ISSN 2663-8169 Vol. 5, Issue 3: 97-101, DOI: 10.25236/IJNDE.2023.050319

# Exploration of talent cultivation mode of information and computing science in the context of emerging engineering education

**Qian Cao[1], Rong Li[2], Qingyun Zou[1]**

[1]*School of Mathematics and Physics, Hunan University of Arts and Science, Changde, Hunan, 415000, China*
[2]*Hunan College for Preschool Education, Changde, Hunan, 415000, China*

***Abstract:*** *As an emerging major, the major of information and computing science still has problems of vague professional orientation, disconnection between talent training and social reality, poor practical teaching effect and insufficient talents in faculty team in talent training mode. In the background of the construction of new engineering, we should clarify the professional direction, optimize the structure of the teaching staff, strengthen the practical teaching links, and actively meet the needs of local economic development, in an attempt to realize the improvement and innovation of the talent cultivation mode of the major and provide talent support for the economic development and industrial upgrading of the country.*

***Keywords:*** *emerging engineering education; information and computing science; school-enterprise cooperation; OBE*

## 1. Introduction

With the rapid development and wide application of information technology, the combination of mathematics with engineering technology, management science and humanities has become closer and closer, and has provided us with many new research topics. The major of information and computing science is a emerging typical major combining science and engineering to solve such problems [1]. In this context, most universities also scrambled to establish information and computing science majors from the end of last century to the beginning of this century. However, in recent years, with the increasing number of students majoring in information and computing science and the changing employment situation, the talent cultivation of information and computing science majors has also generated many problems, and information and computing science majors in many applied colleges and universities have low quality of talent cultivation, and the graduates have difficulty in adapting to the market demand, so that the students cannot fully adapt to the social needs after graduation. Therefore, in recent years, the talent cultivation of information and computing majors has fallen into an awkward situation, and even the information and computing science majors in many colleges and universities have started to stop enrolling, for this reason, many scholars have conducted in-depth research on the talent cultivation mode of information and computing science majors to achieve the innovative development of talent cultivation mode, so as to provide talent support for the high-quality development of society [2-6].

## 2. Current problems in the cultivating of information and computing science talents

Although the major of information and computing science has experienced a rapid development at the beginning of this century and has made certain achievements in talent cultivation, some problems are also exposed with the deepening of education, mainly in the following aspects.

(1) Ambiguous professional orientation

"*The Investigation Report on the Current Situation of Information and Computing Science Major and Related Issues of Major Construction*", issued by the Mathematics Teaching Steering Subcommittee of the Mathematics and Statistics Teaching Steering Committee of the Ministry of Education [7], pointed out that "Information and Computing Science Major is a science major under the mathematics discipline, including information science and computing science. "As far as information

ISSN 2663-8169 Vol. 5, Issue 3: 97-101, DOI: 10.25236/IJNDE.2023.050319

science is concerned, there are a lot of research contents, and together with the research contents of computational science, the connotation of the major of information and computational science seems too broad. It is this "broad" definition that causes different colleges and universities to establish information and computing science majors in a variety of ways under the influence of educational philosophy, history and practical conditions. In some application-oriented schools with weak science foundation, the talent cultivation objectives of information and computing science majors are unclear or even biased. For example, some universities make the major of information and computing science into the major of mathematics and applied mathematics, while some universities use the training goal of computer science and technology to locate the major of information and computing science. Some universities fluctuate between the two, and this deviation directly leads to the confusion of students in the learning process. The author heard students ask more than once. "Is our major math or computer science?". Due to this ambiguous positioning, students have to learn many math courses, as well as many computer courses, and students in some schools even have to learn economic management courses, which also makes students feel at a loss and lack of learning motivation. In this positioning, students in professional training seem to understand everything, but they do not have a deep understanding of everything, which makes it difficult for them to find suitable jobs in the job market. Therefore, when they enter the job market, it is difficult to find a suitable high-quality job.

(2) Disconnect between talent training and social reality

According to *"the Fudan Consensus"* [8] on the construction of emerging engineering education, local universities should play a supporting role for regional economic development and industrial transformation and upgrading.

