Reshaping the teaching ecology based on the construction of informationalized instruction mode

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ABSTRACT

With the further application of information technology in the field of education, the education informationization gradually moves from shallow application to deep integration. The promotion of education informationization makes the integration problem more complicated, so it is urgent to study and discuss how to promote the deepening of the application of information instruction in school. Based on the view of education ecology, this paper puts forward a teaching model to promote the deep integration of information technology in teaching, and to establish an information-based teaching ecological model, and also puts forward the idea to reconstruct the school teaching ecology from the concept layer, pattern layer and practice layer. At the same time, combined with the examples of middle school information teaching ecology remodeling, this paper expounds how to optimize and reform the teaching ways, organization management mode and campus culture through teaching model construction.

1. INTRODUCTION

Educational informatization has been rapidly developed as a strategic means of educational development. In the "twelfth five-year plan" stage, educational informatization has basically completed the construction task of "three through two platform", and schools generally have an information-based teaching environment[1]. The 13th five-year plan for educational informatization puts forward new goals and tasks: "integrate information technology into the process of teaching and management mode innovation, promote development through innovation, promote the reform of educational service supply mode, teaching and management mode, and form the development path of educational informatization with Chinese characteristics" [2]. At present, the application of information technology in education and teaching is limited in overall level and integration

degree, which has not brought about deep changes in teaching and learning [3]. Schools are still facing many difficulties in information construction. The main reason lies in that the pioneers of integrating information technology with disciplines tend to isolate technology, environment and human factors [4]. In this sense, It is necessary to further promote the innovative role of information technology in the teaching model and school organizational structure, and to promote the school education from the teaching environment, content, methods and other aspects to a deeper restructuring. [5] This paper proposes to analyze the deep integration of information technology and subject teaching from the perspective of ecology, construct the new ecology of information teaching driven by the construction of teaching mode, promote the in-depth integration of information technology application and subject, and promote the in-depth development of school information construction.

2. RELATED WORK

2.1 The necessity of ecological analysis method in the development process of information education

"Ecology of education" was first proposed by Cremin (L.A.), former dean of teachers college of Columbia University in 1976 in his book public education [6], which mainly used the theories and methods of ecology to study the problems of education and teaching. To be specific, the educational ecological analysis method is an educational ecological research method that pays attention to the overall connection, highlights the overall value, emphasizes the dynamic process, and pursues sustainable development. It emphasizes the importance of parts and the whole in the analysis of educational problems, and analyzes problems from the perspective of dynamics and development[7]. In the concrete practice process, the problem of education is a comprehensive and complexity, the need to use the methodology of ecology, the values to the analysis, comprehensive, link and open way of thinking to analysis and processing, based on this path can avoid the subjective and objective two thinking single causality relationship analysis, contradiction and problem caused by the biased with invalid [8].

As a complex system engineering, the integration of information technology and subject needs to be reviewed with the analytical method of ecology of education. First of all, teaching is a system, and its vitality is composed of all parts [9]. In addition, the integration of information

technology in the field of education has also broken the original structure and caused imbalance. The system needs to be readjusted to establish a new equilibrium state. In the process of establishing the new equilibrium state, the shallow integration weakens the value and effectiveness of information technology in education and teaching, but the original ecology does not change qualitatively in this process. Thus it become growth factor in the ecological information technology, rather than inhibiting factor, from the value orientation to the method system, the practice process, multilayer the establishment of a new link to the overall thinking to different levels of the information technology on ecological benign pervasive influence, caused by the ecological structure, material and information flows, the change of value, thereby giving impetus to the development and evolution of ecosystem.

