Reform and Practice of Teaching Mode of Programming Courses in Applied Colleges and Universities under the Background of New Engineering Science

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Abstract. Under the background of new engineering, various industries have put forward higher requirements for applied talents, but the current single mode of training for engineering majors, the concept of training is not new, and the training mechanism is solidified, which is difficult to adapt to the development of the new era. This paper takes Xinjiang Polytechnic Institute as a carrier, explores the teaching of programming courses in applied undergraduate colleges and universities, and focuses on the four core objectives of students' knowledge acquisition, engineering application, quality enhancement, and high-quality employment, and first analyzes the limitations and shortcomings of the existing teaching mode of programming courses, and then proposes a three-step progression of teaching mode, which starts from "solid foundation-basic application-comprehensive empowerment" and ends with "solid foundation-basic application-comprehensive empowerment". After analyzing the limitations and deficiencies of the existing teaching mode of programming courses, we proposed a three-step progressive teaching mode from "Compact Foundation - Basic Application - Comprehensive Empowerment", integrating subject competitions and "1+X" training into classroom teaching with the help of enterprise resources, and at the same time, we set up "Special Class" by co-running the school with enterprises. Since the implementation of this model, outstanding results have been achieved in the teaching of programming courses, which can be used as a reference for relevant courses in applied universities.

Keywords: new engineering; applied colleges and universities; programming class; teaching mode.

1 Introduction

In February and April 2017, the Ministry of Education of the People's Republic of China held seminars at Fudan University and Tianjin University, forming the "Fudan

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Consensus" and "Tianda Action"[1-2] for the construction of new engineering disciplines, and the "Hunan-Zhejiang Initiative" was put forward in May and June at Hunan University of Engineering and Wenzhou University. In May and June, Hunan University of Engineering and Wenzhou University put forward the "Hunan-Zhejiang Initiative", and on June 9, the Ministry of Education formed the "Beijing Guidelines" for the construction of new engineering disciplines in Beijing[3] , and from then on, the construction of new engineering disciplines formally entered into the vision of the colleges and universities.

Especially the construction and development of local applied colleges and universities have an important supporting role for regional economic development and industrial transformation and upgrading. In order to meet the needs of the new era, local applied colleges and universities need to aim at cultivating engineering talents with innovative spirit, practical ability and comprehensive quality, promoting the close integration of engineering education and industrial development, and facilitating scientific and technological innovation and economic development. It also emphasizes interdisciplinary and cross-field integration, focuses on the cross-fertilization of engineering education with humanities, social sciences, natural sciences and other disciplines, and cultivates engineering talents with global vision and international competitiveness[4-5] . This puts forward new requirements for the development of higher engineering education in the context of the new era, and also puts forward new challenges for the cultivation of engineering talents in local applied colleges and universities.

As one of the important courses in the field of IT information technology in the construction of new engineering discipline, Universities and colleges in China have opened programming courses, such courses are both an important part of modern higher education and an important way to train computer professionals, which is a course that directly teaches computer programming skills, and is designed to help students to improve their ability to think logically, analyze problems and program to solve practical engineering problems, as well as to It aims to help students improve their ability of logical thinking, analyzing problems and programming to solve practical engineering problems, and at the same time to cultivate their innovative spirit and teamwork ability. However, programming courses have the characteristics of fast update and iteration, strong practicability, strong enterprise dominance, etc., which leads to the teaching of programming courses in local applied colleges and universities to be in the primary stage for a long time, and there is no system connecting with enterprises, resulting in the direct result that the employment rate is low and the quality is not high, and it is difficult to cultivate talents to meet the needs of high-quality applied talents in the new era. This paper explores the reform and practice of the teaching mode of program design courses with Xinjiang Polytechnic Institute's computer talent training as the carrier, which has achieved outstanding results since the implementation of the mode, in order to provide reference for the relevant specialties of applied colleges and universities both inside and outside the country.

Among many foreign studies, for example, Kathy A. Mills et al. proposed that the complexity of program comprehension and new technologies have a great potential to be applied in exploring students' learning strategies, combining eye tracking and audible thinking techniques to analyze the differences in self-regulated learning strategies

during program comprehension between high-performing and under-performing students in a programming course. The results showed that high level students used more higher order cognitive skills while low level students relied on basic strategies [6].Siu Cheung Kong et al. proposed the use of student-centered nuances in school scenarios and advocated the adoption of strategic approaches such as active, interactive, constructive, and reflective learning to maximize student achievement in computational thinking education [7]. Mills, K. A et al. similarly suggested the critical role of computational thinking in education and teaching [8].

