

Research on Basic Education Informatization and Educational Leadership in the Information Age

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Abstract: Informatisation in basic education is an extremely complex systemic project of educational and even social change. A cross-temporal perspective on the history, current situation and trends of informatisation in basic education, on the basis of which the mission of educational leaders in the information age is explored^[1]. The historical process from computer education to education informatisation in China can be summarised in three stages: the experimentation of computer courses in primary and secondary schools, the application and popularisation of information technology in primary and secondary education, and the deepening development of informatisation in basic education. While affirming the achievements, it reflects rationally on the problems in the process of informatization in basic education, analyzes the root causes of various problems and contradictions in reality, reveals that educational decision makers and managers must complete four transformations in the process of informatization, and enhance the quality and ability of leading informatization in three aspects.

Over the past 40 years of reform and opening up, basic education in China has been moving forward in a difficult quest for innovative development. The development of basic education has to meet the requirements of the times, the needs of the public, especially parents, and the laws of education itself (the core of which is the law of healthy physical and mental development of students). Understanding, balancing and managing the above three aspects is the responsibility and mission of basic education policy makers and managers, and is also an important indicator of their ability and competence^[2]. In the past 40 years, the themes and grips of the innovative development of basic education in China have been formed precisely in the synthesis of the three, of which the three main themes are: quality education, curriculum reform and education informatization. This article takes this as the general context for reflection on the times, and provides a cross-temporal perspective and analysis of the history, current situation and trends of informatisation in basic education, and on this basis explores the mission of educational leaders in the information age.

1. The historical process and important footprint of informatization in basic education

Informatisation is a concept with Chinese characteristics, and informatisation in education is a field and sectoral strategy formed and promoted under the guidance of the country's general strategy

of informatisation, which is a historical trend and a requirement of the times, and people's understanding and grasp of this trend has undergone a process of continuous deepening and development. The predecessor of informatisation in basic education in China was computer teaching in primary and secondary schools, which gradually expanded in development to combine with other curriculum teaching to form Computer Aided Instruction (CAI), and at the same time applied to educational management to form Computer Aided Management (CAM), both of which have been developing independently of each other since the beginning^[3]. As computers were updated, the link between databases and repositories, especially the link between data, was created and rapidly developed, and then gradually recognised. The linkage and integration of the two has led to the rapid expansion of the depth and breadth of application of contemporary information technology in the field of education, especially in the development of educational innovation, represented by computers and the Internet, and has given a strong impetus to the pace of innovative development of the entire education system from industrial civilisation to the information age, thus the emergence of information technology in education. According to the above understanding and the above lineage, we can summarize the historical process of computer education to education informatization in China into the following three stages, which are briefly reviewed below.

1.1. Stage 1: Experimentation of computer courses in primary and secondary schools

In 1945, the world's first computer was born in the U.S. In 1981, IBM launched the world's first personal computer (PC). In 1981, a delegation of Chinese computer experts attended the Third World Conference on Computer Education (WCCE/81) for the first time; in 1982, the Ministry of Education, on the advice of experts, organised five high schools, including the Experimental Middle School attached to Beijing Normal University, to conduct experiments in computer elective courses with the support of universities, thus the prologue of computer education in China. This was the beginning of computer education in China^[4]. In July 1983, the General Office of the Ministry of Education issued a document to establish a national experimental centre for secondary school computer education in the Experimental Middle School attached to Beijing Normal University. On 1 October 1984, Deng Xiaoping inscribed "Education should be oriented to modernisation, to the world and to the future" for Beijing Jingshan School, sending out a rallying cry for primary and secondary schools to meet the challenges of the world's new technological revolution. "The popularisation of computers should start with children"; in June of the same year, the Ministry of Education allocated 200,000 yuan to purchase 300 computers and supporting equipment to equip 30 primary schools to carry out pilot sites. 1987, the State Education Commission (established in 1985 and renamed the Ministry of Education in 1998) set up "National Research Centre for Secondary School Computer Education" (Beijing and Shanghai Divisions), with Principal Wang Benzong as the Director of the Beijing Division^[5]. With a relatively stable management and guidance department, the pace of computer education experiments in primary and secondary schools accelerated, and by the end of the 1980s, more than 7,000 primary and secondary schools were conducting computer education, with a lack of funding and teachers becoming the main challenge at the time. The first phase of the experimental computer curriculum in primary and secondary schools focused on learning computer programming languages, which were not only complex and cumbersome, but also had very limited application in the field of education, mainly to lay the foundation for training elite computer talents. The first batch of pilot schools also produced the initial elite computer talents for China^[6].