2.2 The gradual penetration of ecological concepts in educational research

In terms of the ecological perspective analysis of the subject of education and teaching informatization, scholars at home and abroad have made more detailed studies from the overall education ecosystem to sub-ecology at all levels, which can be summarized as shown in figure 1. At the macro level, education information ecology is a sub-ecology in the social information ecosystem. Researchers mainly focus on the connotation and extension of education information ecology, and the relationship between education information ecology and social factors such as economy, policies and regulations, and ethical norms, as well as the establishment of theoretical models of education ecology. Zhang xiyan emphasized that technology can be regard as a growth factor of education ecology[10], which can promote the output of talents and culture, and put education into the social environment to establish an evolutionary model of education information ecology. In terms of the medium level, the research on regional education information ecology mainly focuses on the current situation of regional education informatization development, and provides strategies and Suggestions on how to promote regional education informatization construction with the ecological analysis method. Yu shengquan put forward the strategy of regional education information ecological construction from hardware construction to people-oriented value and application-oriented design in view of the phenomenon

of "disconnection and isolation" in the construction of education informatization. At the micro level, researchers focus on schools and classes to carry out relevant information ecology research, study the changes in the operating structure and mode of the system after the introduction of technology[11] , and how to improve the quality of school work and classroom teaching with new operating mode. Lin liping analyzed student management from the perspective of ecology, and proposed to construct a campus ecology beneficial to the physical and mental health of college students in a harmonious way based on the idea of inclusive education[12] .
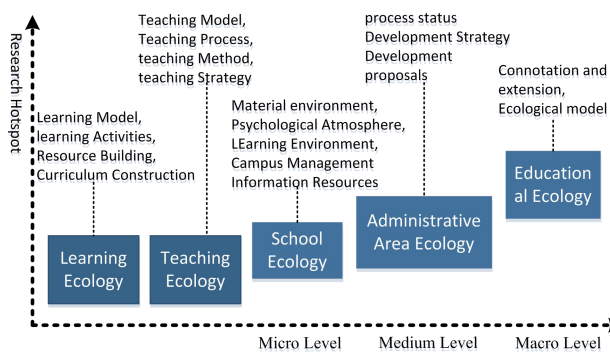

Figure 1 Educational ecology research hotspots related to information technology

In the process of educational informatization practice, teaching and learning are the core of school. The research on information-based learning ecology is mainly based on online learning platforms, software products in order to create a new learning ecology, which is rich in resources, intelligent evaluation and guidance, convenient interaction and communication, and suitable for ubiquitous learning, such as e-book learning ecology [13]. Due to the close combination with specific product functions, the study of information-based learning ecology has strong practical guiding significance. On ecology, the informationization teaching research mainly concentrated in the ecology view overall analysis technology into the teaching mode, teaching process, teaching methods and strategies and so on various aspects of innovation and development, but the research of ecological construction in informationization teaching is less, at the same time research also remain in the theoretical research level, and lack of specific path that can carry out the research.

From a comprehensive perspective, no matter it is based on macro or micro level, we regard classroom teaching

or taking technological products as the starting point of research, education and teaching ecologycontains four elements, including human, practice, value and technology. The core of information ecological construction is not technology, but which brings structure, behavior, and the transformation of the value. The purpose of ecological evolution is the improvement of the function, enhancing social service function, especially the coordinated development among students, teachers, technology and content.

3. Constructing the teaching mode as the driving force to promote the ecological evolution

3.1 Promote the ecological development of teaching from the perspective of teaching mode

The ICT based teaching ecology is the sum of the processes and events that influence the ICT based teaching activities. It is a complex ecological environment that contains both ecological entities composed of people and various environmental factors on which the teaching activities are carried out.

All the factors in this ecosystem are important and interrelated. A free, harmonious and lively relationship between the ecological subject and environmental factors, as well as within the environmental factors is conducive to the healthy and sustainable development of the ecosystem. As an environmental factor introduced in the original ecology, information technology has an impact on the ecological subject and other factors.