2 Characteristics and Deficiencies of Existing Programming Classes Taught in the Curriculum

Programming courses, as a core course for computing majors, or even engineering majors, are offered in major applied colleges and universities, and there are still some significant features and deficiencies in the teaching process, especially in the context of the new engineering discipline, which requires graduates to show their skills in a large environment, the features and deficiencies of the teaching of the existing programming courses are particularly prominent, As shown in Figure 1.

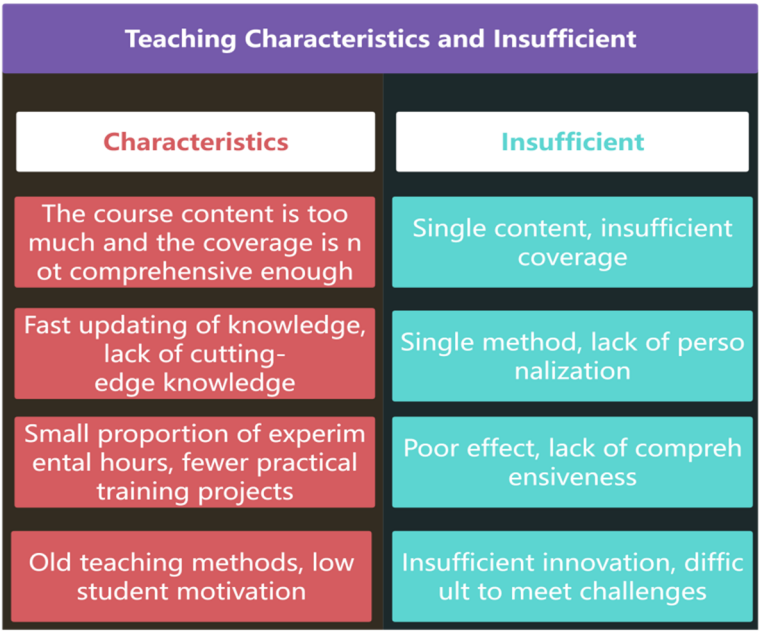

Fig. 1. Characteristics and shortcomings of the existing programming courses taught

2.1 Teaching Characteristics

2.1.1 The Course Content is Large and the Knowledge System is Not Perfect.

Programming courses, as the basic core courses of computer science majors, have a very important position in the training of computer science majors. The core of computer majors is computer science and technology, and programming is the foundation and core of computer science and technology. Programming courses are the basic courses that computer majors must learn, they provide students with the basic knowledge and skills of computer programming, including programming languages, algorithms, data structures and so on, and they are also the precursor courses of operating systems, network programming, database design, artificial intelligence and other courses. The progress, rationality and coverage of the arrangement of programming courses to a certain extent determine the future development and prospects of computer professionals. Although some of the knowledge has been covered in the talent training program, with the development of science and technology, the knowledge update iteration, when the development of talent training program, the knowledge system is not perfect.

2.1.2 Shallow Integration of Engineering and Learning, Poor Effect of Experimental Teaching.

The cultivation of engineering talents in the new era requires solid engineering practice ability, while the proportion of experimental hours in the syllabus of programming courses is low, and there is little in-class practical training and little opportunity for project practical training. One of the important reasons is that the combination of school and enterprise is not enough, and the understanding of social demand is not in place. In the actual teaching process, many applied colleges and universities stay in the purely classroom-based way of imparting knowledge, or the way of imparting knowledge for the sake of knowledge transfer, without going deep into the enterprise to do sufficient research, and are not clear about what the enterprise needs. Long-term use of traditional teaching mode, making students less motivated, forced to learn boring theoretical knowledge, and more importantly, ignoring the new engineering science on the latest higher requirements of engineering talent[9].

2.1.3 Rapid Development and High Level of Teacher Requirements.

As programming technology continues to evolve, so does the level of sophistication required of teachers. Teachers need to constantly learn new programming languages, frameworks and tools so that they can teach the latest programming knowledge and skills. In addition, teachers need to have good teaching and communication skills to be able to effectively impart knowledge and stimulate students' interest and motivation. At the same time, teachers also need to be creative and able to design interesting and practical programming projects to help students improve their programming skills and solve practical problems. In conclusion, with the continuous development of programming technology, teachers need to continuously improve their professionalism and teaching ability in order to better serve students and society.

