USING INFORMATION AND COMMUNICATION TECHNOLOGIES IN HOME-BASED LEARNING ACTIVITIES OF CHINESE PRIMARY SCHOOL STUDENTS

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Using Information Technology Is The Key to Increasing Efficiency of Students' Home-Based Learning

The article reveals the role and functions of information and communication technology in primary school students' home-based learning. The problems of resource supply, learning efficiency improvement, interaction between the school and parents and digital literacy cultivation are under consideration too.

Introduction. The rapid development of information and communication technology poses a challenge for education in terms of expanding the practice of advanced learning, using new technical tools and improving educational methods. In this regard the problem of searching for the possible ways and means of using information and communication technology in a primary school students' home-based learning, monitoring and optimizing it is of great importance. Identifying and accounting for the conditions of digital efficiency will ultimately help to improve the educational process effectiveness.

Main part. Information and Communication Technology (ICT) is regarded in modern Chinese literature as a comprehensive technology system that integrates information processing, data transmission, network interconnection, intelligent interaction and digital resource services. Its essence is a systematic collection of technologies that use computers, mobile terminals, the Internet, cloud computing, big data and artificial intelligence as carriers to realize the collection, encoding, storage, transmission, sharing and application of information [1]. In the field of educational research, ICT is not a single tool, but an ecological element that can reconstruct the learning environment, expand the learning space and time, connect the home and school fields, and support personalized and self-directed learning. Its core value is reflected in breaking through the boundaries of traditional education and structural transformation of learning methods. For the home learning scenario in primary school, ICT emphasizes low threshold, lightweight, security and fun, so as to match the cognitive development law, psychological characteristics and informal characteristics of home learning of young students, and become an important technical link connecting school education and home education. From an educational theory perspective, the openness, interactivity, and resource integration capabilities of ICT perfectly align with the learning characteristics of primary school students, who primarily rely on intuitive and visual thinking. This allows them to consolidate knowledge and expand skills in a more relaxed and engaging way during home learning, which is a key reason why ICT holds unique value in the home setting for primary school students. Within the overall framework of digital transformation in education, home learning is no longer a simple extension of school education but a learning space with independent value and function, and ICT provides the fundamental technological support for this transformation.

From the perspective of historical evolution, the application of ICT in the field of education has undergone a long period of theoretical exploration and practical iteration. The period from the 1960s

to the 1990s was the nascent stage of computer-aided teaching, with stand-alone teaching software and program teaching as the main forms. The technology was limited to the classroom and did not extend to the home learning scene. Its function was mainly knowledge presentation and mechanical practice. The application of technology in this stage was limited by hardware conditions and network environment, and could only realize one-way knowledge transmission. It was difficult to form interactivity and personalization, so there was no effective connection with home learning. From the beginning of the 21st century to around 2015, the period of network popularization and home-school connection began. With the rapid penetration of the Internet and mobile smart terminals, ICT gradually moved from the classroom to extracurricular activities and from schools to homes. Online learning resources and basic home-school communication platforms began to appear, and the home field was gradually included in the research and practice of educational informatization. Since 2016, it has entered a period of intelligent integration and ecological development. Big data, artificial intelligence, 5G communication and other technologies have been deeply integrated into education and teaching. Personalized push, process evaluation and intelligent learning support have become the focus of theoretical research and policy attention. This development process shows that the application of ICT in education has always been upgraded along the path of "tool-media-ecosystem", while family learning has gradually moved from the peripheral scene to the core field and become an important part of the education system that cannot be ignored.

Over the past decade, the Chinese government has continuously introduced a series of policies, including those on educational informatization, the "double reduction" policy (reducing the number of students living in poverty and income), home-school collaboration, and digital literacy. These policies have elevated the application of information and communication technologies (ICT) in primary school students' home learning to the level of a national education strategy, forming a clear policy logic and functional positioning, and providing fundamental guidance for theoretical research and practical implementation. autonomous, personalized, and collaborative training.

