Chapter 9
Create National Smart Education Demonstration Zone to Promote Digital Transformation

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Haidian District is a strong science and technology district in Beijing and the largest basic education district in the city. Based on the idea of "service first, application king," Haidian District explores the construction of new infrastructure, education governance system, education teaching application model and so on based on smart education.

9.1 Regional Integration, Quality Balance

9.1.1 Building a Basic Support System for Smart Education

Building Haidian Smart Education "Cloud Center." The Haidian Smart Education Cloud Platform carries the district-school two-level educational application system platform, providing a computing power guarantee for the formation of cloud, net and terminal information application architecture in the Haidian District. System expansion was completed in March 2021, expanding over 120% of the original resource. To date, there are 86 systems platforms in the Education Cloud, more than 300,000 daily uses, and more than 3,200 educational cloud operations are handled.

Comprehensive promotion of smart classroom construction. Between 2020 and 2021, Haidian Education carried out two consecutive phases of smart classroom construction, upgraded 3555 classrooms in primary and secondary schools in the

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region, installed a smart large screen and recorded broadcast teaching system in 5750 classrooms, and basically achieved full coverage of smart classrooms in the region. The "blackboard" of classrooms has been upgraded to a "resource platform," realizing the timely interactive transformation of text, audio and video, ensuring that all ordinary classrooms in the region have the technical ability to carry out the teaching of air classroom, double teacher classroom, fusion classroom, etc.

Upgrade and optimize Haidian primary and secondary school resource platform. In 2021, the Haidian Primary and Secondary School Resource Management Platform (Air Classroom) has targeted more than 6,000 new educational resources, developed a total of 11,297 large modules and thematic online curriculum resource packages, covering the whole school section and 43 disciplines, and achieved remarkable results in responding to epidemic prevention and implementing double reduction. The resource platform has effectively promoted the balanced radiation of high-quality educational resources across regions. Up to now, 301,957 people have been supported by the resource platform, including Hetian County of Xinjiang, Keyouqian Banner of Inner Mongolia, Aohan Banner of Chifeng City of Inner Mongolia, Yixian County of Hebei and Chicheng County of Hebei.

9.1.2 Creating a Full-Scene Application Model for Smart Education

In Haidian District, the basic functions of "Education Cloud System," "Cloud Classroom Live System," "Primary and Secondary School Resource Platform System," Data Opening and Technology Integration, etc. Combined with the big data platform and the "District Smart Classroom Transformation and Upgrading Project," the whole-scene application of smart education is realized.

Dual-division classes. Thirty-one model schools were selected to explore and build the model of "Double Teacher Classroom." Up to now, the teaching of "double teacher classroom" in Haidian District No. 4 Experimental Primary School, Capital Normal University Affiliated Primary School, Beijing No. 20 Middle School, Haidian District Qinghe Middle School and other schools has been normalized.

There is no suspension of classes. During the period of epidemic prevention and control, the District Education Commission conducted a survey of 194 schools in 17 school districts in Haidian. Under the unified entrance of a smart big screen in a smart classroom, by creating live classroom and pushing daily teaching content, students can simply scan QR code at home to watch and participate in the classroom teaching scenes in real time, to meet the teaching and learning needs of various scenarios under epidemic prevention and control.

Online and offline mixed training. The cloud classroom live broadcast platform supports the whole-process information management such as course release, self-selection, record study, and credit recognition, retaining the structured resources in

the discussion process, forming a mixed study system combining offline study, self-selection, online study, process evaluation and summary evaluation. The platform holds nearly 200 training sessions for teachers and cadres each year, with hundreds of well-known experts giving lectures and a total of about 120,000 training sessions. During the period of epidemic prevention and control, the Platform included 424 schools or units, 132 subject teachers and 35,670 trainees. A total of 147 online training courses were established and 823 formal training activities involving online teaching and research were carried out.