Practically, the optimization and transformation of the teaching ecology cannot be realized by considering one element alone, and it is necessary to start at the level of the teaching mode. In the 1980s, the ecological teaching model was introduced to solve the disconnection between teaching theory and practice. Then, with the development of information technology in the 21st century, the theoretical research and the construction, practice as well as pilot and promotion of innovation models have become a new hot spot [14].The ecological teaching model includes the teaching theory and the behaviors under the guidance of this theory, taking into account the ecological subject and environmental factors in the ecological environment. In the information technology environment, the ecological teaching mode is a relatively stable and universal theoretical framework and a specific operational teaching activity based on a certain educational philosophy and teaching theory. It is

formed by centering on a certain theme and taking into consideration of technology and resources, teaching content and classroom structure, teaching methods and strategies. This paper focuses on the optimization and reshaping of the school's ICT based teaching ecology. To solve the path of ecological construction, it is proposed to promote the construction and development of the ICT based teaching ecology with the construction of teaching mode.

3.2 Realizing the reshaping of the ecological environment in the process of constructing the teaching model

Compared with the teaching mode, the construction of teaching mode is a process quantity, which includes the whole process of teaching mode from research and formation, to application, improvement, to maturity, covering research, practice, evaluation, inheritance and development related to teaching mode. The construction of teaching mode is a process of re-combining various elements and factors in the ICT based teaching ecology, and re-adjusting manpower, material, energy, information and value. The reconstruction and innovation of teaching mode drives the optimization and development of the ICT based teaching ecology. In the process of promoting the stability and maturity of teaching mode, the teaching mode construction and teaching ecological construction are integrated.

3.2.1 The construction of the model promotes the evolution of ecology

The entry of new technologies into the teaching ecology will cause conflicts in the ecological content, especially when the ideas, values, and cultures covered by the teaching software itself are less consistent with the original ones of the school [15]. As shown in Figure 2, the process of constructing the teaching model is the process of teaching ecology changing from imbalance to re-adjustment and reshaping the structure. The construction of the teaching model starts from the research to the design of the innovative plans, and gradually matures through practice and adjustment. In the process, the teacher group will review the teachers, students, goals and values, teaching strategies and methods, techniques and other factors in the teaching, going through conflicts and changes in value commonly. Changes in teachers and students in the ecology will make the teaching ecology reflect new characteristics, and then achieve a new balance and stabilize the new

ecology in the practice of the new model. The construction of teaching mode promotes the development of teaching ecology from imbalance to higher level balance.
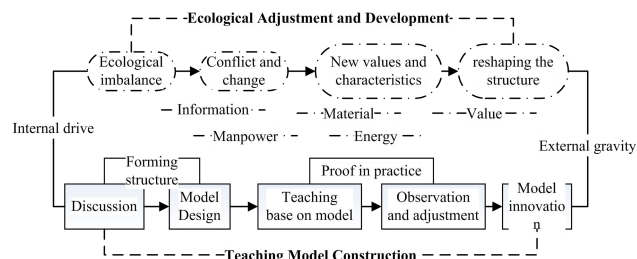

Figure 2   the reshaping of the ecological environment and constructing the teaching model

3.2.2 The construction of the model is the internal driving force and external gravity of the ecology.

In general, healthy ecosystems are open, relatively stable and sustainable. The construction of teaching mode breaks the closeness of individual teachers in the teaching process. The common goal not only increases teachers' collective cohesion in the school, but also promotes the exchanges with relevant teachers, experts, managers and R&D personnel outside the school system, which helps to introduce energy and resources into the ecological system. At the same time, system, management, economical and other phased supports are needed for model construction so as to promote the transformation and transformation of the internal environment of the teaching ecology. On the whole, the internal drive and external gravity in the process of model construction promote the diversified development of manpower, material, energy, information and value in the teaching ecology, and provide inexhaustible motivation for the healthy development of the system ecology.