The major of information and computing science, as a combined natural Science and engineering science major, also belongs to the category of new engineering. And it is logical that the talent cultivation of this major should also meet the social demand as much as possible and provide talent support for the development of regional economy. Therefore, for colleges and universities, it is necessary to promote the combination of professional courses of this major and the actual needs of the post, clarify the relationship between them, and on this basis, promote the unity of talent training objectives and professional teaching objectives to effectively improve students' professional ability. But from a practical point of view, on the one hand, with the intensification of economic and trade frictions between China and the United States, the western countries led by the United States have imposed a comprehensive blockade on China's high-tech fields, especially the information industry. In this context, for the need of developing independent and controllable technology, the demand for professionals engaged in information industry (including information and computing science) is increasingly urgent. In the process of talent cultivation in the major of computing and information science, many colleges and universities have not adjusted their school running concepts and talent cultivation programs according to the needs of the society in time, and they still cultivate talents according to the old methods. In the teaching process, many teachers only explain simple knowledge and rarely cite actual cases for teaching, resulting in a single teaching method for this major, and at the same time, the knowledge learned by students does not match the actual needs of society[7]. In this context, it is difficult to cultivate talents to meet the actual needs of the society and to play the role of talent support for the development of regional economy and industrial upgrading.

(3) Poor effect of practical teaching

Under the requirements of the construction of emerging engineering education and the transformation of applied colleges and universities, many colleges and universities have recognized the importance of practical teaching. The proportion of practical courses in the talent training program of information and computing science has been significantly increased, but at present, practical teaching is still weak compared with theoretical teaching, and the teaching effect is not satisfactory. First of all, some teachers and students do not pay enough attention to practical teaching. In particular, for some curriculum design practice, because the talent training program usually does not make very clear specifications and requirements, the training content is generally designated by the teachers themselves, and the performance assessment is not strictly standardized, which makes the teaching arrangement of these practical courses very random, and students have no benefit from this practical teaching. Secondly, the construction cost of the practice and training base of this major is high, so it lacks high-quality practice resources. Due to the influence of school resources, regional restrictions and students' abilities, it is difficult for students majoring in information and computing science to effectively carry out most of the internship. At the same time, the students trained by colleges and universities are all semi-finished products, and most of them are not good at hands-on skills. Therefore, most well-known information enterprises are generally unwilling to accept students for practice, which

ISSN 2663-8169 Vol. 5, Issue 3: 97-101, DOI: 10.25236/IJNDE.2023.050319

makes it difficult for students of this major to find their counterparts for internship. For this reason, many colleges and universities have no choice but to cooperate with training institutions to provide students with practice bases, but the actual practice process is often a mere formality, which can't achieve the real expected effect.

(4) Faculty deficiencies

From the current actual situation, there are still many deficiencies in the teaching staff of information and computing science in some universities, which affects the quality of talent training [9]. Firstly, information and computing science majors are mathematics majors, and most of their teachers are majored in mathematics, and there is a lack of information technology or computer teachers in the teaching team, and there is a lack of teachers who can control the whole situation, which makes it difficult to improve the quality of information and computing science talents cultivation. Secondly, there is a lack of professional instructors in internship and practical training. However, these teachers rarely participate in the development of practical projects and lack real practical ability, so only a few teachers can directly guide students to operate or develop projects in the process of practice, which makes teaching and the actual needs of society somewhat disconnected to a certain extent, resulting in students' good theoretical skills, but poor practical ability, although the development potential of students in this major is large, But when they enter the society, they need a longer period of adaptation, which also has a certain impact on their initial employment.

