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The Construction of Educational Technology Major and Talent Cultivation in China

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Abstract: *People usually refer to individuals with certain forte as talents, while educational technology talents refer to individuals with educational technology professional forte. Only with professional ability can one form professional forte, while educational technology professional ability is cultivated through the educational technology major. Due to the dual structure of logical starting points, the discipline of educational technology inherently exhibits dual attributes, leading to a dual positioning for the corresponding educational technology major. Educational technology personnel must possess professional knowledge and abilities in teaching design, educational information processing, media (resource) development and application, construction and maintenance of material form teaching system, and research and management of educational technology, supported by new technologies. They should have a high level of political literacy, a sound personality, and the awareness and ability to continuously update, supplement, and improve interdisciplinary knowledge structures. They must also possess critical thinking, innovative thinking, and practical abilities to discover and solve problems. The modernization of education requires many composite talents who can innovate in the information environment and the establishment and development of the educational technology major precisely meets the society's demand for composite innovative talents.*

Keywords: educational technology majors; dual positioning; diversified development; professional ability; talent cultivation

People usually refer to individuals with certain forte as talents, while educational technology talents refer to individuals with educational technology professional forte. Only with professional ability can one form professional forte, while educational technology professional ability is cultivated through the educational technology major.

1 Professional Competence Structure of Educational Technology Talents

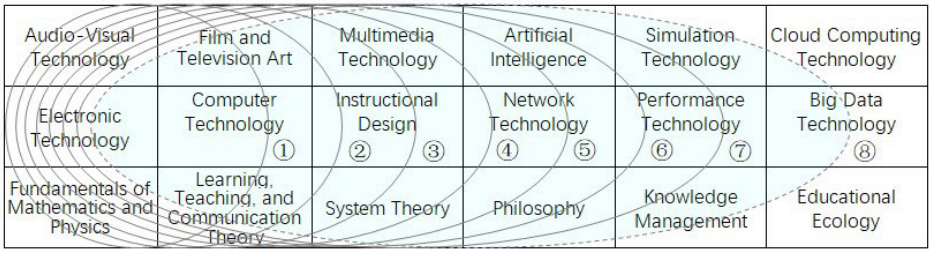
1.1 Looking at the Changes in Knowledge and Ability of Educational Technology Talents from the Development History of Educational Technology in China

The training of educational technology talents in our country began in the 1930s, at that time, primarily focusing on cultivating technical expertise in electrified education (including film education and broadcasting education). Shu (1947) stated that "The talent issue in electrified education can be divided into three aspects: first, technology, second, art, and third, education" (p. 112).

In the late 1970s, electrified education restarted, with a predominant emphasis on the application of audio-visual educational media. Moving into the 1980s, foreign educational technology theories were gradually introduced to China, coinciding with the introduction of electronic computers and networks, which led to a rapid expansion of the connotation of educational technology. Since the beginning of the 21st century, due to the rapid development of information technology, educational technology has formed its current connotation, illustrated in Figure 1.

Figure 1

The Evolution of the Connotation of Educational Technology in China



Note. Adapted from "System Design of Educational Technology Major," by L. Li, 2002, *Modern Educational Technology,* (2), 5-14+21.

Curve ① illustrates the connotation of educational technology before the early 1980s. At that time, the main focus was on the application of audio-visual media such as slides, projection, movies, broadcasting, and recording. Professionals involved in electrified education mainly focused on studying electronic technology, audio-visual technology, and their mathematical and physical foundations. In the late 1970s and early 1980s, the introduction of video equipment into our country prompted the integration of knowledge in film and television arts, computer technology, and educational theory into the training curriculum for educational technology personnel.

Curve ② in the figure delineates the connotation of educational technology in the mid-1980s. Due to the widespread introduction of television recording equipment, a notable peak in television-based teaching emerged. Consequently, there was a progressive surge in the emphasis on studying film and television arts, computer technology, as well as learning theory, teaching theory, and communication theory.

Curve ③ illustrates the connotation of educational technology in the late 1980s. During this period, the theory of instructional design was introduced to China, leading to a gradual increase in the introduction and research of learning theory, teaching theory, communication theory, and system theory. Concurrently, research and initial applications of computer-assisted instruction were initiated, a small number of educational technology workers have begun to explore multimedia technology.

Curve ④ encapsulates the connotation of educational technology in the early 1990s. During

this period, there was a notable emphasis on system theory, and instructional design transitioned from theoretical research to widespread application. Educational technology majors across the nation progressively introduced instructional design courses, and in some regions, the theory and methods of instructional design based on the "teaching" aspect underwent pilot in teaching practices. The acknowledgment and acceptance of computer-assisted instruction among educational technology professionals surged, leading to the development of computer-assisted instruction (CAI) courseware. Furthermore, multimedia technology has also experienced rapid development.

Curve ⑤ introduces the connotation of educational technology in the mid-1990s. Instructional design and computer-assisted instruction emerged as extensively developed and integral components, recognized as two cornerstone courses in the major of educational technology. Multimedia technology and computer network technology reached maturity, finding practical applications in education and teaching. Concurrently, research on artificial intelligence was initiated, emphasizing philosophical considerations. Notably, the guiding roles of educational philosophy and technological philosophy in the development of educational technology garnered attention during this period.

Curve ⑥ signifies the connotation of educational technology in the late 1990s, marked by a swift development trend in multimedia technology and computer networks. The widespread adoption of multimedia computers, especially the establishment and integration of campus networks and the Internet, transformed the teaching environment and enriched educational resources that greatly promoted the development of educational technology. In theory, these changes gradually formed a constructivist learning theory led "learning" based on instructional design theory and methods, and in practice formed a new learning environment and resources that combined various media centered on the network. The research on artificial intelligence has made progress, and the guiding role of philosophy in the development of educational technology has become one of the important research topics.

Curve ⑦ in the figure delineates the connotation of educational technology in the early 21st century. This era witnessed breakthroughs in artificial intelligence and virtual simulation technology. The virtual reality teaching system has also become an important learning environment, prompting further exploration in educational philosophy, technological philosophy, and knowledge management. Concurrently, performance technology emerged as a noteworthy and influential development area in the field of educational technology.

Curve ⑧ encapsulates the current connotation of educational technology. The evolution of mobile communication technology and the widespread use of smart terminals such as smartphones have seamlessly integrated internet + education into the fabric of educational informatization. With the gradual maturity of cloud computing, big data technology, and artificial intelligence, the connotation of educational technology has developed to new heights. At this time, attention and research on the education ecosystem will become an important direction for the development of educational technology.

The developmental trajectory from curves ① to ⑧ illustrates the gradual maturation of China's educational technology theory over more than 30 years, spanning from the late 1970s

to the early 21st century, and initially established its own theoretical framework and practical system for instructional design. It completed the transformation from pure media research to optimizing teaching processes and teaching resources research, and finally focused on educational informatization and promoting the optimization of educational ecology. Against the backdrop of rapid advancements in network technology and mobile communication, China's strides in educational informatization construction have been rapid. The establishment of three connections and two platforms as the starting point, namely the "broadband internet access for every school, high-quality resources for every class, and online learning spaces for every student and teacher," along with building an education resource public service platform and an education management public service platform, provided solid support for educational informatization.

From the above discussion, for educational technology professionals having an instructional design ability and educational information processing ability in the information environment are becoming increasingly important. With the increasing maturity of electronic technology and artificial intelligence, the operation and use of modern teaching equipment are becoming increasingly intelligent and simplified. Therefore, the proportion of learning electronic technology knowledge in the training of educational technology professionals is decreasing day by day.

1.2 Professional Abilities Structure Model for Educational Technology Talents

1.2.1 Investigation into the professional abilities of educational technology talents

There have been multiple achievements in the investigation and research on the abilities and qualities that educational technology talents should possess, among which the most representative results are the two surveys conducted by the Institute of Modern Educational Technology of Beijing Normal University based on social needs.

(1) Survey in the late 1980s

In 1989, the Modern Educational Technology Research Institute at Beijing Normal University, commissioned by the former National Education Commission's Bureau of Electrified Education and Bureau of Teacher Education, conducted a specialized survey on the abilities and qualities required by professionals in electrified education. A total of 109 questions were set up based on the two dimensions of fundamental knowledge and basic abilities that should be possessed. The questionnaire was composed of three academic levels and conducted nationwide: master's, undergraduate, and associate degree.

Following over a year of meticulous investigation and research utilizing modern data processing methods, the institute developed a foundational model for the competency structure of educational technology professionals. For undergraduate-level major in educational technology, the identified competency structure requirements were as follows: ability system centered around instructional design, ability system for constructing and maintaining tangible teaching systems, research ability system, ability system for media development and application, and ability system for management (Yin, 1996).

(2) Survey in the late 1990s

Towards the close of 1998, the Modern Educational Technology Research Institute at Beijing Normal University, once again commissioned by the former National Education Commission's Bureau of Teacher Education, spearheaded a survey to gauge the societal demand for the competencies and qualities expected of professionals in educational technology. This comprehensive survey featured a questionnaire comprising 87 competency items, systematically organized into two dimensions: disciplinary foundational knowledge and basic disciplinary abilities. The survey's extensive reach covered a nationwide spectrum.