1.2 Stage 2: the application and popularization of information technology in primary and secondary education

In the mid-1990s, computer technology made a series of major breakthroughs, especially the birth and rapid development of the Internet, which accelerated the application of computers in various fields and their popularisation in education. The pace of the change In 1991, the State Education Commission held the Fourth National Conference on Computer Education in Primary and Secondary Schools in Shandong, after which a National Leading Group on Computer Education in Primary and Secondary Schools was set up under the chairmanship of Deputy Director Liu Bin and with the participation of the heads of various departments and bureaus. In 1992, the State Education Commission issued the "Opinions on Strengthening Computer Education in Primary and Secondary Schools", which clearly set out the guiding ideology and main contents of computer education in primary and secondary schools, and made clear requirements on such important aspects as financial investment, teacher team building, teaching materials construction, hardware environment matching, teaching software development and management, and assessment of computer subject teaching. The high importance attached by the leaders and the specific deployment have not only accelerated the pace of the popularization of computer education in primary and secondary schools in China, but also made a great difference from the content to the form. Secondly, breakthroughs in computer technology and Internet applications have enriched the content of computer education in primary and secondary schools. in the early 1990s, computers not only made a series of major breakthroughs in hardware equipment such as computing speed, storage capacity and interconnection, but more importantly, they made integrated breakthroughs in the digitization and humanization of software such as operating systems, application systems and human-computer interaction. the Chinese character input method, the operation of Chinese interface, the application of the mouse, the launch of windows and office by Microsoft, the emergence of Internet browsers, the convenient processing of photos, audio and video on microcomputers and networks, and so on, have not only greatly expanded the scope of computer and Internet applications, but also broken the technical threshold of specialisation. All this has not only become an increasingly rich new content for computer education in primary and secondary schools, but has also become more and more closely integrated with subject teaching and school management in primary and secondary schools, deepening computer-aided instruction (CAI) and computer-aided management (CAM), and promoting the combination of the two. Thirdly, building research platforms, a number of outstanding teachers have leveraged information technology to explore the path of educational innovation. In the process of moving towards the second stage, the National Research Centre for Computer Education in Primary and Secondary Schools (Beijing and Shanghai Divisions) played an important role, serving as a link between universities and primary and secondary schools, and between the government, schools and enterprises^[7]. In the first generation of Apple machines introduced, teaching software integrated with the subjects aroused great interest among teachers and students, and in 1996, the National Research Centre for Computer Education in Primary and Secondary Schools applied for 60 million yuan in funding for the development of computer-aided teaching software. Among the first results achieved, the chemistry education software developed by the Chemistry Department of Beijing Normal University was not only welcomed by secondary schools, but also nurtured talents. The three undergraduates involved in this software development at the time were brought into the school as a whole by the affiliated secondary school of Nanjing Normal University, and a computer-assisted teaching development, application and training laboratory was created in the secondary school. The Beijing Research Department of the National Research Centre for Computer Education in Primary and Secondary Schools also cooperated with the People's Education Publishing House to introduce the educational

software Geometry Drawing Board from the United States, which was successfully promoted and applied in the teaching of primary and secondary school mathematics and secondary school physics and chemistry, promoting innovation in classroom learning, and in the process this cooperation not only brought together a group of university experts, but also trained and attracted the first generation of brave newcomers to enter the field of research-based teachers in primary and secondary school IT education^[8]. In the beginning of 1999, they took the lead in creating and accumulating excellent lesson plans for years, using online courseware and personal teaching resource websites as a link. They were the first to share with their peers all the excellent lesson plans they had created and accumulated over the years, the outstanding test questions and answers for the previous year's college entrance examinations, domestic and international competitions, and various units, as well as the courseware and resources they had carefully produced and accumulated, which attracted more and more teachers to participate in them and had a wide and profound impact. A group of IT education companies that have researched and developed education management software have also been favoured by the new wave of headmasters who were the first to focus on the digitisation of education management.

1.3. Stage 3: Deepening the development of informatization in basic education

With the advent of the 21st century, contemporary information technology has been dramatically renewed, with wireless mobile Internet, cloud computing, intelligent terminals, big data, Internet of Things, artificial intelligence, etc. forming an unstoppable trend of informatization in integrated innovation and wide application. The whole society is undergoing a historic and profound change in the way of production, work, life and learning. Against this background, on 25 October 2000, the Ministry of Education convened the National Conference on Information Technology Education in Primary and Secondary Schools in Beijing, officially launching the informatisation of basic education; in his report, Minister Chen Zhili deployed the implementation of the "School-to-School Project", proposing the introduction of compulsory IT courses in primary and secondary schools. In the report of the conference, Minister Chen Zhili deployed the "School-to-School Project", proposed the introduction of compulsory IT courses in primary and secondary schools, and took various measures to narrow the "digital divide". Since then, information technology in basic education, as a major national strategy, has received support from the highest levels of government and society as a whole, exploring and developing investment and operational systems such as the technology market, and gradually promoting the integration of macro and micro, technology and policy, and management and curriculum and teaching innovation, and developing in depth. In order to comprehensively fulfil the objectives and tasks of education informatisation set out in the National Medium and Long-term Education Reform and Development Plan (2010-2020), in 2012, the Ministry of Education released the Ten-Year Development Plan for Education Informatisation (2011-2020), which gives a clear and operational framework for the level of development of basic education informatisation and puts forward the "three channels and two platforms". In April 2018, the Ministry of Education released the Education Informatization 2.0 Action Plan. This is an inherent need to achieve a new leap forward based on historical achievements and is of strategic significance to the sustainable development of education informatization.

