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Exploration of the Practical Teaching System of Information and Computing Science Major under the Background of Interdisciplinary Construction

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Abstract: Based on the interdisciplinary attributes and professional positioning of information and computing science major,this paper proposes a multi-level practical teaching system construction path of"integration of science and engineering,collaborative education",and explores the hierarchy and synergy of practical teaching from the aspects of platform system construction,practice content and teaching methods.With"thick theoretical foundation and strong application practice"as the core,it builds a multi-level practice platform and forms a step-by-step practical teaching system of"basic-professional-comprehensive innovation"to help solve the problems of insufficient off-campus practice bases the separation of practical training from reality for information and computing science major.

Keywords: Information and computing science;Practical teaching system;Integration of science and technology;Interdisciplinary

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1. Professional Positioning and Characteristics of Information and Computing Science under the Background of Interdisciplinary Construction

On December 30,2020,the Academic Degrees Committee of The State Council and the Ministry of Education jointly issued the Notice on Setting up the"Interdisciplinary"Category,which proposed that a new era of higher education discipline professional system that focuses on cultivating high-level innovative,composite,and application-oriented talents,and utilizes the means of"consolidating disciplinary foundations and cultivating emerging interdisciplinary growth points",with deep interdisciplinary integration."Interdisci plinary"becomes an independent subject category.

The information and computing science is born out of computational mathematics and naturally has the characteristics of interdisciplinarity.It to cultivate versatile and high-quality scientific and technological talents who have a solid mathematical foundation,master the basic theories and professional knowledge in the field of information and computing science,have a strong computer application ability and can solve complex problems in the field of information and computing science and be able to apply the theoretical methods learned to analyze,model,solve and design cross-cutting problems in the fields of science and engineering calculation,operations research and control science and computer science.The major of information and computing science has the trend of diversified disciplinary foundations,diversified development directions,and multi-dimensional practical skills.However,with the vigorous development of computer science and artificial intelligence,the rapid development of modern computing methods and capabilities,practical teaching based on traditional theories,methods,and platforms has become difficult to meet the needs of talent cultivation.The practical teaching system is tending to evolve in the direction of integrated development of theory,technology and application.Therefore,it is urgent to carry out theoretical innovation and practical exploration on the practical teaching system of information and computing science major.

2. Current Situation and Existing Problems of Practical Teaching

Due to the limitations of professional orientation,course"credits"or"hours",student employment pressure,practical conditions and teachers,many undergraduate information and computing science majors have a"choice for left or right"problem in student training,that is,whether to pay more attention to the teaching of mathematical theory or to the training of applied ability.The former aims to consolidate students'mathematical professional foundation,emphasize theory over practice,and take the future scientific research and mathematics teaching in related fields as a starting point,which has obvious long-term effects.The latter focuses on the cultivation of students'hands-on practical ability,and is more inclined to master computer technology,so that they can quickly become competent for specific application positions,solve the employment pressure of students,and whose training effect is immediate.In view of the characteristics of multi-disciplinary integration of information and computing science major,the objective conditions such as course"credits"or"hours",practice platform and teachers restrict the training quality and long-term development of information and computing science professionals.Under the existing practical teaching mode,the means are single and lack of innovation,and there is no real integration of mathematical theory teaching and computational practice teaching,and it is impossible to achieve"two handed grasping".How to highlight the major characteristics and make it different from the traditional applied mathematics major,computer science major and the emerging artificial intelligence and data science major is an urgent problem to be solved in the process of the construction of practice teaching department.

3. A Multi-level Practical System Architecture of"Integration of Science and Engineering,Two Wings Flying Together"

In order to solve the existing problems of disconnection between theory and practice,separation of science and technology,practice in a mere formality,unclear overall planning,etc.,we should create a multi-level practical teaching model that conforms to the professional orientation and the law of personnel training,and is compatible with the curriculum system,that is,establish a solid mathematical theoretical basic experiment-a wide-caliber scientific calculation basic experiment-a professional direction practice combining teaching and research,and a personalized innovative practice system,to achieve interdisciplinary personnel training that integrates science and technology,coordinates the proportion,connects the previous to the next,connects reasonably,and operates effectively. Through the reform of practice,the adjustment of practice content and the scientific integration of practice projects,a multi-level practical teaching system of"basic theory layer,professional technology layer,comprehensive practice layer and research innovation layer"is finally constructed,which is integrated with the curriculum system and course content of information and computing science majors.The contents are shown in Table 1 below.