The collected questionnaires underwent meticulous processing through factor analysis, unveiling the top six competencies deemed essential for undergraduate graduates majoring in educational technology. These competencies are outlined as follows: (a) instructional system design ability; (b) ability to application and evaluation of instructional media; (c) ability to continuously update, supplement, and enhance knowledge structures; (d) ability to use, maintain, and manage modern teaching systems; (e) media design and development ability; and (f) preliminary ability in the application research of modern educational technology. The cumulative contribution ratios for these six competency factors were 20.214%, 5.596%, 4.958%, 4.560%, 3.932%, and 3.516%, respectively (Beijing Normal University Institute of Modern Educational Technology, 1999).

1.2.2 Professional abilities qualities that educational technology talents should possess

With the onset of the 21st century, the swift evolution of information technology has brought about widespread applications of multimedia technology and network technology in the education sector. These advancements have not only influenced teaching content, methods, and approaches but have also catalyzed significant shifts in teaching philosophies and models.

The amalgamation of information technology into the curriculum, the shift towards inquiry-based and research-based learning in the online environment, and the implementation of network-based distance education have imposed heightened demands on the information literacy of both educators and students. In 2004, the Ministry of Education introduced the "Education Technology Standards for Primary and Secondary School Teachers (Trial)" and the "Standards of Education Technology of China (SETC)" (Trial) by China Association for Educational Technology, articulating explicit requirements for the information literacy of all participants in the educational process, including students, teachers, educational managers, and educational technology professionals. In 2014, the Ministry of Education "Information Technology Application Ability Standards for Primary and Secondary School Teachers (Trial)" proposed corresponding requirements for the improvement and development of information technology application ability for primary and secondary school and preschool teachers, as well as the implementation of training work. Improving the information literacy of teachers and educational technology professionals has become the key to the deepening development of educational reform. Only educational technology professionals with high information literacy can better guide, assist, and lead teachers in deepening teaching reform. Therefore, the ability to acquire, store, process, utilize, evaluate, and innovate educational information, namely the ability to process educational information, should become an important factor in the professional development of educational technology personnel, second only to teaching design ability.

Based on the above analysis of social development needs and the results of two large-scale surveys, the author posits that the professional abilities of educational technology personnel primarily encompass six key dimensions: (a) instructional design , (b) educational information processing ability, (c) media (resource) development and application ability, (d) ability to construct and maintain material form teaching system; (e) research ability, and (f) management ability (Li, 2002).

In addition to the aforementioned professional abilities, educational technology personnel should also possess high political literacy, a sound personality, and the awareness and ability to continuously update, supplement, and improve interdisciplinary knowledge structures. They should also have critical and innovative thinking skills, and practical abilities to discover and solve problems to help become innovative talents in promoting the modernization of education in the new era. Here, we have exclusively presented the professional abilities structure of educational technology personnel and the associated knowledge areas, as depicted in Table 1.

Table 1

Professional Ability Structure and Related Knowledge Areas for Educational Technology Personnel

Ability Structure	Tasks Analysis	Related Knowledge Areas
Instructional design ability	Master the basic theories and methods of instructional design, and be able to complete the design of teaching systems, teaching processes, and teaching products (media, resources) at three levels, especially instructional design based on information technology environment.	Pedagogy, Psychology, Theory of Learning and Teaching, Educational Communication, Systems Science, Research Methods in Educational Science, Instructional Design, Basics of Computer Applications, Philosophy of Educational Technology.
Educational information processing ability	Understand the laws of educational information generation and dissemination, understand the characteristics and roles of information representation elements (text, images, animation, audio, video) in teaching, master the theories and methods of educational information acquisition, storage, processing, utilization, evaluation, and innovation, as well as the application of generative artificial intelligence supported by big data models.	Introduction to Educational Technology, Educational Communication, Educational Informatics, Computer and Education, Network and Education, Principles and Applications of Databases, Programming, Data Structures, Big Data Models, Artificial Intelligence, Distance Education, Satellite Communications.

Media (resource) development and application ability	Understand the classification and characteristics of instructional media (resources) and their roles in teaching; master methods for the application, management, and evaluation of instructional media (resources); capable of designing and developing media and resources suitable for teaching when necessary.	Photography Techniques, Instructional Design, Audiovisual Psychology, Audiovisual Media, Digital Media, Software Engineering, Basics of Networking, Artificial Intelligence, Virtual Simulation, Music, Fine Arts, Aesthetics.
Ability to construct and maintain material form teaching system	Master the operation, use, and maintenance of the hardware and software environment of teaching systems; capable of constructing new teaching systems based on instructional needs.	Fundamentals of Mathematics and Physics, Electronic Technology, TV and Audio Systems, Multimedia Computers and Network Systems, Artificial Intelligence, Software Engineering.
Research ability	Master research methods in educational technology; capable of selecting and applying appropriate methods to analyze and solve problems in education and teaching.	Research Methods in Educational Technology, Educational Statistics, Educational Measurement, Philosophy of Educational Technology, Educational Informatics, Professional Foreign Language.
Management ability	Master basic theories and methods of management; capable of information management for teaching systems, resources, information, projects, and knowledge.	Educational Informatics, Management, Economics, Library and Information Science, Principles and Applications of Databases.

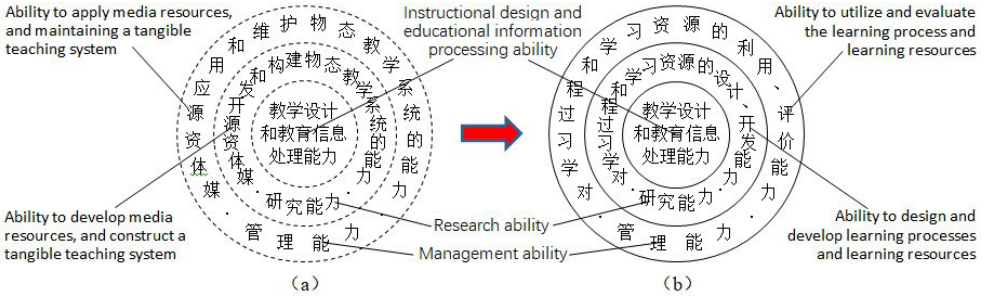
The above professional abilities are constantly enriching new content and requirements with the progress of technology. Currently, fully paying attention to the impact of new developments in artificial intelligence on various professional abilities is important to adjust the knowledge fields that need to be updated in a timely manner.

1.2.3 Professional ability structure model of educational technology talents

Based on the size of the factors that contribute to the growth of professional abilities of educational technology talents, the author divides the ability items in Table 1 into three levels: (1) instructional design and educational information processing ability; (2) media (resource) development, ability to construct tangible teaching systems, and research ability; and (3) media (resource) application ability, ability to use and maintain tangible teaching systems, and management ability, as shown in Figure 2(a). Based on this, further corresponding professional ability structure models that are essential for educational technology talents are derived, as depicted in Figure 2(b).

Figure 2

A Model of Professional Ability Structure for Educational Technology Talents



Note. Adapted from "System Design of Educational Technology Major," by L. Li, 2002, *Modern Educational Technology,* (2), 5-14+21.

From Figure 2 (b), the professional abilities structure of educational technology talents is three-dimensional. The ability of instructional design and educational information processing is in a central position and belongs to the core professional ability of educational technology talents. Other abilities are developed around them. Media (resource) development ability, or the ability to construct tangible teaching systems and research ability, pertain to the design and development aspects of the learning process and learning resources, representing high level professional ability that educational technology talents should possess. The apply media (resources), or the ability to use and maintain tangible teaching systems and management ability, are related to the utilization, evaluation, and management aspects of the learning process and learning resources, representing fundamental professional competencies that educational technology talents must possess.

For undergraduate students majoring in educational technology, it is imperative for them to acquire the ability to proficiently utilize, evaluate, and manage the learning process and learning resources. They should possess foundational competencies in designing, developing, and researching the learning process and learning resources. More, they should posses a preliminary understanding of instructional design and educational information processing ability and be able to carry out practical integration of information technology and teaching. For graduate students majoring in educational technology, they must have the ability to (a) design, develop, utilize, manage, evaluate, and research the learning process and learning resources, (b) deeply grasp the ability of instructional design and educational information processing, and (c) gradually form the abilities of integrated innovation in practice.

This ability structure model stands as a tangible reflection of the societal demand for professional abilities in educational technology talents. Therefore, it is the basic basis for designing the training objectives of the educational technology major and constructing the curriculum system of the educational Technology major.

2 Determination of the Training Program for Educational Technology Professionals Talents

The planning and implementation of educational informatization and educational digital

transformation require a large number of composite professional talents who understand both education and technology. This type of composite professional talent not only needs to master relevant educational theories and information technology, but also needs to be able to integrate them together, form innovative abilities in the information environment, and promote the process of educational modernization. Such composite professional talents can only be cultivated by the educational technology major.

2.1 Social Demand Analysis

The "Thirteenth Five-Year Plan for Educational Informatization" by the Ministry of Education states:

> By 2020, we will basically establish an education informatization system that is 'accessible to learning everyone, accessible to learning everywhere, and accessible to learning at all times', and is in line with the national goal of modernizing education. The basic implementation of educational informatization promotes the comprehensive development of students, supports the deepening of comprehensive reforms in the education field, and enhances the innovative, balanced, and high-quality development of education; The basic formation of a Chinese characteristic education informatization development path with international advanced level and innovative integration of information technology and education. (Ministry of Education, 2016.)

The "2022 Work Points of the Ministry of Education" clearly propose the implementation of the national education digitalization strategy action, aiming to promote the overall transformation of education through digital means, improve the quality of education, achieve inclusiveness and fairness in education, and thus promote modernization of education.