In 2018, the Ministry of Education issued the "Education Informatization 2.0 Action Plan", which proposed the development goals of "three full, two high and one big" and clearly required the construction of a networked, digital, personalized and lifelong education system. That policy established the basic role of ICT in resource supply, time and space expansion and educational equity in family learning from the national strategic level, marking that family learning has officially entered the vision of national education digitalization construction.

In 2022, the "Compulsory Education Information Technology Curriculum Standards" were officially implemented, listing information technology as a compulsory course in primary schools. It required the cultivation of students' digital literacy and skills, and guided students to use information technology safely, reasonably and effectively in family scenarios to carry out self-directed learning. It standardized the boundaries of ICT use and its educational value from the perspective of curriculum standards.

Under a comprehensive policy framework, the role of ICT in primary school students' home learning can be summarized in four aspects: first, it promotes resource accessibility, breaking down urban-rural and regional barriers to ensure that high-quality educational resources reach all families, effectively narrowing the gap in learning conditions between different families. Secondly, it improves quality and efficiency, optimizing learning design and evaluation methods to enhance the relevance and effectiveness of home learning and truly implement the goals of reducing burdens and improving quality. Thirdly, it fosters collaboration between home and school, eliminating information barriers and building a closed loop of collaborative education between home and school, enabling families and schools to form a unified educational force with aligned goals and coordinated pathways. Fourth, it cultivates literacy, fostering primary school students' digital literacy, self-learning ability, and information ethics awareness in the home setting, laying the foundation for lifelong learning. The policy logic clearly points to the fact that ICT is not simply a technological tool, but a key supporting element for the high-quality development of primary school students' home learning and an important force in promoting the balanced development of basic education and the transformation of educational methods.

Over the past decade, Chinese scholars, grounded in the Chinese educational context and the characteristics of primary school education, have conducted systematic theoretical research on the effective application conditions, forms, practical problems, and optimization paths of information and communication technology (ICT) in home learning, forming a localized and professional academic achievement system.

Chinese scientists point out the conditions under which the use of ICT will be effective in primary school students' home learning. Only when technology, participants, environment and teaching are synergistically matched, effective application can be achieved. From a theoretical perspective, the realization of effective application requires the establishment of a systematic guarantee mechanism;

the absence of any single element will directly affect the overall effect.

Regarding the adaptation of technology and resources, Li Yi and Zhong Baichang proposed that primary school students' cognition is characterized by concreteness, intuitiveness, and short attention span. Therefore, ICT tools and digital resources must have low operating threshold, high interactivity, and strong interest. At the same time, it is necessary to ensure the stability of the home network and the compatibility of equipment to eliminate obstacles to the use of technology [1]. Zhang Liguo and Wang Jing further pointed out that home learning is characterized by informality, fragmentation, and strong autonomy. ICT applications cannot directly copy the school classroom model. It is necessary to develop lightweight, life-oriented, and gamified resources that are adapted to the home setting to achieve a deep fit between the technological form and the learning scenario [2]. Wu Di and Li Mang's research emphasized that the subject-specific suitability, synchronicity, and ease of use of resources are the foundation for effective application. Digital resources should be connected with classroom teaching content to meet the needs of the entire process of previewing, consolidating, and expanding [3].

Regarding the multi-subject literacy conditions, Wang Lu's "three-element digital literacy model of home, school and students" has become the mainstream theory in China. This scientist believes, that the effective application of ICT depends on the joint support of three types of subjects: students have the ability to filter basic information, learn independently and surf the Internet safely; teachers have the ability to design digital assignments, diagnose learning data and provide online guidance; and parents have the ability to raise children digitally, supervise technology and collaborate with home and school [4]. Ning Bentao and other scholars also pointed out that the lack of digital design ability of teachers and the lack of guidance ability of parents are the core bottlenecks restricting the implementation of ICT in family learning [5].

