On the In-depth Integration of ICT with Present Education

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Abstract—With the rapid development of ICT and its continuous penetration into the field of education, the importance of educational informatization in the process of educational reform and development has become increasingly prominent. ICT has a revolutionary impact on the development of education. It is a strategic choice to comprehensively drive the modernization of education by informatization of education in order to meet the challenges of educational development in the information age. ICT not only has broken new ground in the models of traditional education, but also provide effective means of teaching and learning. This paper will improve the effectiveness of contemporary education as the starting point and the foothold, expound the new changes brought by ICT for education, and analyze the practical problems faced by the deep integration of ICT and education. On this basis, measures to promote the integration of ICT and education have been proposed, such as improving relevant planning, innovating teaching and learning modes, strengthening the construction of educational resources, and continuously improving the coordinated promotion system of multi-participation.

Keywords—ICT; education; integration; strategy

I. INTRODUCTION

The continuous development of information and communication technology (ICT) has a far-reaching impact on contemporary education, making the deep integration of ICT and contemporary education an important part of the current education. The informatization of education is the foundation and prerequisite of the modernization of education, and is an important element and a key indicator of the modernization of the education. Modernization of education through the education informatization is a strategic choice for the development of the education; the integration of ICT and education is an important part of the construction of the informatization of education. As the end of the second decade of the 21st century, the requirements of informatization of education have increased. Therefore, it is necessary to achieve further integration of ICT and the modern education. Only by the deep integration of ICT and contemporary education, can we continuously optimize contemporary education, and significantly improve the quality of contemporary education.

II. EXPLORATION OF THE THEORETICAL BASIS OF THE DEEP INTEGRATION OF ICT AND EDUCATION

A. Characteristics of ICT

Information Technology, also is known as Information and Communication Technology (ICT). Initial studies focused on understanding and positioning of the concept of "information" and "technology". Because of the different understanding and defining angles of the two concepts, different understandings and disputes about "ICT" have arisen. With the widening of research, a relatively consistent definition of concept connotation has been initially formed, that is, ICT refers to the technology that can complete the functions of information acquisition, transmission, processing, regeneration and application, and is also defined as the whole of sensing, communication, computer, intelligence and control technology. It is a new product of the new era, a milestone in the progress of human civilization, and an engine of economic growth. The integration of ICT in education is an imperative of our time and the development of the community education.

The biggest difference between ICT and other technologies lies in the following two points: technical and informative. Technological means that compared with other technologies, ICT uses more advanced equipment, more mature related skills, more rich experience, more convenient and efficient operation and use, and relatively high efficiency; informativeness means that ICT mainly serves information, and its functions and effects are mainly achieved through ICT. Similarly, ICT has the commonalities of other technologies, namely, universality, dynamics, sharing, sustainability and relativity.

B. Four-stage Continuum Model

The informatization of education is a historical process that is active in the ongoing development of the integration of ICT and education. Anderson et al. put forward the "four-stage continuum" model when discussing the role of ICT in educational reform, which can help us understand the
integration of ICT and education. These four stages are defined as "Emerging", "Applying", "Infusing" and "Transforming" [1].

The initial stage means that the school is in the initial stage of ICT use, which is mainly manifested by the school's purchase of computer hardware and software. At this stage, managers and teachers begin to explore the possibility of applying ICT in school management, and add ICT to the curriculum. The application of ICT in basic skills in curriculum teaching shows an increasing trend. If teachers gradually adapt to ICT, they will enter the next stage. Teachers' task in the initial stage is to learn and master ICT skills.

When teachers form a new understanding of ICT to promote learning, it shows that they have entered the application stage. Managers and teachers use ICT to accomplish tasks in school management and curriculum. Teachers will be more subject to learning environment. Specialized ICT tools and software will be used in different courses. Teachers have mastered ICT skills, and the frequency of ICT use in teaching will gradually increase. Teachers pay more attention to how to integrate ICT with other subjects, that is, how to use technology to solve curriculum and subject problems.