The modernization of education requires many composite professional talents who can innovate in the information environment. The establishment and development of the educational technology majors aim to meet the demand for professionals in educational informatization at the top-level design, effectively implement the plan's blueprint, and produce internationalization innovative professionals. It can meet the demand for talents in school education and teaching reform due to the changes in the "learning and teaching" methods, the learning environment, and the professional development of teachers; It can also meet the talent needs of government agencies, enterprises and institutions in the development of human resources and personnel training during social change.

2.2 Training Objectives and Specifications for Education Technology Majors

The educational technology major in China is divided into three levels of training: undergraduate, master's, and doctoral, this discussion primarily centers on the undergraduate level, as education at the graduate level (encompassing master's and doctoral degrees) is predominantly formulated by the educational institutions themselves.

2.2.1 Training objectives for educational technology majors (undergraduate level)

The training objectives of the educational technology majors at the undergraduate level

can be expressed as follows. This major aims with comprehensive development in (a) morality, intelligence, physical fitness, and aesthetics; (b) mastery the theories and methodologies of instructional design, educational information processing, deep integration of information technology and education, and performance technology; (c) familiarity with computer network technology, big data and artificial intelligence technology; (d) dexterity of engaging in the design, development, utilization, management, and evaluation of teaching processes and resources; and (e) possessing professional talents in educational informatization with analytical and problem-solving skills.

Graduates of this major can engage in the following different jobs depending on their chosen major direction:

(1) Teaching educational technology courses at higher education institutions and information technology courses in primary and secondary schools.

(2) The development and management of informationized teaching environments and digital educational resources in schools, electrified education institutions, and educational equipment centers at all levels and types, as well as the planning, maintenance, and management of educational equipment, as well as research on the application of educational informatization and educational technology.

(3) Curriculum development of various educational and training institutions, design of educational and training projects, and training of teachers in educational technology capabilities.

(4) Designing and developing study tours and research projects for museums, libraries, and event venues.

(5) The development and construction of learning resources and online courses in distance education and open education.

(6) The design and improvement of human resource development, personnel training, and performance in government, publicity departments, and enterprises and institutions.

(7) Design and development of educational products (intelligent education platforms, educational software, simulation teaching systems) in the IT industry, and editing of educational electronic publications.

(8) The creativity, planning, and compilation of broadcasting and television systems, educational film and television programs of cultural media companies, multimedia works, and online programs.

Each educational institution may set its professional direction based on the local social development's demand for educational technology talents and its own educational advantages and select suitable projects from the above 8 as own training objectives.

2.2.2 Training specifications for educational technology major (undergraduate level)

The undergraduate program of educational technology is 4 years, and the total credits should

reach around 160 credits. The duration of practical teaching should account for more than 30% of the total duration. When students graduate, they should comply with the relevant provisions of the Degree Regulations of the People's Republic of China and be awarded bachelor's degrees in education or science (engineering) according to their training direction.

Undergraduate students majoring in educational technology should fulfill the following requirements in terms of knowledge, abilities, and qualities:

(1) Love the socialist motherland, espousal the leadership of the CPC. Have a correct outlook on life and values, love the education industry, abide by professional ethics, possess certain scientific, cultural, artistic and information literacy, as well as a practical and innovative consciousness, and are willing to serve the socialist modernization construction.

(2) Having the knowledge of humanities and natural sciences related to the discipline required for engaging in educational technology work, possessing the ability to continuously update knowledge, improve problem-solving skills, and the spirit of innovation, understanding the current situation and development trends of this major.

(3) Attain a preliminary understanding of instructional design and educational information processing theories and methods. Demonstrate proficiency in using computers and networks for information processing and grasp the basic principles of big data and artificial intelligence, and be able to flexibly apply it in practice.

(4) Be able to apply the theory and methods of deep integration of information technology and education, as well as performance technology, to teaching reform practice.

(5) Possess the ability to effectively utilize, manage, and evaluate instructional processes and resources, along with preliminary design and development ability.

(6) Having the preliminary scientific research ability to comprehensively apply theoretical knowledge and methods learned, analyze and solve practical problems in educational informatization.

(7) Master a foreign language proficiently, possess basic communication and literature retrieval skills, and actively engage in communication and collaboration within the field of educational technology.

(8) Understand national guidelines, policies, regulations, and standards related to education and educational technology. Engage consciously and responsibly in educational technology work.

(9) Maintain a healthy physique and exhibit good psychological qualities. Develop positive behavioral habits, a healthy character, and a sound personality, possessing comprehensive educational technology literacy.

2.3 Training Directions of the Educational Technology Major

2.3.1 Composition of the educational technology major

Educational technology should be a first level discipline in the field in education discipline categories, alongside pedagogy. Due to the dual structure of its logical starting point, the educational technology discipline itself also has dual attributes, and the corresponding educational

technology major has a dual positioning: educational positioning and technological positioning.

According to the educational positioning, the educational technology major (undergraduate level) can set up secondary disciplines major such as Informatization Education (Modern Educational Technology), Smart Education, Intelligent Education, and Information Technology Education. According to technological positioning, the educational technology major can set up secondary disciplines major such as Education Intelligent Technology (Education Information Technology), Education Software Engineering, Digital Media Technology, and Education Equipment Technology. At the graduate level, comprehensive research directions such as Instructional Design and Performance Technology, and Intelligent Science Technology and Education can also be established.

This dual positioning allows the educational technology major to bridge across two distinct disciplines as outlined in the undergraduate catalog of the Ministry of Education: education and science (engineering). This unique positioning significantly broadens the horizons for career opportunities and employment for students, providing an advantage unparalleled by other disciplines. Hence, essential is to diligently uphold and preserve this advantage. The structure of the educational technology major within the education category is depicted in Table 2.

Table 2

Major System of Educational Technology

Discipline Category	**First-Level Discipline (Major)**	**Second-Level Discipline (Major)**	**Notes**
Educational Science	Pedagogy	omit	Granting degrees in Education
	Educational Technology	Informatization Education (Modern Educational Technology) Smart Education Intelligent Education Information Technology Education	Granting degrees in Education (Education positioning, undergraduate level)
		Educational Intelligence Technology (Educational Information Technology) Education Software Engineering Digital Media Technology Educational Equipment Technology	Granting degrees in Science or Engineering (Technical positioning, undergraduate level)
		Instructional Design and Performance Technology Intelligent Science Technology and Education	Granting degrees in Education, Science, or Engineering (Comprehensive positioning, graduate level)
	Physical Education	omit	Granting degrees in Education

Note. When educational technology is currently a second level discipline, the branch disciplines listed in the table can be used as professional training directions for construction.

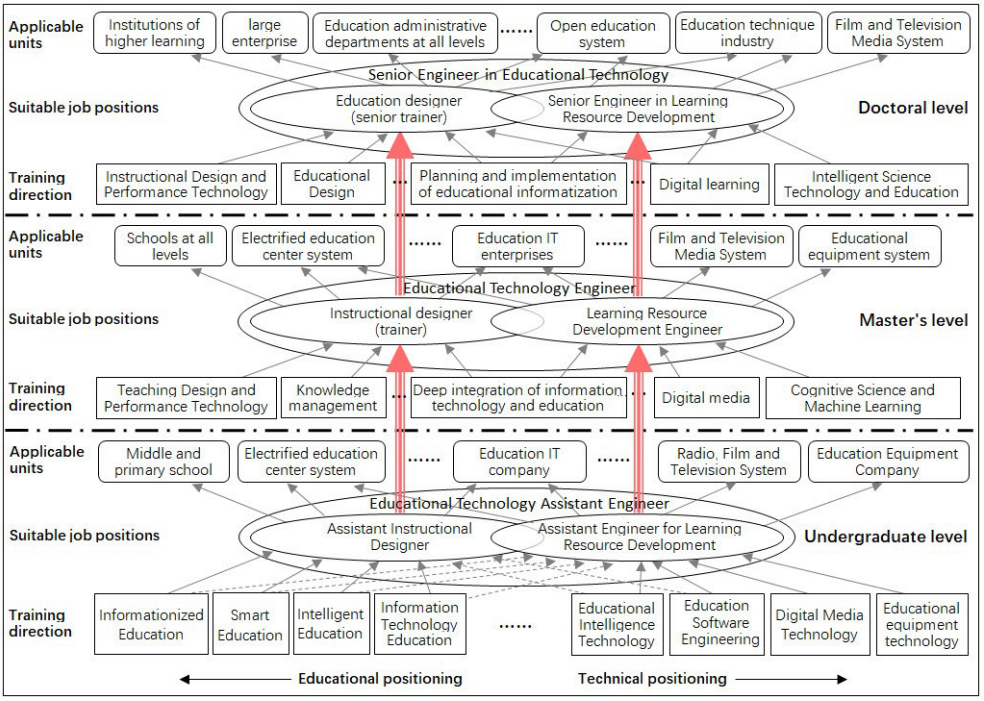
From Table 2, the undergraduate level is mainly focused on the professional direction, emphasizing the cultivation of learners' basic abilities of "one specialty and multiple abilities"; The graduate level focuses on interdisciplinary higher-order thinking abilities, with a focus on cultivating learners' critical and innovative thinking, as well as their comprehensive practical abilities to discover and solve problems.

2.3.2 Levels of the educational technology major

The education technology major in China has formed a complete talent training system from undergraduate to master's and doctoral degrees. Figure 3 can provide reference opinions for the training directions of undergraduate, masters, and doctoral levels in the educational technology major (Li, 2013).