2.2 Deficiencies

2.2.1 Teaching Content is Homogenous and Insufficiently Covered.

The content of the teaching of programming courses in applied undergraduate colleges and universities is relatively stable, lacking in cutting-edge and innovation, and unable to meet the students' needs for new technology and new knowledge. The traditional teaching content of programming courses mainly includes knowledge of syntax, data structure, algorithms and so on. Although this knowledge is the foundation of computer programming, it is not sufficient in actual engineering practice. Specific engineering practice, you also need to master the knowledge of software engineering, project management, teamwork and other aspects, mainly in the following areas[10].

(1) Lack of practical application scenarios. Programming courses often focus only on the basic knowledge of programming languages and algorithms, ignoring the explanation and practice of practical application scenarios. This single teaching content is difficult for students to truly understand the application and meaning of programming technology.

(2) Lack of diverse programming languages. The teaching of programming courses often focuses only on one programming language and neglects the learning of other programming languages. For example, students in the direction of software development may only learn the Java language system, but for students who want to engage in graphic image processing research are more inclined to learn Python language. This single teaching content is difficult to meet the learning needs of different students and the needs of the job market.

(3) Lack of cutting-edge technology explanation. The teaching of programming courses often focuses only on traditional programming techniques, without integrating novel technical elements into the teaching, away from the industry applications, ignoring the explanation and practice of cutting-edge technologies. This single teaching content is difficult to cultivate students' innovation and adaptability.

2.2.2 Teaching Methods are Single and Lack Personalization.

The traditional teaching method of program design courses is mainly based on lectures and supplemented by practice. The disadvantage of this teaching method is that students lack practical experience and cannot apply theoretical knowledge to actual engineering practice. Some applied undergraduate colleges and universities focus on standardization and normalization of programming courses teaching, lack of personalization and differentiation, can not meet the learning needs of different students, mainly reflected in the following aspects[13].

(1) Emphasize theoretical knowledge and neglect practical operation. Programming courses often focus on theoretical knowledge such as programming language syntax, data structures, algorithms, etc., while ignoring the actual operation and practical exercises. This single teaching method easily leads to a lack of practical experience, and it is difficult for students to cope with actual programming problems.

(2) Lack of project practice. Programming courses often lack project practice, students just complete some simple programming exercises in the classroom, it is difficult

to truly master programming skills. Lack of project practice is also difficult to cultivate students' innovation and problem-solving ability.

(3) Lack of individualized instruction. Programming courses are often taught using a standardized teaching method, ignoring the individual needs and differences of students. This single teaching method is difficult to meet the learning needs of different students, and it is also difficult to stimulate students' learning interest and motivation.

2.2.3 Poor Teaching and Lack of Comprehensiveness.

After researching many western local applied colleges and universities still maintain the traditional teaching mode of programming courses, which only focuses on the application of technology and tools, and lacks the comprehensive understanding and thinking of computer programming.

(1) New Engineering focuses on cultivating students' comprehensive abilities. Students are required to not only have programming ability, but also need to have better ability in computer system structure, computer network, distributed system, operating system, network programming and other courses, but also have the ability to manage the cloud platform, software development, design and operation and maintenance ability, as well as the quality of big data analysis and other comprehensive vocational ability, in order to satisfy the current social needs of programming talents[11] . However, the current programming courses do not have a complete knowledge system for the cultivation of these abilities, and the cultivated talents cannot reach the goal of the new engineering discipline.

(2) Shallow integration of disciplines and insufficient application. Programming courses often only focus on the training of programming skills, ignoring the organic integration with other disciplines. In addition, by the geographical impact, many western colleges and universities, educational resources, applied colleges and universities of the resources are not up to the "application" requirements, resulting in comprehensive training can not be effective landing, so that the learning effect of the students greatly discounted, the quality of teaching can not be guaranteed.