Table 1 Multi-level practical teaching system

level	Practice Platform	Object-oriented	Practice Content	Education Elements
Basic Theory Layer	Mathematical Theory Practice Platform	Freshman and Sophomore Students	Course Experiment	Professional Basic knowledge,Experimental Design Ability
Professional Technology Layer	Scientific Computing Practice platform	Sophomore and Junior Students	Curriculum Design	Algorithm Design and Analysis Capabilities;Hands-on Practical Ability
Comprehensive Practice Layer	Professional Comprehensive Practice Platform	Junior and Senior Students	Scientific Research Training,Skill Training,Comprehensive Practice	Ability to Analyze and Solve Problems;Hands-on Practical Ability
Research Innovation Layer	Research and Innovation Practice Platform	Junior and Senior Students	Innovation and Entrepreneurship Projects,Subject Competitions,Graduation Projects	R&D and Innovation Capabilities

The specific connotation of the teaching content of the created practice system is as follows:

3.1 The mathematical theory practice platform supported by curriculum experiment

Aiming at basic theory courses,a curriculum experiment teaching system is established to enable students to understand and master mathematical theories,models and numerical analysis methods more systematically,improve students'ability to master algorithm design and analysis techniques,and design feasible calculation methods to solve relevant mathematical models.Students can consolidate theoretical foundation and master application skills through practice.

3.2 A wide caliber scientific computing practice platform supported by curriculum design

Focusing on computational thinking training and combining computer technology for practical teaching,through various teaching

stages of course design,teachers can design practical solutions according to application requirements and use the software and hardware environment provided by the laboratory for platform construction and program design development to acquire basic skills in using mathematical methods to solve practical problems,and systematically cultivate students to use various numerical calculation software and system development tools for practice.On the basis of consolidating theoretical knowledge,emphasis is placed on systematically cultivating and training students'practical abilities and comprehensive literacy.

3.3 It is a professional practice platform that combines teaching and research and are supported by scientific research,skill training and comprehensive practice

Scientific research training,skill training and comprehensive practice are important practical links for students majoring in information and computing science to consolidate their theoretical knowledge and deepen their understanding of professional research fields.Students choose the application field they are interested in,use the Internet to search for literature,and master the research progress of the subject.Scientific and reasonable theories and methods are selected solutions and technical routes are designed and computing software are applied for the application theme,to implement solving algorithms.Furthermore,students can analyze the experimental results to propose solutions or suggestions for problem solving,and write a research report.Starting from application cases,Teachers should train students to master and apply the theories and methods of the courses they have learned throughout the entire process of practice,combine theory with practice,strengthen students'comprehensive application ability of knowledge,and at the same time,exercise their practical and innovative abilities.

3.4 A personalized innovation practice platform supported by innovative and entrepreneurial projects,professional competitions and graduation projects

Taking a hot issue of information and computing science or its intersection as the entry point,the teacher can use network resources to conduct literature search,understand the background significance and development status of the subject through reading the literature,analyze various mathematical methods to solve the problem,and make a comprehensive evaluation of them to clarify their advantages and disadvantages.According to the subject content,the teacher can choose the appropriate mathematical method or determine the direction of its improvement,or propose a new method,and write a complete research report.Through practice,students can develop their scientific research potential,cultivate their scientific research organization ability and comprehensive application of professional knowledge,exercise their abstract thinking ability,logical reasoning ability,teamwork ability and scientific research innovation consciousness,and improve their comprehensive professional quality.

4. "Double-position Science and Technology Teachers"Assist in Interdisciplinary Collaborative Education

In the training of information and computing talents,the Combination of Science and Engineering is an indispensable part in the construction of teaching staff.In order to cultivate students'ability in an all-round way,the cooperative education mode of"Double-position Science and Technology Teachers"is an effective means.Integrating resources,students are provided with two mentors who are with profound theoretical research and outstanding application skills to achieve the purpose of"thick foundation and strong application",solve the problem of disconnection between theory and practice,and effectively improve practical results.

5. Conclusion

Nowadays,with the emergence of new superior disciplines such as artificial intelligence and data science,the traditional information and computing science has been impacted to a certain extent.In the case of relatively weak teachers and unsatisfactory student quality,highlighting professional characteristics,integrating limited teaching resources,establishing a comprehensive practical teaching system for talent training,and scientifically and reasonably arranging the experimental practice teaching process along with theoretical knowledge,professional skills,and comprehensive abilities are beneficial attempts of cross-neighborhood talent training mode.

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