Figure 3

Levels of Training and Appropriate Roles for Educational Technology Major



Note. Adapted from "Looking Back at the Century of Electrified Education in China," by L. Li, 2012, *China Educational Technology*, (3), 8-15.

3 Curriculum System of the Educational Technology Major

The term "curriculum" refers to "coursework and its processes" (Encyclopedia of China Editorial Office, 1985 p. 207), encompassing the planning and design of educational objectives, teaching content, and instructional methods. It embodies the structured arrangement of specific scientific knowledge and the processes that students are expected to acquire. The curriculum system represents the aggregate of all courses meticulously chosen and constructed by a discipline or major to fulfill the objectives of talent cultivation.

3.1 The Curriculum System of Higher Education Institutions

In accordance with curriculum theory, the curriculum system in higher education institutions typically comprises subject courses and public courses. Subject courses encompass core (main) courses, foundational courses, expansion courses (including elective and innovative courses), and experimental practice courses. Public courses consist of fixed courses (including general education courses) and activity courses.

In practical terms, the curriculum system of higher education institutions not only includes formally listed subject courses and public courses (referred to as formal courses), but also encompasses a form of informal courses presented indirectly and implicitly. Students unconsciously gain ideological content and cultural influence such as experience, values, and ideals in the school context. Although it is not included in the teaching plan, it subtly influences the development of students' personalities, and thus forms different academic styles of university culture. The author refers to it as a potential course. Therefore, the complete curriculum system of higher education institutions should be composed of both formal and informal courses, as shown in Figure 4.

Figure 4

Curriculum System Structures of Higher Education Institutions

Note. Adapted from "System Design of Educational Technology Major," by L. Li, 2002, *Modern Educational Technology*, (2), 5-14+21.

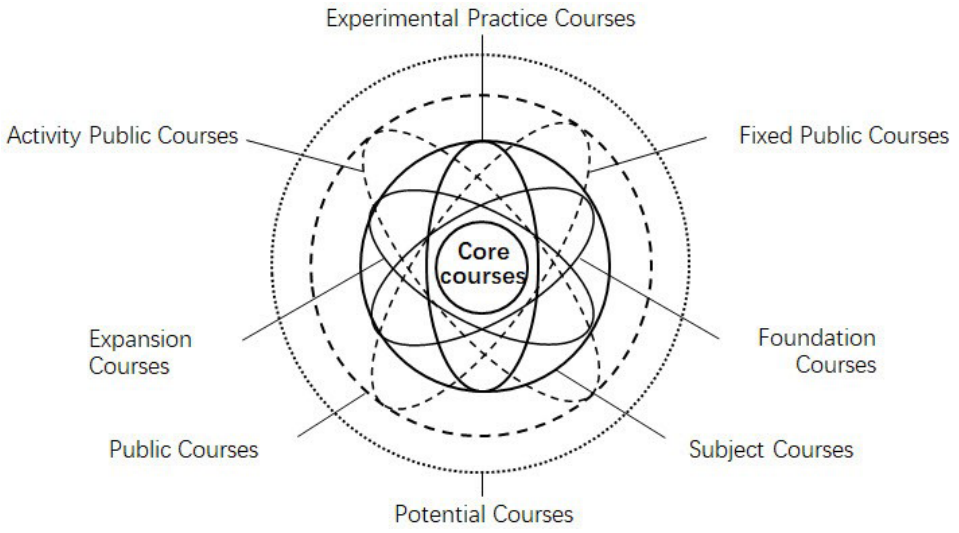
When developing the curriculum system, starting with the core courses that contribute to the formation of students' core professional ability is important. Based on these core courses, determining the major foundational courses and experimental practice courses is next. The major expansion courses should be composed of limited elective courses that deepen major

direction, and any elective courses that can broaden knowledge scope. On this basis, arranging public courses that promote the comprehensive development of students and enhance their comprehensive literacy is needed. Finally, based on the characteristics of various higher education institutions, consciously paying attention to the humanistic environment and academic atmosphere involved in potential courses, as well as the construction of school culture, departmental culture, academic style, and teaching style needs to be considered.

From this the curriculum system of higher education institutions is structured across four distinct levels. The first level is the core (main) course, which is located at the center of the model. The second level is the major foundation courses, major expansion courses, and experimental practice courses in the subject courses, which are established around the core courses. These two levels comprehensively cover all subject courses within the program. The third level is the public curriculum, which includes fixed public courses (containing general education courses) and activity public courses. The fourth level is the potential curriculum, which creates a favorable environment and atmosphere for talent cultivation. These four levels together form the three-dimensional structure of the curriculum system in higher education institutions, as shown in Figure 5.

Figure 5

Three-Dimensional Structure of the Curriculum System in Higher Education Institutions



Note. Adapted from "System Design of Educational Technology Major," by L. Li, 2002, *Modern Educational Technology*, (2), 5-14+21.

The overall function of the above course system structure is to cultivate students to become innovative talents with noble moral character, professional knowledge and ability, and comprehensive development that society needs.

3.2 Curriculum Set Up for the Educational Technology Major

Based on the training objectives, training specifications, and higher education Institutions curriculum system structure model of the undergraduate level of the educational technology major, it can be concluded that the curriculum system structure of the educational technology major (undergraduate level) is composed of the following contents:

3.2.1 Core (main) courses

Core courses, also known as main courses, are divided into two levels. First-level core courses are referred to as subject core courses, and mandatory for all educational technology major direction. Second-level core courses, also known as the major core courses, are selected according to the chosen major directions. In general, the total number of core (main) courses does not exceed 8-10 (professional internships, educational internships, and social practices may not be included in this count).

The first-level core courses encompass Introduction to Educational Technology, Instructional Design, and Educational Informatics. Notably, Instructional Design and Educational Informatics are pivotal theoretical courses for the educational technology major; it determines the uniqueness and irreplaceability of this discipline.

The second-level core courses include Multimedia and Instruction, Network and Instruction, Large Models and Generative Artificial Intelligence, Machine Learning, Data Mining, Education Big Data Analysis, Virtual Reality Technology and Education, Artificial Intelligence Technology and Education, Information Technology and Curriculum Integration, Design and Development of Teaching Media, Analysis and Design of Education Software, Digital Campus Planning and Implementation, Planning and Integration of Education Equipment System, Cloud Computing and Big Data Management Technology, Introduction to Performance Technology, and more, which are selected and offered by various major directions.

3.2.2 Major foundational courses

Major foundational courses are prerequisite courses that must be completed before the core (main) courses. Corresponding to core (main) courses, major foundational courses are also divided into two parts. Part of it is mandatory for all major directions such as History of Educational Technology, Philosophy of Educational Technology, Learning Science and Technology, Educational Communication, Research Methods in Educational Technology, and Database Principles and Application. The other part is offered according to the major directions, including Educational Measurement and Evaluation, Foundations of Multimedia Technology, Foundations of Network Technology, Data Structures, Advanced Language Programming, Courseware Design and Development, Distance Education, Fundamentals of Artificial Intelligence Technology, Fundamentals of Virtual Simulation Technology, Fundamentals of Database Technology, Pedagogy of Information Technology Courses, Fundamentals of Electronic Technology, Fundamentals of Mathematics and Physics, and so on. In general, the total number

of major foundational courses is about 10, which can be increased if necessary.

3.2.3 Major expansion courses

The major expansion courses are structured into two distinct categories. Courses that enhance specialization are classified as limited elective courses, while those that broaden the spectrum of knowledge full under any elective course.

These expansion courses are organized into modules, and each major direction has the flexibility to choose courses within the relevant modules based on their specific requirements. These modules encompass Educational Technology Theory, Computer Technology, Network Technology, Audiovisual Media Technology, Digital Media Technology, Artificial Intelligence Technology, Virtual Simulation Technology, Educational Robots and Educational Games, Computer-Aided Design, Distance Education, Information Technology Education, Teacher Education, Performance Technology, Software Engineering, Knowledge Engineering, Informationized Teaching Environment and Resources, and Discipline Foundations (including Mathematical Foundations, Electronic Technology Foundations, Educational Foundations, Art Foundations, Philosophical Foundations), and more.

The major expansion courses are designed to mirror the distinctive attributes of each educational institution, allowing for a nuanced customization that aligns with local societal needs and capitalizes on the academic strengths inherent to the institution.

3.2.4 Experimental practice courses

The educational technology major is classified as a comprehensive applied discipline, emphasizing the significance of practical and operational skills for graduates. In this context, experimental practice courses assume a pivotal role within the curriculum structure. Successful completion of experiments and hands-on exercises, aligned with the specified teaching objectives specified in the course standards, is imperative for students to accrue full credits in the respective courses.

Experimental courses and some practical courses are generally conducted together with the corresponding courses, and schools with conditions can offer them separately. Professional internships, teaching practicums, and graduation projects (creative works) are often scheduled independently.

3.2.5 Public courses

The fixed public courses are arranged uniformly by the school; general education courses can be selected from the courses offered by the school or arranged by the college or department themselves.