2.2.4 Insufficient Innovation Capacity to Meet New Challenges.

Programming courses, as the foundation of software research and development, is the necessary skills of researchers and developers, and is one of the important factors in promoting the development of China's software industry, but at present China's software industry is still subject to a lot of European and American constraints on the "neck" technical problems. Since 2019, the United States has sanctioned nearly 20 first-class colleges and universities in China with the help of the well-known industrial software MATLAB, including the "Seven Sons of National Defense" and the "Two Electricity and One Postal Service". Through these means, the United States is to impede our first-class colleges and universities in aviation, aerospace, navigation, automotive, nuclear industry, robotics and other high-end scientific research in the field of research, stuck in the neck of China's high-end technology research and development. At the time of crisis, Beijing Shiguan Jinyang Technology Development Co., Ltd. provided its self-developed GCKontrol system simulation software to these colleges and universities,

replacing the functions of MATLAB/Simulink, which solved the software crisis in the short term. Therefore, China wants to completely break through the current situation of the neck need to fundamentally master the key core technology, walk in the international forefront position, which requires universities to vigorously Developing excellence in computer software[12] .

3 Constructing a New Teaching Model for Programming Courses in Applied Colleges and Universities under the Background of New Engineering Sciences

In order to solve the deficiencies and dilemmas of the traditional teaching mode of programming courses, as well as combining the characteristics of programming courses and the talent cultivation orientation of applied colleges and universities, the joint enterprise school will introduce subject competitions and vocational skills tests into schools and integrate them into the classroom.[13-14] , set up "special classes", and build internship bases, so as to achieve the goal from "solid foundation - basic application - comprehensive empowerment" to a three-stage progressive teaching. The three-phase progressive teaching of "solid foundation - basic application - comprehensive empowerment" has become one of the ways to teach programming courses[15] ,See figure 2 for details. Programming courses themselves have strong engineering practice attributes, and many applied colleges and universities do not have sufficient hardware and software resources and few dual-teacher teachers, while large enterprises have abundant hardware and software resources and a large number of high-level skilled engineers with rich experience in engineering practice. Xinjiang Institute of Technology has benefited from the introduction of famous enterprises such as Huawei Technologies Co., Ltd, Xinhua San Technology Co., Ltd, Sichuan Minghoutian Information Technology Co., Ltd, Guoxin Bluebridge Education Technology Co., Ltd, Guangdong Teddy Intelligent Technology Co., Ltd. in the process of construction of industrial colleges, and has established Huawei ICT College, "Competition Characteristic Classes Ltd. and established Huawei ICT Academy, "Competition Class" and "1+X" vocational skills training course with them, as well as set up Touge Practice Teaching Platform jointly with Wisers Education and Technology Group Limited, which makes the traditional offline experimental teaching turn into a combination of online and offline teaching, which can be accessed by the cloud anytime, anywhere and supports personalized and customized experiments, thus meeting the requirements of more students and better serving the new engineering discipline. It meets the requirements of more students and better serves the cultivation of applied talents in new engineering disciplines.

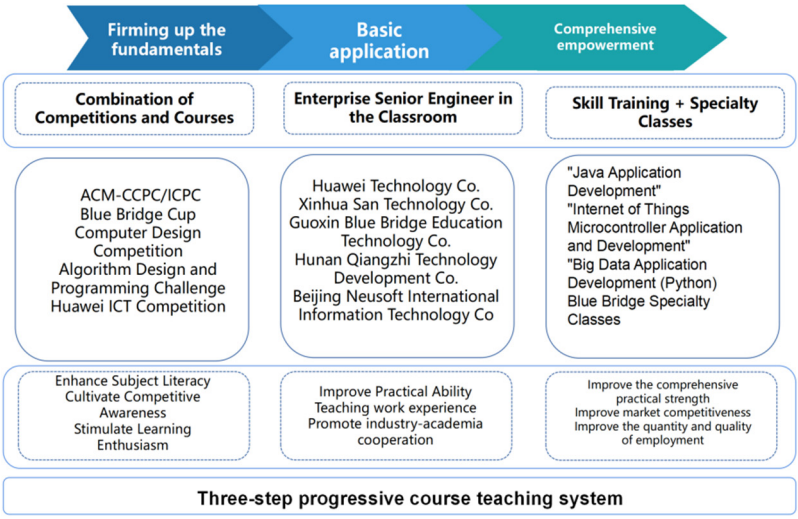

Fig. 2. Teaching model for programming courses

3.1 Three-stage Progressive Curriculum Teaching System of "Solid Foundation, Basic Application and Comprehensive Empowerment"

3.1.1 Combine the Competition with the Course Content to Consolidate the Teaching Foundation.

At the 58th-59th China Higher Education Expo held on April 8, 2023, the National Research Society of Computer Education in Colleges and Universities, the National Virtual Teaching and Research Office of Teachers' Teaching Development Research and the Expert Working Group of the Research Report jointly released the Research Report on the National Competition of Computer Classes for College Students in Ordinary Colleges and Universities, which is the first time that the research report on the computer classes competition for college students at the national level has been released. The release of this report illustrates the importance of integrating disciplinary competitions with curriculum content in the cultivation of computer talents.