The period of integration is to integrate ICT into the curriculum. Computer-based technical equipment is installed in the laboratories, teachers and administrators' offices of schools. In the course of teaching, the application based on the real world makes the boundaries between disciplines blurred gradually. Teachers focus on ICT teaching methods. Compared with traditional teaching, ICT-supported teaching and learning will change its teaching process and teaching mode.

In the stage of change, schools use ICT to reflect and rebuild school organizations in accordance with innovative ways. The core of the curriculum is learner-centered, realizing the integration of curriculum field and real world application. At the professional level, ICT is still an independent subject, but it can be integrated with all professional fields. Schools become community learning centers. The transformation stage can also be regarded as the normalization of the integration stage, which is the basis of the transformation stage.

III. THE PRESENT SITUATION OF INTEGRATION OF ICT AND EDUCATION

There are different degrees of integration between ICT and education. Some researchers divide the integration of the two into three levels: low-level integration is a tool-assisted level, which shows that ICT is used as a teaching technology and tool, such as collecting and collating materials, preparing lessons and demonstrating in class, processing homework, etc. The middle-level integration is a multi-media level, which shows the full use of the image, intuition, truthfulness, reality and relevance of ICT. The characteristics of recent life and its advantages in data assessment, information collection and processing are also discussed. The high-level integration is mainly manifested in the "common thinking level", which is characterized by the integration of technology and teaching, and the integration goes deep into the value, ideology and spirit of teaching and educational informationization, reflecting scientific value judgment and persistent educational belief.

A. New Changes Brought about by ICT in Education
1) Teaching methods

The traditional teaching method is teacher-centered and teaching-oriented. Teachers are the main body, and the method used is a one-way transmission process from teachers to students. However, Flipped Classroom which was initiated in the past few years, substantially renovated the traditional education model. Teachers design activities in class, and the study and practice of the students in the class has increased significantly. Teachers use the teaching platform to assign tasks to students, problems and other feedback found by students in the process of autonomous learning can be summarized into the teacher machine through the teaching platform. Teachers can see and answer at the first time. However, these teaching methods are still in the initial stage. To really apply it in the field of education, we need to understand its advantages and disadvantages, and then give full play to its good teaching effectiveness. ICT has in and of themselves, the advantage of being simple, flexible and functional. The application of ICT can provide diversified new teaching tools for contemporary education, thus actively breaking the bondage of traditional teaching and constantly promoting the improvement of the quality of contemporary education [2]. In short, the development of teaching methods, has given new impetus to the dissemination of information on education.

2) Content of courses

Before the beginning of each semester, the teaching and research department usually customizes the content and plan of each semester according to the teaching materials and syllabus. The advantage of this customization is that it embodies the systematization of teaching. However, a good teaching plan made one semester in advance cannot catch up with the speed of information updating. In this era of ICT explosion, every moment, all walks of life are likely to undergo reform, and various emerging technologies are emerging at any time. Therefore, the personnel training program of each specialty should be adjusted in time, and then the reform of teaching content is about to come out [3]. Thus, the integration of ICT into the process of education has added new connotations to the teaching content. With the continuous development of ICT, we have every reason to believe that the teaching content will keep pace with the times and build a higher, stronger and updated knowledge and skills system.

3) Learning environment

The learning environment is learning locations associated with the objectives of teaching and learning activities. Compared with the traditional classroom teaching environment, the establishment of virtual classroom and the development of e-learning create different learning environments for students. Compared with the traditional classroom, e-learning has no limitation of time and place. At this stage, the learning of the clouds is also made possible by the rapid diffusion of cloud computation. Through the cloud, students can realize the intercommunication of home and school, and the intercommunication of resources, so that they can learn from time to time and from place to place [4]. Therefore, the integration of ICT into education will create a new learning environment, make the living environment and learning
environment into one, and completely change the traditional teaching and learning form.