3.3 Informational teaching ecological model

Based on the teaching model, the construction of the teaching ecological reshaping role, mainly focusing on the four elements of people, value, technology and practice, establishes a three-layer information teaching ecological model consisting of the concept layer, the pattern layer and the practice layer, as shown in Figure 3. Shown. The information-based teaching ecological model takes the teaching model as the link and transforms the value and goals after the integration into technology into specific educational practices. Correspondingly, practice can promote the optimization of teaching mode, and the sublimation of experience can

enrich the teaching theory of education, thus forming an eco-friendly virtuous cycle.

theory
And ideas   **value** - - -> Idea layer

teachers and students
TC

People   **Technology**

CK   PK

Theme   Goal   -> Pattern layer

Reflection

Teaching following the mode

Practice

Observe   Evaluation -> Practice layer

Figure 3 Model of ICT ecological environment

3.3.1 Idea layer: the leading of value and the navigation of the target

The concept layer is the core value of the information-based teaching ecology. Value has the role of regulation, orientation and drive [16], and has a leading role in the ecological reshaping of teaching. The core values pursued by the school, the core literacy of the students, and the outstanding values and concepts of the subject teaching are concentrated in the concept layer. The integration of technology in the teaching ecology is also the integration of the concepts of human-centered value and cooperation and sharing in the information age represented by technology. At the same time, as a catalyst in the educational process, technology can accelerate the innovation of practice, and then realize the transformation of ideas and the shaping of new values, and realize the cultivation of core literacy of students such as independent development, social participation, and cultural foundation required by the new era. Similarly, the concept layer is a process of value selection in the process of constructing the teaching model. In this process, we will focus on the wisdom of the teachers and students, choose the educational ideas and teaching concepts that are suitable for the development of the school and the characteristics of the disciplines, provide direction guidance and scientific development for the reshaping of the ecology, and construct the appropriateness for the teaching model. Provide basic protection with benefits.

3.3.2 Pattern layer: the power cycle diagram of the information-based teaching ecology

The pattern layer is the main core of the information-based teaching ecology, and it is a concrete manifestation of the optimization and innovation of the teaching model. The pattern layer specifically shows the distribution of various elements in the ecology, as well as the circular path of energy, matter and information in the ecology. The pattern layer mainly includes several major factors to be considered in the construction of the teaching model, as well as the main structure of the teaching model. In the process of forming a general teaching model, the first thing to consider is the development of people in the educational process. The pattern layer mainly focuses on the scientific development of human beings. Therefore, on the basis of the value selection of the concept level, it is necessary to combine the current situation of teachers and students in the school to form a clear teaching theme and teaching objectives. The theme and goal should include both the discipline of teaching and the common development of teachers and students. With a clear theme and goals, the main body of the teaching model will be built based on the fusion of science. The teacher group concentrates on the analysis of technical characteristics and the analysis of the discipline teaching rules. Based on the three cores of technology, teaching content and teaching method in the TPACK[17] framework integrated information teaching process, it constructs an optimal teaching suitable for the current information environment. Pattern structure.The main structure of the teaching model points out the implementation path of teaching behavior, and specifies the teaching function of technology, the application method of teaching resources, teaching process and teacher and student activities.The teaching mode guides the activities of people in the teaching ecology, the way in which materials are distributed, and the way information and energy flow.The pattern layer is the inner loop of the teaching ecology and the core link of the teaching model construction.

3.3.3 Practice layer: developing ecological elements in testing

The practice layer is the basis for the ecological reshaping of information-based teaching and an indispensable part of the construction of teaching models.It mainly includes the implementation of teaching mode and corresponding classroom observation, mode evaluation, and teaching reflection.The deep integration of information technology and school education often does not happen overnight, and teachers need to deepen their understanding of technology and teaching in practice.The construction of information-based teaching mode is also based on certain information-based teaching practices, and is based on the

refinement of teaching experience.At the same time, teaching practice is also the best test and evaluation of the teaching model.The information-based teaching ecology highlights the promotion of technology. How to evaluate the teaching impact of technology and the superiority of the new teaching model needs to be evaluated on the basis of practice and scientific observation.At the practical level, teachers use self-reflection, mutual observation and evaluation, in the implementation of teaching mode, dynamic, development of the model of the mode of consideration, the application of technology, the relevance of the teaching method, whether the application of the evaluation technology is scientific, whether it has produced Promote the role of teaching transformation or improve the teaching effect, whether the new model optimizes the teaching atmosphere, whether it can reflect the new value, realize the development goals of teachers and students, and how to further adjust the teaching mode so that it can fully exert its integrity and penetration. Sexual efficacy promotes the overall optimization and steady development of the teaching ecology.