Teaching and Learning Model Inquiry. 1. The autonomous learning mode of students integrated into micro-classes. Taking micro-course research as the starting point, taking micro-course fusion application as the starting point, supplemented by information technology series training to enhance teachers' information technology application ability, provide teachers with a variety of rich learning resources such as micro-class to meet students' independent learning needs, and cultivate students' independent learning ability and deep learning ability. 2. The "three integration" model of the core literacy of internalized disciplines. By exploring new ways of learning and developing the community of teachers and students, online and offline mixed learning, we can realize the mutual promotion of learning, teaching and evaluation. Three. Focus on creative interaction patterns of learning development. Build a unified service platform, promote high-quality resource sharing, promote the creation of a development learning community through multi-campus linkage and multi-project, empower teaching and evaluation of data, and optimize classroom teaching. 4. Cultivate the "programming + mathematics" mode of computational thinking. According to the age characteristics and cognitive laws of the students, the course system of "Programming + Mathematics" covering the whole grade is built, which deepens the students' knowledge of mathematics and improves the students' ability and literacy to solve problems.

9.2 Regional Governance and Characteristic Leadership

Taking the opportunity to develop smart education, the Haidian District established the Haidian Internet Education Research Institute under the direct leadership of the district committee and government. With the aim of resource sharing, collaborative innovation and cooperation, Haidian adopted the implementation path of "government management, expert guidance, enterprise research and development, and school application". Haidian Institute of Internet Education actively plays the role of think tank platform and resource hub. On the one hand, it accelerates collaborative innovation in Industry-University-Research, and unites high-tech enterprises with experts, scholars and front-line teachers in various fields to jointly study the application of new technologies such as artificial intelligence. Combined with Beijing Normal University, Capital Normal University, Tsinghua and other universities, as well as Internet education enterprises in Haidian District, special applied research has been carried out in primary and secondary schools in Haidian District, forming a demonstration

and leading role. On the other hand, explore the wisdom of education crowdfunding, and establish an innovative cooperation mechanism between the government and high-quality enterprises. Unified planning and design, unified standard planning, unified training services, unified operation and maintenance guarantee and unified effectiveness evaluation form a new mechanism for the integration and innovation of high-quality resources, providing a good policy environment and development space for promoting smart education.

9.3 Innovation and Development

Haidian District explores the construction of a new environment of education and teaching that is universal, flexible and intelligent based on the Science and Technology Applied Education Teaching Scenario of Zhongguancun Science City—Beijing 101 Middle School Education Group Future School Project.

9.3.1 Smart Environment Construction

The construction of new basic hardware facilities for education in Haidian District includes: high-speed and safe wired network and wireless network covering the whole school. We manage the campus intelligent hardware environment, including intelligent security system, face recognition access control gate, classroom intelligent access control and classroom Internet of Things, and electronic class boards covering classrooms, laboratories and conference rooms of the whole school. As for the inside of the campus, there is a flexible and ubiquitous learning environment and an intelligent and efficient teaching environment, including a new technology classroom equipped with students' mobile terminals, English listening and speaking model test/teaching computer room classroom, normal direct recording and broadcasting courier interactive classroom, outdoor reading kiosk, self-service library, streaming media center, innovative education laboratory of artificial intelligence, and laboratory of a college of excellence focusing on cultivating top-notch innovative talents, etc.

Haidian District has built a future school platform covering teaching, learning, examination, evaluation, management and research, including a direct recording and broadcasting system, intelligent teaching system, precise teaching system, personalized learning system, school-based resource platform, comprehensive quality evaluation system for students and intelligent office management system.

9.3.2 Smart Teaching

Intelligent readiness. We collect students pre-learning data, homework results and other data, generate visual chemical situation report, help teachers accurately grasp the academic situation. We also provide teachers with teaching materials analysis, teaching design, knowledge inquiry, test training, demonstration example and other types of preparatory teaching resources. Meanwhile, we push teaching resources for teachers and help teachers improve their preparation efficiency through precise markup, intelligent recommendation and search for teaching resources.

Precision teaching. Through classroom teaching multi-screen co-operation seamless interaction, large- and small-screen mixed teaching, we realize interactive teaching and timely academic feedback. Relying on various interactive teaching tools, virtual experiments and other scenarios of chemistry resources, we help teachers to accurately judge academic conditions and pay attention to each student. Classroom teaching brings together student quizzes, classroom exercises, homework, autonomous learning and other academic data to generate digital images of students, helping teachers to teach accurately.