From the perspective of past education, in the teaching process, the group is mainly used as a teaching object to carry out teaching activities. This method of teaching is very detrimental to the development of the personality of the students and the development of his or her interests and abilities of autonomous learning. The deep integration of ICT and contemporary education not only changes the traditional indoctrination and passive education mode, but also enriches the teaching environment, thus effectively improving students' interest in learning and effectively stimulating students' subjective cognition. Significantly enhance the innovative spirit of students. With the aid of ICT, teachers can use the video, course software and other tools to teach students outside the classroom during the course of teaching. At the same time, in order to facilitate the exchange and discussion between students, the teacher can upload the teaching process to the network, so that the teacher becomes the organizer and participant of the learning, thereby significantly improving the quality of knowledge transfer.

B. Realistic Problems Faced by The Deep Integration of ICT and Education

1) Cognitive divergence

There are some divergences in the understanding of the value and significance of educational informationization: some believe that the object of education is people with emotions, modern ICT can solve the problem of general "products", but technology has no emotions, facing people with emotions cannot do anything, educational informationization will be a "show"; Some people think that desktop computers, tablets, smart phones and other information products are the main culprit in Internet addiction and game addiction. Others believe that electronic equipment is the direct cause of myopia. All these hinder the further integration of ICT and education.

2) Software and hardware configuration

The main purpose of the deep integration of ICT and education is to optimize learning, the object is very clear-students. All the work, such as optimizing learning resources and changing teaching organizational forms and so on, should be carried out around students regardless of the law of support and optimizing means provided by ICT. Deviating from student orientation is tantamount to violating the law of learning, and the effectiveness of any equipment and software will be greatly reduced.

Since human beings entered the information society from the industrialized society, profound changes have taken place in production resources, production tools and so on. The influence of ICT on social formation is all-round, learners have access to resources and more diverse information. How to screen valuable resources for learners from numerous online learning materials? What kind of organizational form of education is more conducive to learners? This series of problems are relatively independent and intrinsically related, and need to be considered and solved one by one. At present, the integration of ICT and education is relatively fragmented. Some are confined to a certain section, some are confined to certain disciplines. This kind of integration is not conducive to the full play of ICT to promote the modernization of education, and may even lead to controversy and effect. It is counterproductive.

3) Teacher's lag in information-based teaching

Firstly, informationization has a profound impact on teaching, but due to various subjective and objective reasons, teachers lack of thinking and Exploration on Informationization teaching, which makes the effect of informationization teaching poor [5]. Secondly, the research angle and means are monotonous, and the traditional research methods still play a dominant role in the research of information-based teaching, mainly experience summary and speculative research, lack of operability. Finally, there are some difficulties in the practice of teaching informatization, such as high quality resources cannot be shared, the effect of excellent courses is not high, and the click-through rate of network courses is low.

C. Analysis of the Reasons Restricting the Integration of ICT and Education

1) Superposition of technology and education

Education is a complex ecosystem, and teaching is also a complete system composed of teachers, students, learning environment, learning resources, teaching evaluation and many other elements. Integration is not a duplication of ICT and education, but rather as a technological innovation. On the one hand, to increase the benefits of the traditional education and eliminate the shortcomings of the traditional teaching, on the other hand, it promotes the generation of new and more advantageous teaching methods and leads the systematic reform of education. The introduction of modern ICT in the teaching process does not mean that the content of books is simply transferred to the screen, computer and mobile phone to achieve the integration of ICT and education, but the application of ICT to assist teaching and learning, to create teaching scenarios for students and stimulate students' interest in learning. Collaborative inquiry is the main way of learning. Teachers are not only organizers, learning instructors, but also participants. If we simply apply a variety of ICT to education, not only can we not give full play to technological advantages in education, but also can make technology become embellishment.