4. Case of Developing Information-based Teaching Ecology with Teaching Mode

In order to promote the development of school education informationization and promote the deep integration of information technology and subject teaching, Jiangsu A School, on the basis of the application of StarC educational cloud platform, practices the ecological remodeling based on the construction of teaching mode, and builds an "open, pluralistic and integrated" new ecology of informationized teaching, promoting teachers' teaching innovation and students' learning ability. Since the second half of 2016, the School has taken four

experimental classes around five disciplines: Chinese, Mathematics, English, History and Geography. 68 teachers and 180 students have participated in the construction and evaluation of the new model. Through one year's practice and summary, five mature information-based teaching modes have been formed, as well as the "one-mind, two-body and four-support" approach to the construction of teaching information-based ecology, providing a model for the optimization and innovative development of teaching information-based ecology.

4.1 Focusing on the Construction of Teaching Model

This paper takes the construction of hierarchical and progressive teaching model of mathematics as an example to explain on the core of the construction of teaching model. Mathematics is a discipline that pays attention to the training of logical thinking. Research shows that as for training, the more doesn't mean the better. Appropriate amount of training and more specific questions are beneficial to students' thinking training. In order to improve the appropriateness of training, mathematics teaching is guided by layered progressive and individualized autonomous learning. In the implementation of the new model, based on big data analysis, the main resource bracket is the same kind of wrong questions which will be pushed intelligently in the future classroom, the resource bank or the self-made answer analysis map and micro-lesson, and the main active learning channel is self-study, group mutual assistance, teacher's in-class guidance and after-class online answer, so as to enable students to gradually improve their thinking ability and exercise their integration in the training of the new model. Ability to work and self-study. The main contents of each link in the construction of specific mode are shown in Figure 4.
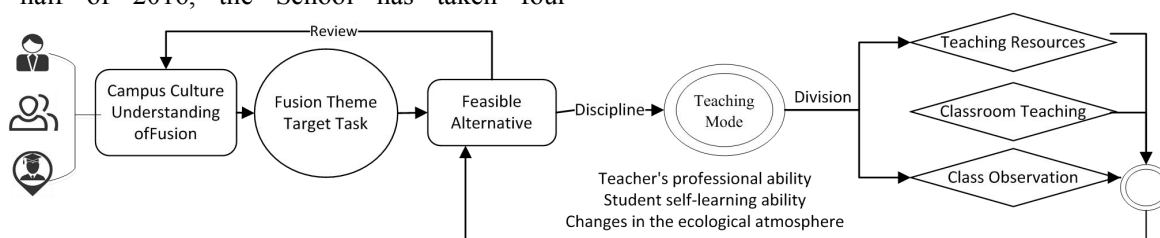

Figure 4 Construction Scheme of Mathematics Hierarchical and Progressive Teaching Model

and Students in the Model Construction

4.2 Promoting the Development of Teachers

The primary purpose of the construction of

information-based teaching ecology is to promote the development of human beings and the independent development ability of teachers and students. In the aspect of promoting students' development, we are committed to cultivating students' learning and thinking ability under the information technology environment. Learning data analysis improves the accuracy of teachers' mastery of students' learning conditions, allows students to enter multiple learning channels, guides students to learn to solve problems by finding resources, cooperating with each other, seeking help from teachers and other ways, adjusts learning according to online assessment, and enables students to learn to self-analyze according to the causes of mistakes and the ways of correcting. The new teaching mode pays attention to the accuracy, individuation and collaboration of students' learning process, so as to improve students' learning ability, problem solving ability, and cultivate the spirit of openness, science, collaboration and innovation in the information age. In the aspect of teachers' development, we should make good use of the differentiated structure of teachers' teams to stimulate the energy of teachers at different levels. Under the framework of TPACK, young teachers are the main body of technical research and dissemination, experienced teachers are the main guiding body of subject content, subject teaching leaders and subject experts are the main evaluating bodies of teaching methods, thus jointly promoting the improvement of teachers' information literacy, professional knowledge and teaching skills. In the process of constructing the teaching mode, practice and idea promote each other and the integration and development of the three professional qualities of teachers are promoted to change the teaching idea of individual teachers, enhance the ability of teaching and research, promote the formation and development of the teacher community, and form a group atmosphere of trust, cooperation and learning.