2. Overview of the achievements of basic education informatization and rational reflections

The achievements of China's basic education informatization can be summarized in the following aspects: (1) educational decision-making management departments at all levels have been paying increasing attention to education informatization, and the construction and application of management information systems have provided more and more data bases and scientific bases for

the scientific, democratic, flat and intelligent management of China's educational decision-making; (2) the construction of campus network hardware, software and resources has been promoted by administrative (3) the exploration of new learning and curriculum teaching models is receiving more and more attention; (4) a new generation of teachers, students and education administrators is growing up; (5) exchanges and cooperation with countries around the world across time and space are getting deeper and deeper; (6) the openness of the whole education system is increasing. The review and reflection on the development process of informatization in basic education has brought us many insights.

2.1. Insights from the process of informatization in basic education

First, the introduction of the world's cutting-edge technological achievements, based on the needs of future talent training. The first decade of the birth and development of computer education in China's primary and secondary schools coincided with the important historical stage of the initial reform and opening up in the 1980s. At that time, high-level experts introduced the world's cutting-edge ideas and achievements into China and linked them with the innovation of primary and secondary education, which shouldered the important task of cultivating future talents, and received the attention and advocacy of the highest national leadership, which determined that computer education in China's primary and secondary schools had a global vision at the beginning and was included in the strategic deployment at the highest national level. The "three orientations" and "the popularisation of computers should start with children" are not only firm, concise and far-sighted leadership language, but also deep-rooted and grounded policy guidance and implementation guidelines that can be easily understood and accepted by teachers and students, parents, the public and the education administration at all levels^[9]. It can be easily understood, accepted and implemented by teachers and students, parents, the public and education administrations at all levels. Secondly, the value orientation of information technology in education should be grasped, so that technology can truly serve human development. The difficulty and key to the entry of information technology into primary and secondary education is whether it can be truly integrated with the primary and secondary school curriculum, exploring what changes will occur in classroom teaching in the new time and space of information technology; whether it can improve the quality of education and teaching while freeing teachers and students from a large amount of low-level, repetitive work. This is what front-line teachers and headmasters are most interested in and need, and where the fundamental interests and hopes of primary and secondary school students and parents lie. This should become the goal and value orientation that primary and secondary education informatization firmly grasps. Thirdly, the informatization of basic education is becoming an important driving force for the innovative development of education. In the past 20 years, China's basic education informatization started from building a network, a library (digital resource library) and a team (training headmasters and teachers), to the top-level design of "three channels and two platforms", and then to the current deepening development of "three full, two high and one" (teaching (teaching applications covering all teachers, learning applications covering all students of school age, digital campus construction covering all schools, the level of information technology applications and information literacy of teachers and students generally improved, the completion of the "Internet + education" platform) in the continuous exploration of wave-like It is becoming an important driving force in the development of educational innovation.

2.2. Rational reflection on the process of informatization in basic education

While fully recognising the achievements, the problems in the process of informatisation of education in China cannot be ignored. (1) The goals and policies in the top-level design of

education informatization need to be better coordinated as a whole, and multiple policies should be avoided in the operation plan and concrete implementation process. (2) The grassroots government education administration and school leaders should prevent the one-sided pursuit of "hard targets" in the evaluation system to reduce the inefficiency and waste of investment in education informatization. (3) In order to solve the problem of chaotic and disorderly internal and external drivers of educational informatization, it is necessary to change the overly strong market-driven and technology-driven, and gradually strengthen the drive for educational innovation and application, especially in the construction of various informatization platforms, database construction, and resource construction, to coordinate and resolve the barriers of division of labor and conflicts of multiple vested interests between different investment systems and different IT enterprises involved in construction. (4) The basic theories and research on education informatization cannot all be imported and copied from foreign research, and the confusion of concepts must be overcome, especially against the hype of concepts and the misleading of policies and practices. Research on education informatization is a multidisciplinary and cutting-edge exploration, a complex system project of educational innovation and social change in which theory and practice are inextricably linked, requiring the cooperation and synergy of multiple fields and departments. This will enable the promotion of education informatization to remain rational and grow along a sustainable path.