Subject competition is a kind of test of students' subject knowledge and skills, through which students can be prompted to learn and master subject knowledge in depth, improve subject literacy, and more importantly, cultivate students' competitive awareness and innovation ability, and stimulate students' enthusiasm and motivation for learning[13-14] . Xinjiang Polytechnic Institute has incorporated computer-related disciplinary competitions, such as ACM-CCPC/ICPC, Blue Bridge Cup Competition, Challenge Cup, Computer Design Competition and other disciplinary competitions into its daily teaching, and has also included the performance of the competitions as one of the assessment standards for the quality of talent training. Through the integration of the contents of discipline competitions, students' basic knowledge is effectively consolidated, and at the same time, students' thinking and expression skills are practiced, so

that students have the opportunity to show their talents and abilities, and improve their self-confidence and self-esteem.

3.1.2 Enterprise Engineers in the Classroom to Solve the Problem of Insufficient Engineering Practice Ability of Teachers.

In the past two years, we have negotiated with Huawei Technology Co., Ltd, Xinhua San Technology Co., Ltd, Guoxin Blue Bridge Education Technology Co., Ltd, and Hunan Strong Intelligence Science and Technology Development Co., Ltd. on the process cultivation and employment of students, and we have successively employed a total of 7 senior engineers from enterprises to teach students, which effectively improved the situation of teachers' insufficient experience in enterprises. It also cooperates with teachers to jointly develop courses and teaching materials, which builds a teaching platform for sharing resources and complementing the advantages of schools and enterprises to meet the needs of enterprises, schools and students, and completely breaks the situation of rapid development and difficult to support the level of teachers.

3.1.3 Introducing "1+X" Skills Training to Meet Students' Individual Needs.

In order to adapt to the demand for programming talents in the development of new engineering disciplines, Xinjiang Polytechnic Institute insists on taking high-quality employment as the guidance, so that students can adapt to the needs of social development in advance, and at present, with the help of enterprise resources, provides vocational skills training for computer science majors, such as "Java application development", "Internet of Things microcontroller application and development", "big data application development (Python)" and so on. At present, with the help of enterprise resources, we provide vocational skills training for computer science majors, such as "Java application development", "Internet of Things microcontroller application and development" and "big data application development (Python)". Through this teaching mode of combining actual engineering practice with teaching, students can learn knowledge in actual engineering practice and improve their comprehensive practical ability. At the same time, the "1+X" skills training can also improve the match between the talents cultivated by universities and the needs of the society, so that the students can better adapt to the needs of the society.

3.1.4 Establishment of "Blue Bridge Specialty Classes" to Improve Students' Comprehensive innovation Ability.

Combined with Guilin University of Electronic Science and Technology, Guilin University of Science and Technology, Guangxi Normal University, Shanxi University, Huanggang Normal College, Sichuan College of Literature and Science, Shihezi University and other successful cases inside and outside of Xinjiang. Xinjiang Polytechnic Institute of Computer Science and Technology and Guoxin Blue Bridge Education Technology Co., Ltd. to create "Blue Bridge special class", part of the theoretical and practical courses taught by the company's technical staff, the real knowledge of the subject competitions, comprehensive projects into the classroom teaching, cultivate students' comprehensive and innovative capabilities to achieve the reform of the applied

colleges and universities Programming courses teaching mode, promote students' employment, improve the quality of employment, improve the employment environment.

3.2 Course Assessment Mechanism

In the context of the new engineering discipline, programming talents are required to have the ability to apply engineering science and systematic thinking, and be able to skillfully use relevant tools, techniques and theories to solve engineering problems. Therefore, as a classic engineering education course in applied colleges and universities, programming courses must formally return to "engineering", and change the traditional teaching mode purely based on knowledge transfer into a practical combination of methods, so that students can obtain practical experience in the enterprise and the ability to solve complex engineering problems, and change the situation of high demand of enterprises and difficult employment for graduates to a certain extent. The situation of large enterprise demand and difficult employment of graduates[12]. In order to achieve the purpose of the above reform and to ensure the quality of teaching, the programming courses canceled the traditional paper-based examination as the assessment standard, and adopted a combination of large-scale assignments and on-line examination assessment, including large-scale assignments including algorithm design improvement and design, large-scale system design, and the on-line examination is based on the development of programming.