## 3. Countermeasures for the talent cultivation of information and computing science talents

(1) Make clear the professional direction and innovate talent cultivation mode

The current embarrassing situation of talent cultivation in information and computing science is largely due to the ambiguity of professional orientation. As a comprehensive discipline, it integrates mathematics, operational research and computer science [10], and solves engineering problems through modeling methods and existing computing technologies. Its professional orientation is not and should not be fixed, but needs to be fully integrated with the development of the times and the actual needs of society. Therefore, in order to better cultivate talents, the first thing that universities should do is to fully understand the needs of local industrial development and transformation and upgrading, and make clear the positioning of information and computing science majors by combining their own school conditions and faculty strength. For example, some research universities have strong scientific research strength, and a large proportion of students in these schools will be engaged in scientific research, so their professional direction can be towards computational mathematics, can be close to computational mathematics, so that students can deeply learn the relevant knowledge of scientific computing and the general method of mathematical modeling. The students cultivated by some applied universities may engage in application work, mainly serving local economic and social development. Its professional orientation needs to combine local social needs and humanistic characteristics, and pay attention to the professional characteristics of information and computing science to avoid confusion with software engineering. In general, compared with software engineering students, information and computing science students have deep mathematical background and mathematical modeling ability, their hands-on ability may not be as good as that of software engineering students, but they have inherent advantages in algorithm analysis, Therefore, when formulating talent training programs, these colleges and universities should start from this aspect. Under the framework of the "*National Standards for the Teaching Quality of Undergraduate Majors in General Colleges and Universities*", they should reasonably set up professional courses and practice links, innovate talent training models, and cultivate special talents with characteristics in information and computing.

(2) Optimize the structure of the faculty

Due to the short history of the establishment of the information and computing science major, the teachers of this major in some colleges and universities are mainly composed of mathematics teachers or other technical teachers, which makes it difficult for the specialty to reflect its professional characteristics in the talent training process [11]. Therefore, colleges and universities need to strengthen the construction of faculty members and make them form a reasonable structure. First of all, universities need to hire more excellent teachers to improve the comprehensive quality of the teaching team. On the one hand, they should Actively employ of young masters and PhDs in information and computer to optimize the structure of the teaching team. On the other hand, in the process of talent cultivation, colleges and universities can also appropriately introduce excellent personnel from enterprises and let them participate in the teaching process of certain courses with strong application, so

ISSN 2663-8169 Vol. 5, Issue 3: 97-101, DOI: 10.25236/IJNDE.2023.050319

as to make up for the shortcomings of college teachers' little project participation and poor hands-on ability. Especially for some internship practice courses, let the elites from enterprises and college teachers jointly guide, which will greatly improve the teaching effect of this kind of courses. Secondly, colleges and universities need to strengthen the training of existing teachers. On the one hand, they can let teachers participate in all kinds of training to improve the comprehensive ability of teachers in information and computing science, so as to improve the comprehensive level of teachers' team. On the other hand, universities can also send teachers who are good at project development to enterprises, let them work part-time in enterprises, participate in enterprise projects, and jointly develop scientific research projects, so as to cultivate more " dual qualified teachers" teachers. This will improve the professional level and strengthen the practical ability of the teachers of information and computing science major, and finally form a teaching team that can effectively improve the quality of talent cultivation.

(3) School-enterprise cooperation to strengthen practical teaching links

Because colleges and universities are limited by their own conditions, practical teaching has become a weak link in talent cultivation. Therefore, based on the original talent cultivation mode, Colleges and universities should make full use of the high-quality resources of enterprises, participate in the actual project of enterprises, and realize the seamless connection between professional settings and enterprise posts. Firstly, strengthen the teaching concept of application development ability training, invite enterprises to participate in the whole process of professional cultivation program development, jointly adjust the curriculum, optimize the syllabus, set up scientific, practical and complete training programs, and strictly organize the implementation. Secondly, in the teaching process, in accordance with the principles of accuracy, timeliness and authenticity, implement the curriculum teaching system of "combining theory and practice", encourage students to participate in the project development of enterprises to be familiar with the project process and required knowledge reserves of enterprises, which can help students better connect with the society and improve the quality of talent cultivation. Finally, colleges and universities need to strengthen the investment and construction of professional training laboratories and practice training bases to provide more professional practice places for students, so as to improve their practical ability. At the same time, colleges and universities should also formulate the evaluation system of students' practical training, so as to ensure that the role of practical training can be given full play.