2) Relying too much on ICT and neglecting the cultivation of innovative ability

The development of various information media has indeed expanded the dimension of educational resources, but if educators do not grasp the "degree", abandon the enlightening link of teaching links to students, blindly pursue the informationization of teaching process, and occupy the time originally used to guide students' thinking by the overwhelming multimedia resources. The wealth of information not only expand the horizons of students, but also imprison their thinking and reduce their imagination [6]. Students see more and more complex content, lack of independent thinking and precipitation. The brain is left behind by other people's views, forming a thinking pattern. It is difficult to have a unique perspective of their own problems, cannot cultivate students' innovative thinking ability.
3) **The renewal of teachers’ educational concepts cannot catch up with the technological renewal**

At present, some teachers have a low acceptance of new things, especially the lack of curiosity. About the use of some new technologies and methods, they even have a sense of resistance. The renewal speed of their educational ideas lags far behind the development of technology. Traditional educational ideas are deeply rooted. They believe that the transfer of knowledge to the students can carry out teaching tasks and achieve the goals of education. Some experts have pointed out that at the level of integration of ICT and education, technology is never a problem, and the root of the problem lies in educators themselves. Teachers themselves are also learners. Only by keeping curiosity for new things and constantly absorbing new nutrients, can we ensure that we are not out of date.

4) **Teachers are constrained by the application ability of ICT**

Many in-service teachers are exposed to ICT only after they are engaged in educational work. However, in the training of teachers in some areas, the training of ICT application ability is very limited. Many schools first choose key teachers to participate in ICT application training, and then train other teachers. Although this method saves a lot of manpower and funds, the vast majority of teachers receive "second-hand training", which is limited by the comprehension and expression ability of indirect trainers, and the effect of "second-hand training" is greatly reduced. The level of informatization of teacher education varies, ICT application ability is not strong, the knowledge information is insufficient and it is difficult to assess the development of the latest technologies. It is difficult to apply the concept and method of new technology to teaching, let alone the deep integration and innovation of teaching.

**IV. MEASURES FOR INTEGRATING ICT WITH EDUCATION**

A. **Improving Relevant Planning**

Scientific and perfect planning is the foundation and key to ensure the deep integration of ICT and education, as well as the constraints and guarantees. Firstly, during the preparation of the planning of policies, we should do a good job of relevant constraints and guarantees. Firstly, during the preparation of policies, we should do a good job of relevant constraints and guarantees. Secondly, systematically design and plan the relevant policy norms according to the national conditions, macro-economic environment and actual operation ability of the country. Secondly, it is necessary to clarify the objectives and concepts of the integration of ICT and education, as well as the related task planning and ultimate goals from a macro and overall perspective, so as to improve the practicability and applicability of the plan and ensure the maximization of their value.

Finally, there is a need to establish a standardized system of information on education. The purpose of using ICT is to educate people effectively, and ICT is to serve education. The establishment of a standardized and strict system is a powerful means to promote new technology, but also a prerequisite for technological innovation. In the development of education, in order to maximize the role of ICT, it is necessary to innovate the system. On the one hand, in contemporary education, in order to establish a learning mode of accommodation and support on the basis of ICT, we must keep pace with the times and give full play to the advantages of ICT. Only with an appropriate education system can we innovate and reform the way of running schools and establish a standardized and strict system. For example, school-running system, degree system and examination system must keep pace with the times, and be able to accommodate, support, rather than discriminate against, and exclude the learning mode on ICT. On the other hand, we must establish a strict system from the beginning to avoid the negative problems in the process of integration of ICT and education as far as possible.