Regarding the conditions for scenario integration and teaching collaboration, Yu Shengquan proposed that ICT applications in home scenarios must form a complete closed loop with school classroom teaching to achieve seamless connection between pre-class, in-class, and post-class learning. Isolated use of technology detached from the school teaching system makes it difficult to achieve knowledge internalization and ability improvement [6]. The continuity of learning is the core logic for ensuring learning effectiveness. Gu Xiaoqing and Wang Wei further emphasized that a stable home-school collaboration mechanism is a long-term guarantee. Only by achieving information sharing, task synchronization, and evaluation sharing through a technology platform can the standardization and continuity of ICT applications be guaranteed [7]. Yang Xiaohong and Li Hongke proposed from the perspective of fairness that the differences in digital environment between urban and rural areas and families must be compensated through policy and resource allocation; otherwise, scenario integration will exacerbate educational inequality [8].

Chinese scholars, have summarized the application of ICT in primary school students' home learning into four systematic models, covering the entire home learning process.

The first model is connected with resource supply applications, that use the National Primary and Secondary School Smart Education Platform and the Local Education Resource Public Service Platform as carriers to provide families with digital learning content such as micro-lesson videos, synchronous exercises, reading materials, and audio materials. This is the most basic and widespread application.

The second one is process support applications, including intelligent tutoring, voice assessment, online Q&A, interactive exercises, etc. These applications use artificial intelligence and interactive technology to provide students with real-time learning support, especially suitable for family practice scenarios in language subjects. This form focuses on optimizing the learning process, providing timely feedback and guidance to students, which is in line with the reality that primary school students lack self-learning ability and effectively improves the completion quality of family learning.

The third model is evaluation and feedback applications, which rely on big data technology to collect learning behavior data, analyze learning time, completion quality, error type, and habit characteristics, and generate visual reports to provide a basis for teachers to adjust their teaching and parents to provide guidance. Its theoretical significance lies in changing the traditional evaluation model of family learning that "emphasizes results and neglects process", and moving towards precise and process-oriented evaluation.

The fourth model is home - school communication applications, which realize the push of learning tasks, feedback on learning progress, and sharing of family education guidance through digital platforms, thereby promoting home-school collaboration. Its core value lies in eliminating information asymmetry, building a collaborative education support system, and making family learning no longer a one-sided task for students, but an educational activity jointly participated in by home and school.

While affirming the value of ICT, domestic scholars have also deeply reflected on the practical dilemmas from a theoretical perspective.

Firstly, the conditions for effective application

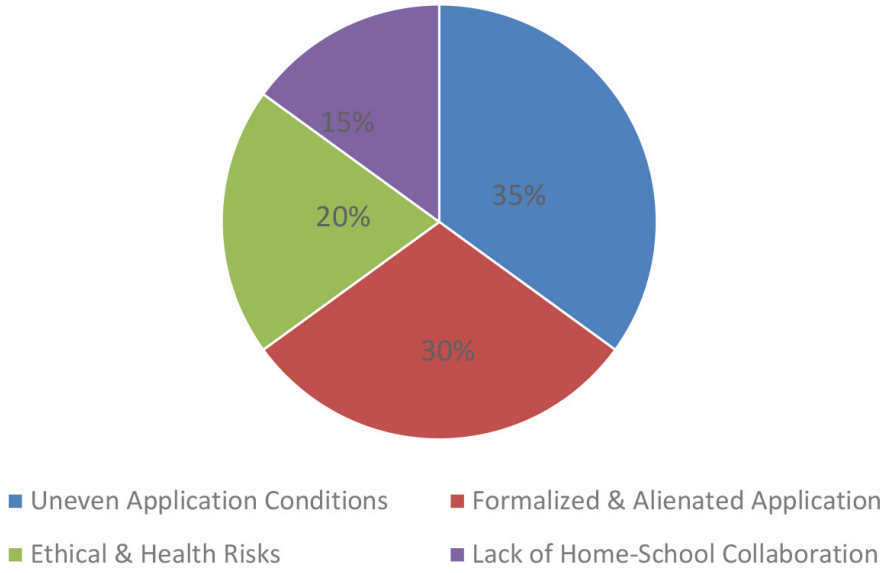

Figure — Composition of Practical Problems in ICT Application for Primary School Home Learning