3.2.6 Potential courses

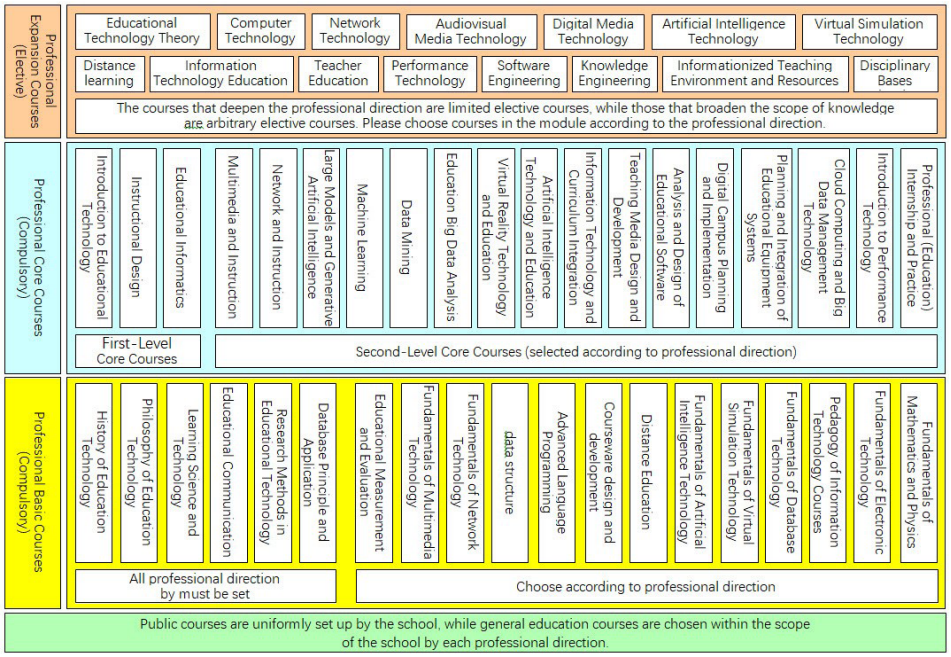
The humanistic environment, academic atmosphere, school culture, academic style, and

teaching approach of the institution profoundly shape students' life values, professional thinking styles, and cultural backgrounds. Hence, when formulating talent training programs for this major, imperative is to comprehensively consider these influential factors.

To sum up, the undergraduate-level curriculum system structure for the educational technology major can be represented using Figure 6.

Figure 6

Structure Diagram of Undergraduate Level Curriculum System for Educational Technology Major



Note. Adapted from "The Professional Ability Structure of Educational Technology Talents - Five Discussions on the Theory and Practice of Educational Technology Disciplines," by L. Li, 2005, *e-Education Research,* (7), 3-8.

3.3 Content Framework for First-level Core Courses

Due to space constraints, this article only introduces the framework of the first-level core curriculum. For in-depth information on additional courses, please refer to the relevant curriculum standards. The first-level core curriculum consists of three mandatory courses applicable to all educational technology majors: Introduction to Education Technology, Instructional Design, and Educational Informatics.

3.3.1 Introduction to educational technology

The Introduction to Educational Technology course is designed to explore the fundamental questions of "what" and "why" within the realm of educational technology, encompassing ontology theory, values, and methodology. The main framework includes:

A Brief History of Educational Technology Development at Home and Abroad. An Overview of Educational Technology that includes: (a) definition group of educational technology; (b) the object, purpose, task, domain and scope of research of the educational technology discipline; (c) disciplinary foundation of educational technology; (d) values and methodology of the educational technology discipline; and (e) logical starting point and disciplinary positioning of educational technology discipline). Discussion of theoretical and knowledge system of the educational technology discipline. Discussion on how and why to study educational technology, and more.

3.3.2 Instructional design

"Instructional Design" is a core course that cultivates students' instructional design abilities. The author believes that the research object of "instructional design" should not only include the instructional process, but also the instructional system and instructional products. To this end:

(1) Clarified the direction of instructional design courses for the educational technology major

There are three main academic teams in China that conduct research on instructional design: pedagogy, psychology, and educational technology. The disciplines of pedagogy and psychology focus on deepening the research of instructional design theory, while the discipline of educational technology should address the issue of how instructional design can be easily implemented, especially how to guide and lead frontline subject teachers to master the laws and methods of instructional design and enhance the operability of instructional design.

(2) Deepening the concept of instructional design

The concept of instructional design proposed by the author should be:

Instructional design stands as a systematic decision-making process rooted in the analysis of learning needs, with the overarching goal of proposing optimal solutions to problems, thereby enhancing the overall performance of education and instruction.

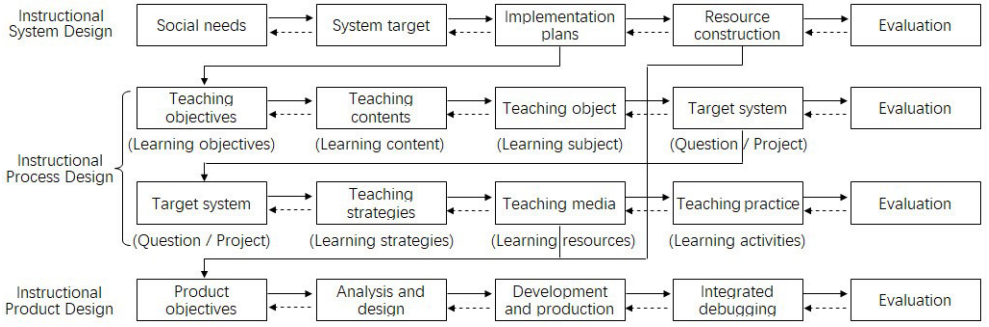
It is based on learning theory, teaching theory, communication theory, and design theory, and applying the perspectives and methods of holistic optimization theory and systems science theory. It includes investigating and analyzing problems and needs in teaching and determining goals. Then it addresses selecting corresponding teaching strategies and resources, establishing problem-solving steps. Finally, the leading toward implementing and evaluating their results is covered, thereby improving and enhancing educational and teaching performance.

(3) Proposed the hierarchy of instructional design

Instructional design extends beyond the scope of crafting individual classes or learning activities; rather, it encompasses three distinctive levels: instructional system design, instructional process design, and instructional product design, as depicted in Figure 7.

Figure 7

Hierarchy of Instructional Design



Note. Adapted from "Theory and Practice of Teaching Process Design," by L. Li, 1999, *e-Education Research,* (4), 20-26.

The commonly referred to "instructional design (also known as instructional system design)" is only its median level and not the entirety of instructional design. The connotations and further development directions of the three levels of instructional design are shown in Table 3.

Table 3

The Hierarchy and Development Direction of Instructional Design

Gradation	Name	Research Object and Task	Development Direction
Macro level	Instructional System Design	Instructional Systems: Top-level design and scientific planning of different aspects of educational informatization (educational ecological environment, distance education system, new disciplines or majors, training systems, or learning systems)	Educational Design
Median level	Instructional Process Design	Instructional Processes: the design of a course or unit, a lesson, a knowledge point, or a teaching (learning) activity	Subject Instructional Design
Micro level	Instructional Product Design	Instructional Products: Design and development of teaching media (multimedia courseware), intelligent teaching platforms, online courses, etc.	Design and Development of Instructional Resources

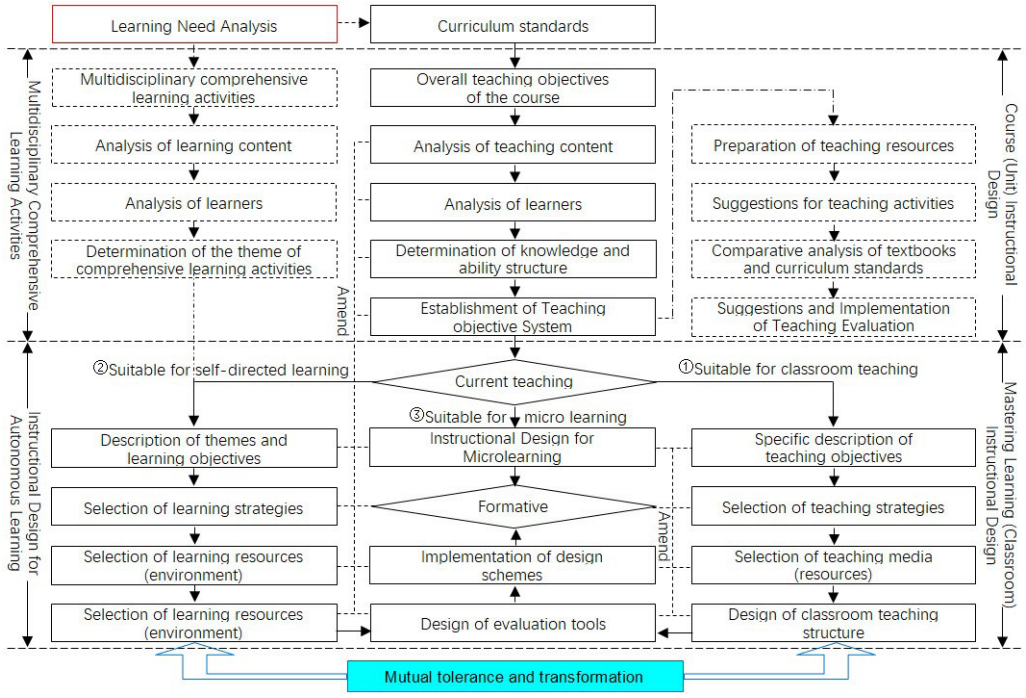
(4) Provided models, operating procedures, and templates for each level of instructional design

The author provides a series of "instructional design models, operating procedures, templates and evaluation criteria for each level mentioned above." These resources supply specific and directly applicable methods to apply instructional design theory to solve educational and teaching problems for educational administrators and frontline subject teachers, especially those in the student of educational technology major.