4.3 Organizational and Management Change with Human Resources, Material, System and Information as the Focus

The construction of teaching mode needs to coordinate manpower, material, system and information in an all-round way, and the mode of coordination needs to conform to the nature of the problem. The construction of teaching mode is a problem of inferior structure. From the choice of value at the ideological level to the

judgment and evaluation of the main structure and practice level at the mode level, we need to analyze, explore and innovate on the basis of study and discussion. The smooth development of activities necessarily requires a more flexible and efficient organizational structure, as well as management methods to stimulate teachers' group wisdom and promote collaboration and innovation. The flattening and simplification of organizational structure, as well as the interchange of channels, are beneficial to efficient cooperation and collective decision-making, the transformation of management from administrative order to service-oriented and flexible support-oriented management, and the centralization of human resources, materials, systems and information in schools. The transformation of organizational management has transformed the energy of school development from one-way wastage to surround and aggregate flow, providing inexhaustible power for the coordinated coexistence of human and environment, human and human, and the healthy and sustainable development of ecology. The change of ecological inner circle and the increase of energy are embodied in the formation of "pluralistic, open and integrated" class culture and campus culture. The formation of ideas and culture advocated by the construction of teaching mode is the symbol of the formation of a new information-based teaching ecology and its steadiness and maturity.

5. Summary and Prospect

The reconstruction of information-based education ecology has put forward new requirements for teachers' development. The change of teaching and learning methods has brought two challenges: first, the new teaching mode requires teachers to change their teaching stereotyped thinking: the change of habits is a breakthrough for themselves, breaking away from the limitations of individual habitual thinking, relying on collective wisdom and energy, and interacting with each other in thinking about teaching problems. The second challenge comes from the change of students. Students gradually change from passive learning to active learning. The cultivation of learning ability needs a process. Teachers are not only supporters of autonomous learning, but also trainers of skills. They need to know students' learning situation more accurately, provide more appropriate learning materials and methods guidance, timely classroom guidance and skills training, and more

scientific evaluation. Teachers' breakthroughs in themselves and the transformation of teaching roles are the key issues to be paid attention to in the process of the construction of information-based teaching ecology, and also the key to the smooth construction of teaching modes.

In addition, the reconstruction of information-based education ecology puts new demands on school management. The deep integration of information technology requires school management to reflect and re-position in essence. Teachers' classroom teaching work has a strong independence. The relationship between teachers and administrators is not a simple administrative order relationship. School organizations and teachers are interrelated and independent, with loose coupling characteristics[19]. The development of school organization depends more on the cohesion of professional research, and the formation of good culture also depends on the maintenance of emotion, morality and belief. The construction of teaching mode belongs to a routine professional research activity. The good construction of teachers' team requires more decision-making power, closer cooperation and mutual assistance, breaking the original organizational closure and rebuilding a pluralistic professional support system and management support system under the common goal.

Taking the construction of teaching mode as the main way of information construction, we should promote the integration of human, value, technology and practice in the teaching ecology to stimulate the active development ability of human in the ecology, promote the professional development of teachers and the development of students' information literacy and learning ability. Building a campus ecology suitable for talent cultivation in the information age makes information technology a promotion factor and growth factor to keep the trend of school teaching consistent with the evolution of the times.

6. ACKNOWLEDGMENTS

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