3. The dilemma in education informatization and the mission of leaders of the times

The informatization of basic education is an extremely complex systemic project of educational and even social change. What kind of good headmasters are needed in the information age? And how can we judge whether a school is good or not? Is it possible to create a good school in the information age on the basis of a headmaster's personal skills alone? In reviewing and reflecting on these issues, headmasters of primary and secondary schools and educational decision makers at all levels in China must face and solve these challenges of the times.

3.1. Recognise the challenges of informatisation faced by education policy managers

The rapid development of information technology in education has brought many challenges to traditional school management. At the same time, the cost and knowledge content of information technology in school education is rapidly increasing, and the education industry is transforming from a labour-intensive industry to a capital-, technology- and intelligence-intensive industry, especially with the historic changes in the learning style in the curriculum and classroom teaching, and the rapid development of productivity in education, which inevitably conflicts with the original education system, which is the root of the various problems and contradictions that have emerged in the current process of education informatization. This is the root cause of all the problems and contradictions that have emerged in the current process of education informatization^[10]. Only by facing up to and resolving this conflict can we achieve a rational allocation of educational resources, fundamentally liberate the creativity of teachers and students, and achieve the healthy and sustainable development of educational innovation in China driven by information technology.

3.2. Deep understanding of the historical mission of education leaders in the information age

In the process of implementing the Ten-Year Development Plan for Education Informatization (2011-2020), the Ministry of Education has clearly proposed to cultivate and enhance leadership in education informatization. Leadership in education informatization is the ability to lead in informatization, including the two basic concepts of "education informatization" and "education leadership in the information age". "Education informatization" emphasizes a dynamic development

process, and the goal it pursues is to lead educational decision-making and management beyond industrial civilization and into the information age. The management of the information age is based on the collection and processing of massive management information, and through "IT governance" and "management process reengineering", the rational allocation of resources is achieved, thereby improving the level and effectiveness of decision-making and management, reducing decision-making and management costs, and enabling management on the basis of On the basis of scientification and democratisation, management will be standardised, process-oriented, flattened, personalised, humanised and intelligent.

3.3. The quality and ability of leaders required for the informatisation of basic education

At present, the teaching and learning model and the management service model of schools are undergoing a historic change in terms of digitalisation, networking and globalisation. This change is not just about allocating computers and building campus networks for teachers, students and headmasters, but about two deep changes in the digital transformation of schools. The first is the digital transformation of the school's curriculum and teaching "cells"^[11]. This means breaking with the traditional model based on individual teacher work (smallholder economy) and "mechanised indoctrination + standardised examinations (industrial assembly line)", and promoting a historical reform of learning styles. Secondly, this will inevitably lead to the digital transformation and integrated development of the school curriculum - teaching - assessment - management, as well as the creation of a new system and mechanism of networked services, which will in turn transform management concepts and styles and achieve a historical change from traditional school administration to information-based services. In this process, leaders are faced with a series of complex conflicts and dilemmas. How to face tradition and change, equity and efficiency, humanism and technology, morality and utilitarianism, the combination of the introduction of market-based management systems and mechanisms and adherence to the public good of education, the combination of reform and innovation with stability and coordination in management, etc. To maintain a dynamic balance of innovation and development in this series of dilemmas, leaders must have an open mind, a spirit of exploration, a tolerant heart and an indomitable In particular, the following three qualities and abilities must be constantly enhanced.

First, the ability to learn efficiently in the information age. This includes the ability to learn across disciplines and fields, the ability to lead and organise team learning, the ability to use information technology to learn efficiently across time and space, and the ability to make good use of external brains and rely on experts to expand one's core competencies and apply what one learns.

Secondly, the ability to use information technology to communicate, to communicate, to dialogue, and to make choices and decisions. In terms of external communication, the expert consultants contacted and hired by the school have to be expanded from the previous experts in pedagogy, educational management and subject teaching to experts in educational information technology, policy and regulation, etc. The consultation methods are also more convenient and diverse, reducing costs; communication with IT enterprises is a new challenge, requiring the search for enterprises with educational sentiments and strength to establish mutual understanding, learning, trust and win-win cooperation Long-term partnership, to achieve school-enterprise co-existence and co-growth.

Thirdly, execution in information management. This requires leaders to complete four transformations, including the transformation from individual decision-making management to democratised collective decision-making management; from traditional administrative management to information-based services; from hierarchical management to flat, fully participatory self-organised management; and from empirical management to intelligent management supported

by scientific data^[11]. This complex series of transformations of the times is difficult to be broken through by one school alone. Therefore, information technology in education management calls for win-win cooperation, resource sharing and collaborative innovation among schools, and urgently requires schools, government, enterprises and society to work together to create a large platform for education services, thus creating a new education ecology, promoting the balanced development of education, creating a new generation of education decision makers and leading Chinese education to move faster into the forefront of the world.

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