B. **Innovating the Teaching and Learning Mode**

Mode innovation is another important initiative to promote the integration of ICT and education. On the one hand, we should actively introduce intelligent, innovative and other related information talents training mode; on the other hand, we should be good at learning the school running mode of the information frontier schools, and build up the teaching mode suitable for their own development and progress according to their own geographical, cultural and special characteristics. In addition, we should strengthen the training of talents, build a team of compound talents with strong professional quality and comprehensive quality, and ensure the deep integration of ICT and education [7]. Teachers’ information literacy can be improved by organizing the training of information-based teaching ability. Information literacy is our necessary quality to adapt to the information society. The improvement of teachers’ information literacy is the core of education development. Teachers need to be able to teach and innovate according to the requirements of the information age. Teachers should improve their information awareness and ability. In this way, teachers can use ICT, with the help of big data, and understand thousands of different students, into the real world of each student.

C. **Strengthen The Construction of Educational Resources**

We should optimize and develop continuously the management system of teaching resources in schools by taking full advantage of existing ICT, link the school-running institutions into pieces, and make full use of cloud computing technology to carry out unified management of the school's public service platform, Digital Library and so on. We should constantly enrich our own MOOCS resource base and make reasonable restrictions on its openness and audience; we should learn from the domestic experience. The management modes of foreign universities, enterprises and institutions will introduce high-quality systems into the management of modern educational and teaching resources, thus laying the foundation for promoting the deep integration of education and ICT. To sum up, education is a process of constant discovery and exploration, and its ultimate mission is to provide the most extensive possibilities for learners entering the learning state. ICT is an important condition to realize this possibility, so the deep integration of education, teaching and ICT is one of the important topics in modern education. The use of information technologies and communications to change the traditional
model of teaching in order to improve the training of teachers and beneficiaries and to modify the models of teaching and learning and realizing the sustainable development of the deep integration of ICT and education is the direction and goal that needs the people in the industry to work hard all the time.

D. Continuously Improve The Coordinated Promotion System of Multi-participation

The informatization of education is a systemic project which involves large-scale, the full participation of all sectors of society. Governments need to plan carefully to stimulate their intrinsic motivation through a series of incentive policy arrangements. Of course, the interest structure of different participants is different, and the interest needs of the same participant may change in different periods, which requires smooth communication channels and mechanisms between the government and various social participants. This will not only help social forces better participate in the coordinated promotion of educational informatization, but also help the government to further encourage them. There is also a need to put in place systems of incentives adapted to the different actors. For example, scholars should increase their support for educational informationization research; for educational informationization industry departments, they should establish a reasonable benefit-sharing system; for other social enterprises, they should provide other compensation arrangements.

V. CONCLUSION

ICT has powerfully promoted the progress of modern society, has had a significant impact on human productivity and lifestyle, and has a wide range of coverage. In this context, education is also undergoing reform, summarizing the shortcomings of the past. In the information age today, the integration of ICT and education is a complex and huge project, which requires simultaneous innovation in education structure, teaching concept, technology, environment and other aspects, and continuous in-depth exploration, in order to gradually achieve the goal. We should have innovative educational ideas and innovative thinking. Creating a new educational environment, pleasant and conducive to learning in depth by the integration of ICT and education that is conducive to students’ in-depth learning, develop individualized and abundant learning resources and sharing platform, so that the traditional teacher-centered classroom teaching reform can not only give full play to teachers' leading role, but also fully reflect learning. Students as the main body of the new educational concept, stimulate students' initiative, enthusiasm and creativity, so as to achieve the high-level goal of training innovative thinking and innovative ability through education.

From the perspective of ICT, integrating ICT into teaching as a teaching idea is certainly the ideal state of integration of the two. However, from the perspective of teaching, it is not necessarily the ideal state of teaching, because if the ICT of teaching is completed and thoroughly realized, it will lead to the alienation of teaching and the decline of its educational function. The more serious problem is that the development of students will be impaired, because relying entirely on ICT to teach, many important qualities are difficult to get proper development. Therefore, we must not lose sight of the challenges related to the integration of ICT and education. Only by formulating effective innovative transformation strategies and grasping the key issues in the process of ICT and contemporary education, can we effectively promote the deep integration of ICT and contemporary education, thus effectively realizing the efficient and high-quality teaching of contemporary education.

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