One of the reasons for choosing small algorithm design as part of the big assignment is that algorithm is a core content in computer science, which can help us solve engineering problems efficiently and optimize the use of resources, and a good algorithm is one that can promote the continuous development and progress of computer technology. More importantly, it helps to cultivate students' ability to think about problems and their sense of innovation. For example, students are required to read the classic algorithms of image segmentation, so that they can understand the basic principles of segmentation, and then let them improve or design new algorithms appropriately according to their personal mastery, so as to stimulate the thinking of the future development trend of image and video processing technology, and to enhance the interest in the study of image processing technology. In addition, the system design module is added in the stage examination, so that the interested students can study the software development technology and pave the way for graduation into the software industry.

The traditional paper-based examination is difficult to avoid human errors in grading, increases the difficulty of marking, and is difficult to prevent cheating, and cannot objectively respond to the level of students. As an alternative to the paper-based examination, the on-line examination avoids the shortcomings of the traditional examination, and is also in line with the concept of cultivating innovative and excellent engineering talents under the perspective of the new engineering discipline.

4 Effectiveness of Teaching Reform

Since 2019, Xinjiang Polytechnic Institute has continued to reform the programming courses for computer science majors, insisting on the mode of "solid foundation - basic application - comprehensive empowerment" to cultivate application-oriented talents for engineering majors in the new era. During the past four years, we have received strong support from Huawei Technologies, Xinhua San Technologies, Guoxin Bluebridge Education Technology Company Limited, Hunan Strong Intelligence Technology Development Company Limited, Wisers Education Technology Group Company Limited, and other famous enterprises and the three major carriers in Xinjiang. Since the implementation of this model, a total of 9 enterprises and 16 senior engineers have participated in the teaching of programming courses through the combination of online and offline, covering more than 1430 students so far. Obvious results have been achieved in the following aspects.

4.1 High Participation in Subject Competitions and Increase in the Number of Students Winning Prizes

Subject competition as an effective way to improve students' subject literacy and comprehensive ability, participation can promote students' interest in learning and enthusiasm for the subject, stimulate students' learning motivation and innovative thinking. More than that, it is a platform to show students' talents and achievements, and winning awards can motivate students to study harder and explore. Participation in subject competitions requires students to have a certain subject foundation and comprehensive quality, so increased participation also means that students' subject level and comprehensive ability have been improved, and winning awards is a direct reflection of the overall teaching level. Typical examples include Songxian Zeng, who won the first prize in the 11th Blue Bridge Cup National Finals and shared his experience as a national representative on Beili Beili, and the competition team led by Prof. Jiya Tian, who won the silver medal in the Asian region in the ACM-ICPC competition in 2021-2022. In the last three years in computer-based competitions, only four majors of computer, software engineering, intelligent science and digital media technology students won a total of 455 awards at the provincial and ministerial levels and above, of which 95 were in 2020, 149 in 2021, and 211 in 2022, of which a total of 94 awards were at the national level, which accounted for 20.66% of the total number of awards, As shown in tables 1 and 2. As a whole the participation in competitions and the rate of awards are increasing year by year.

Table 1. Statistics of awards in computer science competitions, 2020-2022

	Number of participants	Number of winners in provincial competitions	Number of winners of the National Competition
ACM-CCPC/ICPC	15	3	0
	62	15	5
	93	13	6
Blue Bridge Cup	156	53	11
	176	69	8
	253	102	14
Computer Design Competition	86	24	4
	88	26	3
	104	39	6
National Algorithm Design and Programming Challenge for College Students	0	-	0
	98	-	15
	156	-	22
(grand) total	1287	344	94

Table 2. Huawei ICT Practice Competition Award Statistics, 2021-2022

	Number of participants	Number of people promoted	Number of finalists
Huawei ICT Practice Competition	26	8	0
	38	9	0
(grand) total	64	17	0