Taking instructional process design as an example, the operating program for instructional process design is shown in Figure 8.

Figure 8

Operating Procedure for Instructional Process Design



Note. Adapted from *Selected Works of Li Long on Educational Technology* (p. 46), by China Association for Educational Technology, 2009, Central Radio and Television University Press.

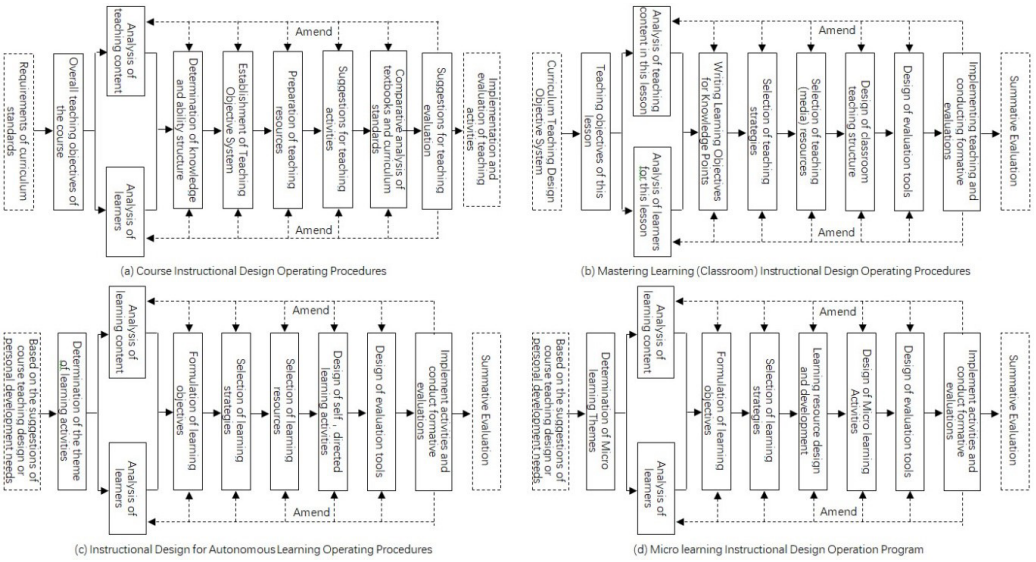
From Figure 8, the operations in the instructional process design can be divided into five parts: Course (Unit) Instructional Design, Mastering Learning (Classroom) Instructional Design, Instructional Design for Autonomous Learning, Instructional Design for Micro learning, and Instructional Design for Multidisciplinary Comprehensive Learning Activities. They follow a

certain sequence and are interconnected and mutually constrained.

Expanding upon the systematic approach model for instructional design proposed by Dick et al. (2002), the author provides specific operating procedures for each part of instructional process design, as shown in Figure 9.

Figure 9

Specific Operating Procedures for Each Component of Instructional Design



Note. Adapted from *Instructional Design,* by L. Li, 2010, p. 99, 273. Higher Education Press.

To facilitate novices in mastering instructional design method, the author has made "operation templates" for Course (Unit) Instructional Design, Mastering Learning (Classroom) Instructional Design, Instructional Design for Autonomous Learning, and Instructional Design for Micro learning, currently updated to version 13. With over 30 years of practical application within the nationwide "holistic optimization" teaching reform project, gradually forming a universal version, commonly seen in teacher continuing education and various teaching skills competitions across the country.

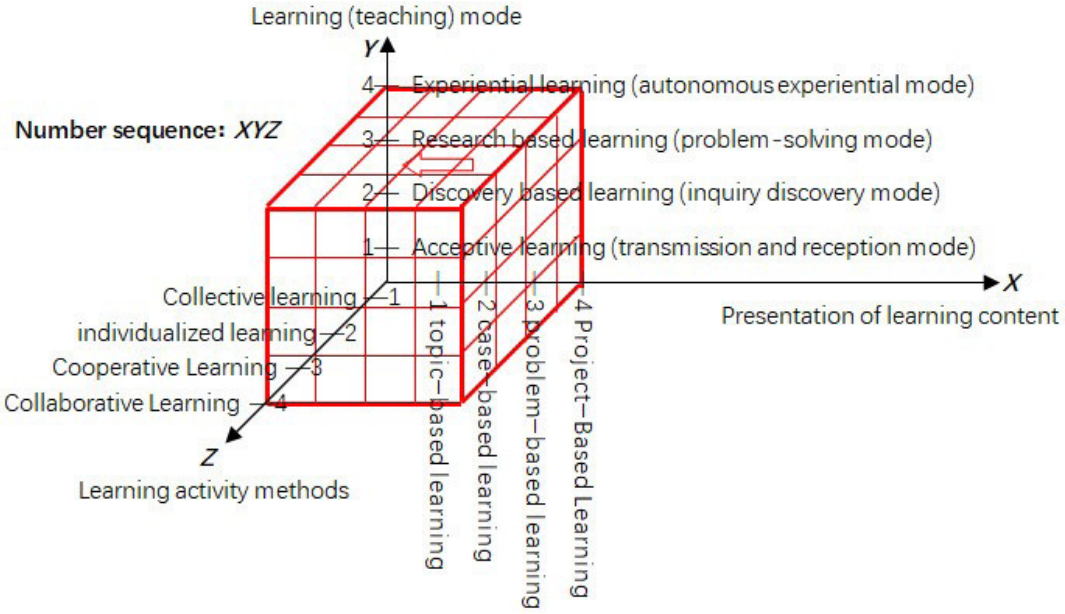
(5) Constructed a three-dimensional model of diverse "learning and teaching" methods in the information technology environment

Drawing on extensive years of theoretical research and guiding the practical implementation of the "holistic optimization" teaching reform project, the author has crafted a comprehensive three-dimensional model for diverse "learning and teaching" methods within the information

technology landscape, see Figure 10. This pioneering model encapsulates 64 effective "learning and teaching" methodologies, and good results have been achieved in teaching design practice.

Figure 10

A Model of Diverse "Learning and Teaching" Methods



Note. Adapted from *Instructional Design*, by L. Li , 2010, p. 288. Higher Education Press.

In the instructional process within the information technology environment, there is a heightened focus on student learning activities. Consequently, the diagram incorporates the three pivotal elements of the "learning and teaching" methods three dimensions: learning content, the learning (teaching) modality, and learning activities. Put differently, any "learning and teaching" methods can be accurately portrayed through the combination of these three dimensions: the presentation of learning content (i.e., the organization of learning material), the learning modality (alongside its corresponding teaching approach), and the methods of learning activities (intricately linked to the organizational structure of teaching), all three dimensions are indispensable. When completing instructional design, selecting from the above three different dimensions based on learning objectives, learning content, and student characteristics is essential as they combine to form an effective "learning and teaching" approach, which will be included as the selected learning (teaching) strategy in the design plan.

3.3.3 Educational informatics

Based on the theoretical framework of educational technology established in this study, educational information processing is one of the two components of the core theory. It serves as the guiding theory for the media (materialization) technology within educational technology. This encompasses three main aspects: the fundamental concepts of educational information, the theory of educational information processing, and the methods associated with it.

Thereunder, based on the tasks defined for educational information processing in this study, the author has developed a content framework for educational information processing.

(1) This content framework adopts the name "educational informatics" and belongs narrow educational informatics in terms of disciplinary positioning. It is a theory and method about the design, development, utilization, management, and evaluation of educational information, and therefore can also be called the theory of educational information processing.

(2) The research object of this theory is educational information within the media (materialized) technology. The research task is to discover and summarize the patterns of educational information operation within educational media (materialized) technology. The research purpose is to provide theoretical guidance for the design, development, utilization, management, and evaluation of educational information within educational media (materialized) technology.

(3) This theory's content framework is meticulously designed to circumvent redundancy with courses like Introduction to Educational Technology, Educational Communication, Instructional Design, and Educational Measurement and Statistics. Instead, it exclusively delves into the macro-level theories and methodologies of media (materialized) techniques, deliberately excluding specific applications and operations, which are duly addressed by pertinent applied theories.

(4) The content framework of this theory comprises nine integral parts: the initial two sections encapsulate fundamental concepts of educational information, the third section pertains to the theory of educational information processing, and the subsequent four to eight sections delve into the methodologies of educational information processing, last item is an introduction to artificial intelligence educational applications. For visual clarity and reference, Table 4 delineates the interrelationships between each section.

Table 4

Content Framework of "Educational Informatics - Theory of Educational Information Processing"

First-level Title	Second-level Title
Introduction	1. The Development History of Media (materialized) Technology 2. New Media and New Technology 3. Significance and Methods of Learning Educational Informatics
Chapter 1: Overview of Educational Informatics	1. Basic Concepts and Research Objects of Educational Informatics 2. Research Content and Research Methods of Educational Informatics 3. Disciplinary Foundations of Educational Informatics
Chapter 2: Representation of Educational Information	1. Characteristics and Information Entropy of Educational Information 2. Classification and Characteristics of Educational Media 3. Representation of Educational Media
Chapter 3: Acquisition and Transmission of Educational Information	1. Acquisition and Identification of Educational Information 2. Transmission and Reception of Educational Information
Chapter 4: Processing and Transformation of Educational Information	1. Processing of Text and picture Information 2. Processing of Audio and Video Information 3. Conversion of Educational Information Formats
Chapter 5: Utilization and Development of Educational Information	1. Roles and Limitations of Different Media Information in Education 2. Design and Development of Media Information
Chapter 6: Measurement and Evaluation of Educational Information	1. Education Information Measurement under Technical Support 2. Education Information Evaluation under Technical Support
Chapter 7: Educational Resources and Environment	1. Classification and Sharing of Educational Resources 2. Creation of Educational Environment
Chapter 8: Artificial Intelligence	1. Basic Principles of Artificial Intelligence 2.The Impact of Artificial Intelligence on the Dissemination of Educational Information

3.4 Recommendations for Courses in Educational Technology Major

Distinguishing the main talent training directions (see Table 5) based on the branch disciplines and majors established in the aforementioned educational technology discipline is important to establish their respective curriculum systems.

