the storage capacity, computer is different from human brain, however, on scientific research and technological benchmarks, we can compare their capacities. Modern computers use digital storage (binary data: 0s and 1s), with well-defined metrics. At a certain instant, Short-Term Memory (RAM) has capacity of 8 GB - 2 TB (consumer PCs) / up to 24 TB (servers). If Long-Term Storage (HDD/SSD/NVMe), the capacity of SSDs (Solid-State Drive) can reach to 500 GB - 100 TB (consumer) / petabytes (PB) in data centers. With Cloud Storage, Google, AWS, etc. can offer exabytes (1EB=1024PB) globally. The brain has been estimated total capacity about 100 terabytes (TB) to 2.5 petabytes (PB) in lifetime but not instant.

The storage capacity of a hard drive is far greater than the memory capacity of the human brain. The storage capacity of

a disc can be used at all times, while the memory of the human brain is often accompanied by amnesia and cannot be retrieved at this time. The reliability of computer memory determines that humans have to rely on hard disks for data storage.

2.2. The Deficiencies of Teachers' Manual Labor that Delay the Development of Education

Computer technology and AI technology are rapidly entering the field of education, and the application of these technologies is gradually replacing teachers' mental labor. In contrast, when the teacher human resources continue to work in the original mode, that is, without the use of computer and AI technologies, the working efficiency of teachers clearly shows a lagging situation. In the new environment of the great development of information technology, teachers are facing huge pressure and frustration that they did not have before. Especially the application of AI technologies such as large models in the field of education has brought about earth-shaking changes to education. Among the influences of AI on teachers, students and teaching management, the impact on teachers is the most severe.

Because AI has the function of replacing teachers' human brain labor, from the perspective of the efficiency of educational management, cost-effectiveness and time saving, those things that consume teachers' human brains and energy should give way to AI, and those tasks with time limits that need to be completed in the short term should be accomplished by AI. Those matters that require a great deal of memory and effort from the human brain for data and knowledge storage should also be undertaken by AI.

From students' learning aspect, due to the application of information technology, such as web and multimedia technology, which have been applied to teaching, various online courseware, learning materials, etc. have become more convenient and comfortable available learning resources for students. The mode of students' learning has changed. The guiding role of teachers in students' learning has been rapidly replaced by the convenience of online courseware and electronic courseware. Teachers are no longer the center of teaching but have become helpful roles in students' learning.

Take DeepSeek and ChatGPT as examples, the application of AI technologies based on large language models has immediately highlighted the advantages of AI technology. In contrast, the handcrafted works of teachers seem to be of lower quality, time-consuming and labor-intensive, and not economical enough. In many teaching links and spots, there is a strong trend of large model AI applications replacing teachers.

According to Language Oriented Approach of Teaching (LOAT) theory, the quality of teaching depends on communication effect between teachers and students, depends on whether those theories, ideas and methods are accurately transmitted from teachers to students. If they be, the knowledge has been caught by the students; If not, the students will enter a situation where they can't learn [8]. To enhance the quality of teaching, the main way should be the enhancement of communication between teachers and students. Language is relative to quality of teaching to some extent. Both teachers and AI applications use language as a tool. In contrast, AI applications use language for reasoning, which is more efficient and accurate, has more advantages. This is the essential reason why teachers' jobs have been replaced by AI.

Nowadays, the technical conditions for AI software to replace some teachers' jobs have emerged. The reason why it has not been implemented is that as decision-makers, allowing AI to replace teachers' jobs would reduce the use of teachers and, relatively speaking, increase the proportion of management personnel. This would negate the work of management personnel, including decision-makers their selves. This makes managers lose the necessity of existence.

3. AI Reshaping the Education System

In order to enhance work efficiency and also to reduce the physical burden on people, in education, humans will inevitably use AI to replace their own brains for work. In Education, where there is mental labor for teachers, there will be a demand for AI applications. If the bureaucracy systems do not prohibit it, will the application of AI be a matter of course. Here are some predictions.

In the past decade or so, with the application of deep learning algorithms in Artificial Intelligence technology, the functions of language models can be well supported. The large language models' ability of AI software has been significantly enhanced. This breakthrough has led to the rapid development of AI technology centered on GPT (Generative Pre-trained Transformer). Because GPT technology is highly suitable for use in education, the educational application of AI is transforming all aspects of education, especially the challenges it poses to the teaching profession, which we must study seriously.

First of all, it is a tool or technology that AI makes impacts in education. As a technology, its influence on education far exceeds that of any other factor. Therefore, its effect will be revolutionary. In my opinion, AI will transform the current student-centered teaching model into a Knowledge Gaining Tools-Centered Teaching (KGTCT) model, with which the teaching process is drove by knowledge gaining tools, the teaching objective is summarized into knowledge gain, and the teaching work is centered on knowledge gaining tools. Because of the neutrality of technology, it doesn't need to distinguish who is or what characteristics of the teachers or the students, and it works as technique in the process of learning and teaching.

Secondly, of course, AI will, in some extent has, transformed the teaching process. In the present, the teaching process consisted of three steps: teachers preparing lessons

themselves, imparting knowledge to students, and students digesting and absorbing it on their own. However, due to the substitution effect of AI on teachers' work, in an AI background, students will directly use AI tools for learning without having to seek help from teachers. Appart from the changes in the teaching process mentioned above, due to the use of AI tools, there is one new node added in the teaching process. The number of nodes has increased from the original two, namely the teacher and the student, to three, that is, a new AI tool node has been added. This makes the organization of the teaching process more diverse and leads to more complex teaching process forms.