4.2 Through "1+X" Skills Training, Students Have a Firm Grasp of Classroom Knowledge and Basic Engineering Applications.

In the past three years, the school has cooperated with Beijing Sinosoft International Information Technology Co., Ltd, Guoxin Blue Bridge Education Technology Co. Ltd. provided vocational skills training for computer science majors in the three directions of "Java Application Development", "Internet of Things Microcontroller Application and Development" and "Big Data Application Development (Python)". Sixty-three, 31, and 68 students received certificates of skills in the corresponding directions, respectively. Through the "Java Application Development" students have basically mastered the Java language fundamentals, object-oriented programming, database programming, Web development, commonly used frameworks and tools: master Spring, Hibernate and other commonly used frameworks and Eclipse, IntelliJ IDEA and other knowledge. Through the "Internet of Things microcontroller applications and development" students have understood the fundamentals of microcontroller, embedded systems development process and debugging skills, master the types of sensors, principles, applications, and communication technology. Through the training of "Big Data Application

Development (Python)", students have basically mastered the fundamentals of Python language, the basic concepts of data processing and analysis, data cleaning, data visualization, Hadoop, Spark and other big data frameworks, and through the development of actual projects, they have mastered the practical skills of big data application development. Practical skills of application development.

4.3 High Quality and Quantity of Employment and Good Feedback from The Community in Specialized Classes

Xinjiang Polytechnic Institute of Information Engineering and Guoxin Blue Bridge Education Technology Co., Ltd. to carry out cooperation in 2019, and in 2020 the establishment of the "special class", the establishment of this class is the college and the third-party institutions to run a bold attempt to run a school of joint training, three years to train a total of 120 students, in addition to the 16 students in graduate school, the employment rate of 100%, and into the State Grid and other well-known enterprises such as the three major carriers up to more than 20 students. The employment rate is 100%, and the number of students who entered the national power grid, the three major carriers and other well-known enterprises is as high as more than 20 people. Per capita salary up to 6,000 yuan or more, part of the southern border enterprises wages up to 10,000 yuan. The results are remarkable, not only enhance the technical ability of the students, but also effectively improve the quality of employment of the college students, and actively contribute to the school-enterprise cooperation, greatly expanding the job market, after communicating with the employers, all of them fully affirmed the school's students majoring in computer science.

4.4 Jointly Build Online Courses with Enterprises and Establish Online Platforms

In order to make full use of the credit hours and solve the shortage of classroom credit hours, the school has cooperated with Wisdom Tree platform to build a C programming online course, and the number of students listening to the course now reaches more than 1,800, of which 1,380 are on-campus and more than 400 are off-campus, with a good overall operation effect. This mode provides a more convenient way of learning for students of the school, and at the same time promotes the exchanges and cooperation between the school and the enterprises and the sister colleges and universities. In addition, we cooperated with Wisers Education Technology Group Limited in 2022 to deploy the Headsong online practice platform to the official website of the School of Information Engineering, which can be used by all the students of the school to practice the programming courses online, and this way solves the problem of insufficient hardware resources in the school and provides a more efficient management method. In conclusion, the online course and online platform not only improve the brand awareness of the company, but more importantly, improve the influence of the school.

4.5 Teachers' Practical Ability Has Been Improved, Laying the Foundation for Subsequent Talent Training

In the past three years, through a series of reform measures such as combining the contents of discipline competition with the knowledge of teaching materials, senior engineers from enterprises entering the classroom, "1+X" skill training and special class, we have improved the practical ability of programming talents under the perspective of new engineering discipline, and also improved the engineering practice ability of teachers, which has played a certain role in boosting the construction and development of applied colleges and universities. certain boosting effect, laying a foundation for subsequent talent cultivation.

5 Conclusion

With the arrival of the new round of technological revolution, the teaching mode of programming courses in applied colleges and universities needs to be constantly explored and reformed in order to adapt to the new challenges facing higher engineering education in the new era.

This paper takes Xinjiang Polytechnic Institute as a carrier, after analyzing the characteristics and shortcomings of the teaching of existing programming courses, based on the effectiveness of the existing reform, puts forward a new model suitable for the teaching of programming courses in applied colleges and universities, which mainly focuses on the measures of discipline competition-driven teaching, enterprise engineers in the classroom, skills training and special classes to improve the students' practical engineering ability, increase the employment rate, and enhance the degree of the college cultivated The degree of talent and social demand, so that students can better adapt to the needs of society. At the same time, we need to recognize that the teaching reform of programming courses is affected by social progress, industry development, geographical differences and other factors, and still needs to be explored and reformed by other applied colleges and universities, in order to meet the needs of talent cultivation.

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