(4) Take the cultivation outcomes as the guide and actively meet the needs of local economic development

In order to run the major of information and computing science well and get out of the current predicament, colleges and universities must first have extensive contact with the society, master the cutting-edge information, theory and practice of production, economy and science and technology, and understand the requirements of the society for the structure of talents, knowledge and skills. At the same time, we should also find out what kind of knowledge, ability and quality structure of information talents are needed for local economic construction and social development. With Outcome based education (OBE)[12-13] as the guide, we should adjust the professional direction, reasonably set the curriculum system, and actively promote the updating of teaching contents, so that students and teachers can change their learning and teaching modes in a targeted manner, grow faster to integrate into the market economy, and achieve a seamless connection with the regional economy, based on local characteristics and unique resources. Based on the local characteristics and unique school resources, colleges and universities can reflect the special needs of the economic and social development of the region for talents in the aspects of specialty setting, training objectives and training norms, as well as the cultivation of students' entrepreneurial ability, employability and learning ability, and develop their own characteristics, so as to effectively cultivate practical talents for the local, promote the deep integration of local universities and local economy, provide talent support for local economic construction and industrial upgrading, and help regional economic development.

## 4. Conclusions

Under the background of the construction of the emerging engineering education, through in-depth research on the talent cultivation mode of the information and computing science major, this paper finds and solves the existing problems, and strives to achieve the improvement and innovation of the talent cultivation mode of the major, so as to cultivate more professionals in information and computing science that meets the needs of the society and provide more talent support and motivation

ISSN 2663-8169 Vol. 5, Issue 3: 97-101, DOI: 10.25236/IJNDE.2023.050319

for China's development.

**Acknowledgement**

Fund Project: Supported by the 2021 Education Reform Foundation of Hunan University of Arts and Science (Nos. JGYB2127).

**References**

*[1] Sub-Committee of Teaching Guidance Committee of Mathematics and Statistics, Ministry of Education. Teaching specification of information and computing science [J]. University Mathematics, 2003, 19(1): 6-10. (In Chinese)*
*[2] Yongqin Xie, Guixiang Qin, Daqing Lu, et al. The reform of curriculum system of information and computing science majors [J]. Mathematical Theory and Applications, 2003, 23(4): 9-11. (In Chinese)*
*[3] Jiaohuang Luo. Construction and research on the curriculum system of information and computing science majors based on school-enterprise cooperation [J]. Journal of Daqing Normal College, 2018, (38): 3: 139-141. (In Chinese)*
*[4] Cunyun Nie, Xiaoling Chen, Jianxin Cao, et al. A little discussion on the construction of practical teaching curriculum system for information and computing science majors [J]. University Mathematics, 2016, 32(6): 40-45. (In Chinese)*
*[5] Fenghua Liu, Youhui Su. Research on the curriculum system of information and computing science majors for big data [J]. Science and Technology Innovation Herald, 2016, 13(24): 131-133. (In Chinese)*
*[6] Yan Hu, Qingguo Zhang. Exploring the training mode of socially applicable talents in information and computing science [J]. University Mathematics, 2011 (3): 7-11. (In Chinese)*
*[7] Teaching Steering Committee of Mathematics and Statistics, Ministry of Education. Investigation Report on the Current Situation of Information and Computational Science and Problems Related to Professional Construction [J]. University Mathematics, 2003, 19(1): 1-5. (In Chinese)*
*[8] Anonymous. The consensus of Fudan on the construction of "new engineering" [J]. Higher Engineering Education Research, 2017(1): 2. (In Chinese)*
*[9] Lihua Yang. Exploring the training mode of information and computing science majors [J]. Science and Technology Information, 2011(36): 2. (In Chinese)*
*[10] Shili Xuan, Maosheng Zhang, Guodong Ma, et al. Exploration on the reform of experimental teaching in information and computing science under the mode of training applied talents [J]. China Management Information Technology, 2019, 22(4): 222-223. (In Chinese)*
*[11] Liping Jia. Research on the influence of the "two lines and three combinations" model on the "double creation" ability of information and computing science students [J]. Neijiang Science and Technology, 2021, (4):109-110. (In Chinese)*
*[12] Spady W G. Outcome-based education: critical issues and answers [M]. Arlington: American Association of School Administrators, 1994: 1-10.*
*[13] Willis S, B Kissane. Systemic approaches to articulating andmonitoring student outcomes: are they consistent outcome-based education [J]. Studies in Educational Evaluation, 1997, 23(1): 5-30.*