Table 5

The Training Direction of Each Branch Discipline Major (Undergraduate Level)

Branch discipline majors	Main training directions	majors positioning
Informationized Education	Helpers and guides for the deep integration of information technology and teaching among subject teachers	Education
Smart Education	Combination of intelligent technology and education, culture innovative specialized talents of "smart environment, smart teaching methods, and smart assessment"	
Intelligence Education	Integrate human cognition and artificial cognitive systems to promote the specialized talents of "interpersonal + human-machine" collaborative education	
Information Technology Education	The construction and maintenance of information technology curriculum teachers and digital teaching environment in primary and secondary schools	
Educational Intelligence Technology	Training of educational big data models and development and creation of educational artificial intelligence technology	Technology
Education Software Engineering	Design and development of intelligent education software systems and platforms	
Digital Media Technology	Design and development of digital teaching resources and communication media	
Educational Equipment Technology	Integration of digital teaching environment, platform, and facilities supported by artificial intelligence	

Based on 40 years of experience in cultivating educational technology talents and long-term research on the national educational technology major, the author provides suggestions for curriculum install according to different directions of professional talent cultivation (see Table 6) for reference.

Table 6

Suggestions for Curriculum Design in Various Majors Directions

	Majors Direction / Course Name (Module)	Informationized Education	Smart Education	Intelligence Education	Information Technology Education	Educational Intelligence Technology	Education Software Engineering	Digital Media Technology	Educational Equipment Technology	Notes
Core (main) courses	Introduction to Educational Technology	★	★	★	★	★	★	★	★	★ This represents the first level core (main) course, which must be offered in all major directions. ☆ Indicating the secondary core (main) courses, selected by various major directions. ○ Indicating the core (main) courses that can be supplemented and selected for each major direction.
	Instructional Design	★	★	★	★	★	★	★	★	
	Educational Informatics	★	★	★	★	★	★	★	★	
	Multimedia and Instruction	☆	☆	☆	☆	○	○	○	○	
	Network and Instruction	☆	☆	☆	☆	○	○	○	○	
	Large Models and Generative Artificial Intelligence	☆	☆	☆	☆	○	○	○	○	
	Machine Learning	○	○	○	○	☆	☆	☆	☆	
	Data Mining	○	○	○	○	☆	☆	☆	☆	
	Educational Big Data Analysis	☆	☆	☆	☆	☆	☆	☆	☆	
	Virtual Reality Technology and Education	☆	☆	☆	☆	○	○	○	○	
	Artificial Intelligence Technology and Education	☆	☆	☆	☆	○	○	○	○	
	Information Technology and Curriculum Integration	☆	☆	☆	☆					
	Design and Development of Teaching Media	○	○	○	○			☆		
	Analysis and Design of Education Software					☆	☆	☆	☆	
	Digital Campus Planning and Implementation								☆	
	Planning and Integration of Education Equipment System								☆	
	Cloud Computing and Big Data Management Technology					☆	☆			
	Introduction to Performance Technology	☆	☆	☆	☆	☆	☆	☆	☆	

Major Foundational Courses	History of Education Technology	◆	◆	◆	◆	◆	◆	◆	◆	◆ Indicates the major fundamental courses that should be offered in all major directions ◇ Indicates the major foundational courses that can be offered in various major directions.. ○ Indicates the major fundamental courses that can be supplemented and selected for each major direction.
	Philosophy of Educational Technology	◆	◆	◆	◆	◆	◆	◆	◆	
	Learning Science and Technology	◆	◆	◆	◆	◆	◆	◆	◆	
	Educational Communication	◆	◆	◆	◆	◆	◆	◆	◆	
	Research Methods in Educational Technology	◆	◆	◆	◆	◆	◆	◆	◆	
	Database Principles and Application	◆	◆	◆	◆	◆	◆	◆	◆	
	Educational Measurement and Evaluation	◇	◇	◇	◇					
	Fundamentals of Multimedia Technology	◇	◇	◇	◇			◇	◇	
	Fundamentals of Network Technology	◇	◇	◇	◇			◇	◇	
	Data Structures	○	○	○	○	◇	◇	◇	◇	
	Advanced Language Programming	○	○	○	○	◇	◇	◇	◇	
	Courseware Design and Development	○	○	○	○					
	Distance Education	○	○	○	○					
	Fundamentals of Artificial Intelligence Technology					○	○	○	○	
	Fundamentals of Virtual Simulation Technology					○	○	○	○	
	Fundamentals of Database Technique					○	○	○	○	
	Pedagogy of Information Technology Courses				◇					
	Fundamentals of Electronic Technology					◇	◇	○	○	
	Fundamentals of Mathematics and Physics					◇	◇			
Expansion Courses Module	Philosophical Foundations	▲	▲	▲	▲	△	△	△	△	▲ Indicates the recommended modules for limited elective courses, where suitable courses can be selected. △ Indicates the recommended modules for any elective course, where suitable courses can be selected. ○ Indicating the modules that can be supplemented and selected for each major direction, suitable courses can be selected among them.
	Educational Foundations	▲	▲	▲	▲	○	○	○	○	
	Fundamentals of Art	▲	▲	▲	▲	○	○	○	○	
	Educational Technology Theory	▲	▲	▲	▲	△	△	△	△	
	Computer Technology	○	○	○	○	▲	▲	▲	▲	
	Network Technology	○	○	○	○	▲	▲	▲	▲	
	Artificial Intelligence Technology	△	△	△	△	▲	▲	▲	▲	
	Virtual Simulation Technology	○	○	○	○	▲	▲	▲	▲	
	Educational robots and educational games	△	△	△	△	○	○	○	○	
	Audiovisual Media Technology	○	○	○	○				○	
	Digital Media Technology	△	△	△	△		○	▲		
	Distance Education	○	○	○	○					
	Information Technology Education				▲					
	Teacher Education	▲	▲	▲	△					
	Knowledge Engineering	○			○					
	Software Engineering					▲	▲	△	△	
	Computer Aided Design					○	△	△	○	
	Informationized Teaching Environment and Resources	○	○	○	○	△	△	△	▲	
	Performance Technology	△	△	△	△	○	○	○	○	

Note. Public courses are uniformly set up by the school, while general education courses are chosen within the scope of the school by each major direction.

With the development of education and science and technology, new theories, concepts, and technologies continue to emerge. The development of educational technology discipline must align with the needs of educational informatization and social development. Consequently, the array of theories and technologies that necessitate comprehension and proficiency is continually expanding. To address this dynamic landscape, the author will progressively introduce new courses in the expansion course module (refer to Table 7), offering a range of choices for various major directions to select from.

Table 7

Courses in Expansion Courses Module

Module	Available Courses to Choose From
Educational Technology Theory	Instructional System Design, Modes and Templates of Instructional Design, Case Analysis of Instructional Design, Development of Teaching Systems, Quantitative Research Methods, Qualitative Research Methods, Action Research Methods, Design Based Research, Educational Information Processing, Educational Evaluation Technology, SPSS Educational Application, Interactive Learning Theory and Practice, Blended Learning Theory and Practice, Teaching Activities and Teaching Mode Theory, Teaching Technology and Media, Theory and Practice of Teaching Media, Teaching Media and Application, Higher-Order Thinking Abilities, Thinking Skills Training, Thinking Training And Learning Ability Enhancement, Micro Teaching Practice, Special Topics on Basic Education Curriculum Reform, Comprehensive Practice of Educational Technology, STEAM And Maker Education, Cutting-Edge Development of Educational Technology Disciplines, Literature on Educational Technology. Selected Readings, Education and Teaching Management, Educational Technology Policies and Regulations
Computer Technology	Introduction to Computer Science, Introduction to Computational Thinking, Computer Principles, Principles of Microcomputers, Fundamentals of Computer Hardware, Principles of Operating Systems, Fundamentals of Programming, PYTHON Language, C Language Programming, VB Programming, Object Oriented Programming, Distributed Application Programming, Computer Vision, Computer Graphics, Computer Vision and Image Analysis, Digital Image Processing, Graphics and Image Processing and Production, Computer Game Programming, Algorithm Analysis and Design, Database Theory and Systems, Logic and Computer Fundamentals, Embedded System Design and Practice, Computer Education Applications, Computer Fault Diagnosis and Maintenance, Computer Culture
Network Technology	Principles and Applications of Computer Networks, Computer Network Technology, Web Program Design and Application, Web Application Development, Web Programming, Web Application and Web Page Design, LAN Design and Management, JSP Network Programming, Linux Environment Practice, MAC Software Operation Fundamentals, Net Practical Technology, PHP Program Design, Vb. net Program Design, Network Security and Management, Use of Online Search Tools, Network Design and Practice, Network Education and Network Culture
Artificial Intelligence Technology	Fundamentals of Artificial Intelligence, Principles of Artificial Intelligence, Introduction to Artificial Intelligence, Principles of Artificial Neural Networks, Artificial Neural Networks, Pattern Recognition, Database and Intelligent Information Retrieval, Deep Learning, Intelligent Control and Intelligent Computing, Human Computer Interaction Technology, Cognitive Science and Machine Learning, Cognitive Science and Intelligent Video Surveillance, Facial Recognition, Object Recognition, Advanced Algorithms, Big Data Management and Systems, Text Information Retrieval and Data Mining, Education Data Analysis and Visualization, Education Artificial Intelligence Application Cases and Practices, Education Big Data Thinking and Analysis Technology, Artificial Intelligence Program Design, Generative Artificial Intelligence Applications, Wireless Sensor Networks, Introduction to the Internet of Things