are insufficient and uneven. Zhu Zhiting and Peng Hongchao have pointed out that there are significant digital divides between urban and rural areas, regions, and families in my country, manifested as equipment divides, network divides, resource divides, and literacy divides. Rural families generally face insufficient hardware and resource scarcity, while urban families experience resource overload and overuse, resulting in overall inadequacy [9]. This unevenness leads to a significant differentiation in the application effects of technology and also exacerbates the pressure on educational equity. At the same time, the varying levels of subject literacy, weak self-management ability of primary school students, limited digital design ability of teachers, and insufficient supervision and guidance ability of parents all restrict the application effect.

Secondly, the formalization and alienation of application are prominent. Yang Xiaohong and Li Hongke's research found that some schools equate ICT simply with "online homework", increasing the amount of practice through technology, which actually increases the learning burden on students' families and deviates from the original intention of the "double reduction" policy. Some resources are designed to be adult-oriented, entertaining, and complex to operate, which does not conform to the cognitive patterns of primary school students; some platforms have redundant functions and weak practicality, resulting in superficial application. Formalized application not only fails to realize the value of technology, but also has a negative impact on students' learning, and may even cause conflicts between families and schools.

Thirdly, ethical risks and physical and mental health issues are prominent. Scholars generally believe that excessive use of digital devices may lead to decreased vision, distraction, and weakened paper writing ability in primary school students; problems such as harmful online information and game interference affect students' concentration; some students develop a dependence on technology, which weakens their independent thinking ability. Theoretical research generally emphasizes that it is necessary to clarify the boundaries of technology application, strengthen digital ethics and rule education, and maintain a balance between technology empowerment and physical and mental health.

Fourthly, the lack of a home-school collaboration mechanism leads to fragmented application. Multiple theoretical studies have shown that the current application of ICT in home learning is mostly limited to resource delivery and homework assignment, lacking a systematic home-school collaborative design. There is a lack of coherent teaching logic, learning paths and evaluation standards between schools and families, resulting in fragmented and inefficient application of technology. Fragmented applications make it difficult to form a joint force for education and also fail to achieve long-term and stable learning results, becoming an important obstacle to high-quality development.

As shown in Figure, the real problems of ICT in primary school home learning are unevenly

distributed. Among them, “uneven application conditions” accounted for the highest proportion (35%), reflecting the digital divide between urban and rural areas and between families; “formalization and alienation of application” was the second highest (30%), which was manifested in equating ICT with “online homework” and increasing the burden on students; “ethical risks and physical and mental health issues” accounted for 20%, involving concerns such as vision loss and attention deficit; “lack of home-school collaboration mechanism” accounted for 15%, which was reflected in the fragmentation of technology application and lack of system design. This problem structure has clarified the direction for subsequent research.

Conclusion. In modern Chinese scientific literature the concept of information and communication technology (ICT) is regarded an integrated technical system that realizes information collection, transmission and application through digital tools and network technology. Originating from computer-aided instruction and developing via internet popularization and intelligent technology integration, ICT has evolved from a single tool to an educational ecological element. Advanced experiences focus on policy guarantee, child-centered design, home-school collaboration and digital equity, that provide valuable references for China.

Supported by China’s policies including “Education Informatization 2.0 Action Plan”, the “Double Reduction Policy” and home-school collaborative education documents, ICT performs four core functions in primary school students’home-based learning: inclusive resource supply, learning efficiency improvement, home-school connection and digital literacy cultivation.

Domestic scholars clarify that the effective application of ICT requires the coordination of technical resource adaptation, home-school-student digital literacy and teaching scene integration and summarize four application forms: resource supply, process support, evaluation feedback and home-school communication. Meanwhile, they also point out prominent theoretical problems: unbalanced application conditions, formalized and alienated use, physical and ethical risks, and fragmented home-school collaboration, which lay a theoretical foundation for the high-quality development of ICT application in primary school family learning.

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