Thirdly, AI will transform teaching units, and the size of a class is no longer characterized by the average number of students, but can be either large or small. In the past, all what education does is that teachers possess knowledge; Teachers are at the center of teaching; Teaching was carried out in units of classes and classrooms. Now, in the context of AI, knowledge is spread everywhere in various media. Teaching organizations can be established on the techniques characters, they can be connected through the network to form a large internet group, or on the spot, they can merge into a large one; either teaching units can be divided into smaller ones, even down to individual units. When the teaching concept further adopts a student-centered approach, the individual learning needs of different students must be met, and thus the teaching unit will become smaller than before.

Fourth, as the emerging or downsizing of teaching units will become inevitable, various teaching management personnel, teaching facility management personnel, etc. are needed. Since students can study independently online or by applying AI tools, it is necessary to divert the existing teaching staff in order to better serve students' learning. So the teaching staff will be changed.

Fifth, the management of education will also change due to the use of AI. AI technology itself can be applied to management, and the teaching order managed by AI will definitely be different from the current teaching management. ChatGPT and Gemini are considered for creating quizzes, summaries, and interactive content. AI-Powered Virtual Classrooms are also under the development. [9].

4. Professional in AI Educational System

After the current education system has adopted AI technology, knowledge gaining tools will become the core of teaching organization and implementation. AI tools are widely used in management of teaching affairs, supervision of the teaching process, and evaluation of teaching results. These will lead to an update and recruit of teaching management personnel. older teaching management personnel need to undergo AI knowledge training and recharging before they can be competent for new management work.

Meanwhile, with the advent of the diversity of the teaching process, new changes have brought challenges to teaching administrators and teaching implementation teachers. They need to have knowledge of computer software and hardware as well as AI in order to better perform their jobs. The provision of teaching facilities, the allocation of teaching venues, students' schedules and class arrangements will all change.

According to the LOAT theory, after AI is applied to education, applications based on LLMs will undertake many mainstream work, and will account for the main proportion of AI; On the other hand, Previously, teachers' main duties were also accomplished based on language usage. Those large models based AI applications will inevitably replace teachers' language-related work for the sake of functions replace, which is the greatest impact of AI on teachers. This impact will lead to the division and transformation of the teaching staff.

The first category of teachers is the Mentor Group. Mentors will specifically guide students' studies and design learning plans for them. Mentors provide academic advice, and focuses on long-term guidance, career advice, and personal growth. In the AI era, Individual learning will develop greatly, and thus a large number of mentors will be needed.

Of course, classes still need to be attended. Imparting knowledge is the main task of teaching. Therefore, a portion of teachers must be divided to specialize in the propagating of knowledge and the imparting of skills. These teachers are the main force in teaching. We can call them as Lecturers, which is the second category of teachers.

The third category of teachers is Curriculum Designers. Those professional heads or academic administrators in the current teaching system will be transformed into Curriculum Designer. Of course, it is possible to form a new evolutionary mechanism, and competition gives rise to this group.

The forth category of teachers is Education Managers. Schools cannot do without some administrative staff. These current administrative staff will still be engaged in their old jobs after the popularization of AI, but new thresholds will be needed because AI technology requires people with a foundation in computer or digit culture.

5. Conclusion

AI has the function of replacing teachers' manual labor. The three pillars of AI technology determine the areas where AI can replace teachers' manual labor. These substitutions determine that AI will bring about transformation or reshaping in five aspects of education: Knowledge Gaining Tools-Centered Teaching (KGTCT) model will rise; As new node, AI tool will add in the teaching process; Teaching units will changed with scalability; Teaching staff will be divided; Management of education will use AI. Based on the analysis of language-oriented teaching methods, teachers will be divided into four parts: Mentors, Lecturers, Curriculum Designers, Education Managers.

AI will be applied in several aspects including teaching

elements or nodes, teaching processes and teaching management, etc.. It will bring about a huge transformation of the teaching system. Teaching staff will face unprecedented challenges and pressures. As teachers, it is necessary to understand and learn AI technology as early as possible to adapt to the change in the arrival of the AI education era. Since this article focuses on the issue of teachers' challenges, a big problem about educational objectives change has been avoided because it is at another level and thus not touched upon, leaving it for discussion and argumentation by other colleagues.

Abbreviations

AI	Artificial Intelligence
LLMs	Large Language Models
GPT	Generative Pre-trained Transformer
LOAT	Language Oriented Approach of Teaching
KGTCT	Knowledge Gaining Tools-centered Teaching

Author Contributions

Bauminwood is the sole author. The author searched for the topic of the application of AI in education, read the literature on related topics, combined with his own computer knowledge, dissected AI technology into three pillars, analyzed and predicted the development trend of the application of AI in education, and put forward some specific viewpoints, such as future mode of Knowledge Gaining Tools-centered Teaching, three nodes of teaching process, the replacement of the language function of manual labor teachers by AI, the fractal impact of AI on the teaching staff, and the positioning of the future role of teachers, etc.

Conflicts of Interest

The authors declare no conflicts of interest.

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