Virtual Simulation Technology	Sensor Principles and Applications, Sensory Interaction Technology and Applications, Sensors and Detection Technology, Virtual Reality Technology and Applications, Virtual Reality Design, 3D Games and Virtual Simulation Systems,
Educational Robots and Educational Games	Introduction to Robotics, Robot Control, Biomimetic Robots, Robot Education, Educational Robotics, Robot Design, Principles of Automatic Control, Human Computer Interaction Design, Robotics and Maker Education in Primary and Secondary Schools, Mobile Game Development, APP Education Applications, Android Mobile Learning Development, Maya Fundamentals and Modeling, Processing Data Visualization, UI Interaction Design, Game Technology Fundamentals, Unity3D Game Development, Unity Application Development, Educational Data Mining, Mobile Learning, Mobile Learning Applications, Mobile Learning Resource Design and Development, Mobile Application Program Design and Development, Design Thinking and Maker Education, Comprehensive Practice Activity Design for Middle Schools, Educational Game Design, Educational Game Design and Development, Anime and Game Design, Education Policies and Regulations,
Computer Aided Design	Animation Design and Production (Flash), Computer Graphic Art, 2D Animation Design and Production, Planar Graphics and Image Processing, 3D Scene Design and Production, 3D Animation Design and Production, 3D Animation Special Effects Technology, 3D Modeling Fundamentals, 3D Interactive Virtual Simulation Technology, 3D Digital Image Technology, Advanced 3D Design
Digital Media Technology	Digital Media Theory, Introduction to Digital Media, Application of Digital Media Tools, Comprehensive Practice of Digital Media, Multimedia Information Processing, Multimedia Technology and Applications, Multimedia Resource Design and Development, Multimedia Program Design, Interactive Multimedia Design and Applications, Advanced PPT Design and Teaching Applications, Dynamic Web Page Design and Production, Dynamic Website Development and Maintenance, Digital Science Popularization Resource Creation, Appreciation of Digital Media Works, Digital Video Editing, Digital Video and Audio Technology, Digital Image Processing, Digital Audio Technology and Applications, Digital Film and Television Editing
Audiovisual Media Technology	Audiovisual Media Technology, Fundamentals of Photography, Photography Technology and Art, Photography and Photography Technology, Fundamentals of Photography and Graphic Art, Television Photography, Nonlinear Editing, Education TV Program Directing and Production, Comprehensive Course Design for Teaching Special Topics, Film and Television Post Production Technology, Audio Production Technology, Lighting Processing, Film and Television Lighting Technology, Film and Television Special Effects Production, Film and Television Production and Special Effects Technology Practice, Audiovisual Language, Audiovisual Language and Editing Art, Film and Television Basic Writing, Film and Television Appreciation and Review, Science and Education Film and Television Directing and Creation
Informationized Teaching Environment and Resources	Information Based Teaching Environment, Management and Application of Educational Information Resources, Design and Development of Teaching Resources, Design and Development of Online Teaching Resources, Design and Development of Educational Mobile Resources, Design and Production of Micro Courses, Design and Development of Online Teaching Environment and Resources, Classification and Management Mode of Teaching Resources, Theory of Utilization and Management of Teaching Resources, Construction of Large-Scale Distributed Resource Libraries, Theory and Practice of Network Teaching Support Platforms, Design and Development of Intelligent Teaching Platforms, Database and Dynamic Website Development, Webpage Script Program Design, Webpage Design and Development, Webpage Production and Subject Specific Website Construction, Learning Website Design and Development, Education Website Design and Development, Education Website Construction and Management, Static Website Design and Production, Campus Network Engineering Design and Application, Smart Campus Management Practice, Theory and Practice of Digital Campus Construction In Universities, Digital Library Construction, Design and Development of Educational Informatization Projects, Project Planning and Management, Modern Educational Equipment, Development of Network-Based Educational Administrative Management Systems, School Informatization Management

Information Technology Education	Information Technology Curriculum Standards and Teaching Design, Research on Information Technology Curriculum and Textbooks, Case Studies of Information Technology Curriculum instructional Design, Professional Skills Training in Information Technology education, Development of Information Technology Curriculum Resources
Performance Technology	Principles of Performance Technology, Design and Development of Training Courses, Design and Implementation of Enterprise Training Courses, Social Network Analysis, Principles and Methods of Education and Training, Education Project Management
Teacher Education	Basic Teacher Skills, Teacher Speaking, Speaking Ability Training, Teacher Professional Ethics, Teacher Professional Development and Evaluation Techniques, Teacher Professional Development and Mental Health, Teacher Professional Literacy Training, Teacher Professional Development, Professional Education and Personal Development Planning, Professional Practice and Training, Middle School Famous Teacher Lectures, Comprehensive Training of Classroom Teaching Ability, Quality Expansion and Innovation, Theory and Practice of School-based Teaching and Research, School-based Curriculum Development
Distance Education	Online Course Design and Development, MOOCs Design, Network Education Communication Studies, Network Education Applications, Network Education and Network Culture, Computer Network Education Applications, instructional Design of Online Courses, Online Teaching Strategies, Organization and Implementation of Online Teaching
Software Engineering	Educational Software Engineering, Software Programming Thinking, Software Testing, Introduction to Software Engineering, Software Engineering, Software Engineering Laboratory, Software Project Management
Knowledge Engineering	Knowledge Engineering, Knowledge Management, Knowledge Engineering and Knowledg Management
Philosophical Foundations	Philosophy of Education, Philosophy of Technology, Philosophy of Science and Technology, General Theory of Natural Sciences, Sociology of Education, General Theory of Social Sciences, Fundamentals and Ethics of Artificial Intelligence Philosophy, Society and Humanities
Fundamentals of Educational Psychology and Communication	Fundamentals of Neuroscience, Artificial Neural Networks, General Psychology, Cognitive Psychology, Educational Psychology, Theory and Practice of Learning and Teaching, pedagogy, Principles of Education, History of Chinese and Foreign Education, Curriculum Theory, Teaching Theory, Curriculum and Teaching Theory, Educational Statistics, Education Statistics and Evaluation, Communication Studies, New Media and Communication, Emerging Media and Scientific Communication, Information Communication and Media Theory
Fundamentals of Mathematical and Electronic Technology	Advanced Mathematics, Linear Algebra, Mathematical Analysis, Matrix Theory, Discrete Mathematics, Probability Theory and Mathematical Statistics, Mathematical Logic General Physics, Circuit Analysis, Fundamentals of Electronic Technology (Analog Circuits), Fundamentals of Electronic Technology (Digital Circuits), Digital Circuit and Logic Design, Signals and Systems, Electroacoustic Technology, Educational Electroacoustic Systems, Educational Television Systems, Satellite Digital Television Broadcasting Technology, Wireless Radio Frequency Identification Technology
Fundamentals of Art	AArt Appreciation, Basics of Media Aesthetics, Color, Drawing and Composition, Music Basic Skills, Modeling Foundations, Media Art Design Practice, Visual Communication Design, Visual Culture and Media Literacy, Design Theory

The courses in Table 7 are available for various major directions to choose from when setting up extension courses. Some of these courses can be considered for inclusion as major foundational courses or even core courses in the talent training program for specific major directions if needed.

4 Conclusions

Educational technology personnel must possess professional knowledge and abilities in teaching design, educational information processing, media (resource) development and application, construction and maintenance of material form teaching system, and research and management of educational technology, supported by new technologies. They must have a high level of political literacy, a sound personality, and the awareness and ability to continuously update, supplement, and improve interdisciplinary knowledge structures. They should possess critical thinking, innovative thinking, and practical abilities to discover and solve problems. In this way, they become a composite of innovative talents in promoting the modernization of education in the new era. Such composite of innovative talents can only be cultivated by the educational technology major.

The dual attributes of educational technology discipline have created a dual positioning of the educational technology major. In terms of professional construction alone, "dual positioning" such as establishing the educational mission, training objectives, and curriculum for the educational technology majors of teacher education and non-teacher education categories, can provide sufficient theoretical basis and various training practice models to achieve the vision of "diversified development." Additionally, it provides broad prospects for actively participating in educational informatization construction, promoting the digital transformation of education, and addressing the social employment and further studies of graduates in the educational technology major.

Only by setting up the major system of educational technology in this way (the names of secondary disciplines are for reference only) can we fully reflect the connotation of the current field of educational technology. Through such a configuration of the educational technology major can it effectively fulfill its mandate of nurturing diverse professionals essential for educational informatization and digital transformation. Moreover, this approach actively contributes to the cultivation of forward-thinking and innovative talents crucial for societal advancement. Only by doing so can we solve the current situation of graduates in the major of educational technology. If their knowledge is extensive but do not possess a strong professional ability required in society, we can face a severe employment situation.

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