Personality learning. Using knowledge maps and teaching big data as support to build a personalized learning platform for students to push personalized learning resources for targeted learning. With the help of multi-intelligent terminals, students learn universally, including omnipresent reading, error correction and expansion exercises based on intelligent wrong question book, intelligent planning learning path based on knowledge map, intelligent correction of English composition photography, English listening, reading and writing full-scene intelligent training evaluation, etc.

Student development guidance. To build a student development guidance platform to help students understand their own professional interests and personality advantages and other information, and to provide reference suggestions for students' college entrance examination. Study investment evaluation, macro-grasp students' degree of investment in each subject, early warning of insufficient study investment, and provide advice for subject study. Construction of the college entrance examination mock voluntary application system, through the estimation of scores, the position of mock voluntary application, recommended suitable schools and majors for reference by students and parents.

OMO hybrid teaching. To build an online direct-broadcast teaching system for expanding the radiation range of high-quality teachers, such as the delivery classroom and the dual-teacher classroom, to support the development of group-school hybrid teaching and research through informatization, and to provide high-quality resources for weak or counterpart schools in group schools; Support offline new technology classroom teaching, also support online direct/video teaching, online and offline integration teaching, special period air classroom teaching, etc.

Smart Review. Through automatic correction of objective questions, automatic scoring of English math blank questions and intelligent correction of English and Chinese composition, the burden of teacher's homework and examination evaluation is reduced. Teaching assistant assignments are taken, handwritten content of

multiple choice questions is automatically identified, multi-dimensional information reports are automatically generated, and teaching assistant teachers review burden reduction and efficiency gain. To build a simulation examination system, intelligent teaching system and independent training system for English listening and hearing, to support teachers to carry out simultaneous listening and hearing exercises in class, and students to train independently in class to improve the efficiency of English listening and learning.

9.3.3 Smart Examination

Build an online and offline examination system that supports multiple scenarios. Support special period online examinations such as epidemics, teacher's real-time online invigilation, inspection, student's online examinations, post-exam online marking. Offline examinations use an AI qualifying engine to arrange and output multidimensional examination tables, and electronic class cards to push and display test room information. Support the Group School Entrance Examination, Single School Examination, Daily Practice, Support the first reading after sweeping the hand reading form and first sweeping after reading the online reading form. Upon completion of teacher marking, the multi-level examination report is quickly generated, including joint examination report, school-level report, class report, individual student report, teacher after examination timely and efficient carry out targeted assessment and student personalized tutoring.

9.3.4 Smart Evaluation

Comprehensive quality evaluation of students. Based on the development needs of school characteristics, a comprehensive quality evaluation system with 43 indexes is constructed, which is mainly composed of four modules: study, ability, character and vision. Support multi-roles to record, review and score students' daily performance. Record and evaluate students in a process, and generate a record file of students' personal growth. With the help of the Internet, the evaluation results will be pushed to parents in time, and parents will be introduced to cooperate with schools to pay attention to and guide students' comprehensive development and healthy growth.

Evaluation of students' mental health. Build a mental health evaluation system for students, conduct mental health evaluation for freshmen, fully understand freshmen's mental health, personality, values, etc., and conduct appropriate and timely psychological intervention and targeted counseling. During the semester, students' stress assessment will be carried out to fully understand all aspects of students' study and life, and to guide teachers to scientifically and pertinently design and carry out educational and teaching activities.

9.3.5 Smart Management

Haidian has built a "two centers and one platform" intelligent management system in the school, covering all aspects of campus operation guarantee such as OA office, intelligent educational administration and student development. The two centers include "Campus Service Center" and "Campus Call Center", which serve teachers and students in efficient and paperless office and daily life; The first platform is "Campus Communication Service Platform", which includes campus communication PC and mobile APP applications, and carries out campus information exchange, file transfer, mobile office and other scene applications.

In the future, Haidian District will continue to follow the principle of "people-oriented, all-round development, multi-participation, coordinated promotion, innovative mechanism, openness and sharing", focus on enriching the quality supply of education and teaching, insist on educational informatization as strong support for educational modernization, promote the normal application and large-scale popularization of smart education in education and teaching, foster new kinetic energy of educational development with new technologies, boldly explore and do what one can in terms of environment, mode and system, and strive to form a nationwide smart education.