Teaching Reform of Computer Public Basic Courses in Colleges and Universities in the New Era

Pingshui Wang, Zecheng Wang, and Qinjuan Ma

Abstract—Computer public basic courses are a series of required courses for the non-computer specialized university students. It aims to cultivate students' comprehensive application ability of computer basic knowledge and operation skills, and improve students' information literacy. With the development of the new generation of information technology, such as Internet, cloud computing, big data and artificial intelligence (AI), the teaching of computer public basic courses should keep up with the pace of the times to adapt to the new development strategy. Therefore, we actively explore the educational reform of computer public basic courses, update teaching contents and ideas to meet the practical requirements of students in the new era.

Index Terms—New era, computer public basic course, teaching reform, colleges and universities.

I. INTRODUCTION

The development strategy of the colleges and universities in the new era focuses on deeply integrating the new generation information technology with economy, society, education and teaching, which puts forward new requirements for discipline and specialty construction, personnel training and so on. It is the only way to build a high-level teaching and research-oriented university in the new era [1], [2].

Let's speed up professional reform, optimize and improve the personnel training mode, accelerate the reform of curriculum construction, enrich educational and teaching resources, grasp the new opportunities, embrace the new era, and start a new journey of teaching reform of computer public basic courses.

With the development of new information technology such as Internet, cloud computing, big data and artificial intelligence, the teaching of computer public basic courses should keep pace with the development of the times and adapt to the new development strategy [3]. To this end, we actively explore the teaching reform of computer public basic courses, update the teaching content and teaching mode, and strive to make computer public basic courses a strong support

for the new development strategy of higher education.

II. PROBLEMS IN THE TRADITIONAL TEACHING MODEL OF COMPUTER PUBLIC BASIC COURSES

A. The Specialty of Teaching Content Is not Well-Targeted

At present, the computer public basic course is offered uniformly for all students. It uses the same textbook, syllabus, teaching plan, question base and examination standard, which results in great differences in the learning enthusiasm and learning effect of students of different majors. The distribution of examination results is unbalanced among different majors, and the examination results are not fair enough to some extent.

B. Lack of Innovation in Teaching Methods

At present, the network multimedia mode is widely used in the classroom teaching of computer public basic course. Teachers explain the theoretical concepts according to the teaching plan and syllabus and demonstrate the specific database operation technology. The interaction between teachers and students is not strong during the whole teaching process. Because of the repeated compression of teaching hours, the amount of classroom teaching information is very large, but students have a good grasp of knowledge and skills. Therefore, the teaching effect is not ideal, which directly affects the students' enthusiasm for learning the course.

C. The Way of Assessment Is not Scientific and Reasonable Enough

At present, the examination mode of computer public basic course is the final unified on-line examination, which includes the examination of the basic concepts of database and the examination of the basic operation of database. However, a single examination score cannot fully reflect the students' mastery of the basic theoretical knowledge and operation technology of the course, nor can it reflect the students' flexible application ability of computer application skills. More scientific and reasonable assessment methods should be excavated.

D. The Mechanism of Teaching Evaluation Is not Perfect Enough

At present, computer public basic course lacks effective teaching evaluation mechanism. There is a phenomenon of "eating big pots of rice". Teachers' teaching effect is not qualitative and quantitative evaluation index system, lack of necessary reward and punishment measures, resulting in individual teachers' weak sense of responsibility, teaching effect is not good. We need to improve the teaching

evaluation index system of computer public basic course and implement it.

III. REFORM OF THE TEACHING CONTENT OF COMPUTER PUBLIC BASIC COURSE

A. Design of Teaching Content for "Computer Application Foundation"

The computer public basic course in most of the colleges and universities include "Computer Application Basis" and "Database Application", which aim at cultivating students' comprehensive application abilities of basic computer knowledge and operation skills, data processing and data analysis abilities, and comprehensively improving students' information literacy. With the development of the new generation of information technology, the teaching goal of computer public basic courses has shifted to improving the ability of data processing and data analysis, especially the processing and analysis of big data. Therefore, the relevant curriculum content and teaching mode also need to be updated. A brief introduction of our design ideas for the teaching content of computer public basic courses is presented as follows [4].

1) Refine the explanation of basic theoretical knowledge

As a part of College Students' computer literacy, the basic theoretical knowledge of computer is an important part of the course "Computer Application Foundation". It mainly includes computer development and computer system composition. However, considering the limitation of course hours, the improvement of students' autonomous learning ability and learning means, the study of computer basic theory knowledge can be arranged to finish online after class, and teachers spend a little time in class to check the learning effect, and shift the focus of teaching to operational skills.

2) Strengthen the training of basic operational skills

Computer basic operating skills are an important part of College Students' ability training and one of the necessary skills for daily study, life and future work. They mainly include Windows operating system, office software and Internet application. These operating skills reflect students' ability to use, manage and control computers, which should be emphasized and strengthened in class. Practice and examination in class and after class can improve students' practical ability in an all-round way.

Windows operating system focuses on Windows file management and computer system settings; Office software should highlight three basic components: Word, Excel and PowerPoint for case-based teaching; in addition, it should also briefly introduce common computer tools and software, such as file compression tools, screen capture tools and image processing tools, etc.

3) Highlight the improvement of data analysis ability

Data in a computer is essentially a bunch of physical symbols describing things. It is meaningful to users only when it is processed into information. Therefore, it is necessary to adopt appropriate technical means to process data. Excel in office software, as the basic software of spreadsheet processing, not only provides the functions of collecting, sorting and decorating the data of worksheet, but also provides rich functions of data calculation, data management and data analysis, such as formula and function, sorting, filtering, classification and summary, and charts, pivot tables, data perspectives, data validity, merger calculation and simulation analysis, etc. which should be explained in detail for students, especially in colleges of finance and economics, so as to highlighting the improvement of data analysis ability.

B. Design of Teaching Content for "Database Application"

1) Introduce the basic concepts of big data theory

The era of big data has arrived, and the concept of big data may still be very vague for students, which plays an important role in understanding and mastering the technology of big data processing. Therefore, it is necessary to introduce the basic characteristics, basic structure and processing technology of big data in the course of "Database Application", so that students can not only grasp the basic concepts of traditional relational database, but also have a good understanding of the generation, development and related processing technology of big data, and master the difference and connection between big data and traditional database. For example, the traditional relational database is explained in the background of SQL Server, and the "4V" characteristics of big data are introduced, such as large data size (Volume), fast processing speed (Velocity), multiple data types (Variety), low value density (Value), etc. The NoSQL database is briefly introduced, and the difference between NoSQL database and SQL database is clarified.

2) Supplement the core processing technology of big data

The data type and amount that students are facing have changed at present, how to effectively deal with and grasp the challenges and opportunities brought to us by this change needs to supplement the database processing technology and increase the explanations of big data core processing technology (such as Hadoop, HDFS, MapReduce, Spark, etc.), so that students can not only deal with traditional transactional relational database, they can also keep up with the pace of development of the times and handle big data with ease. In addition, in order to meet the needs of some students in the processing of big data applications, the optional course "Python Application" can be added to expand the students' ability of data analysis and processing in an all-round way.

3) Strengthen the cross-integration with economics and management specialty

In view of the fact that the object of this course is the students majoring in management, the teaching content should closely focus on the practical application requirements of these students. The design of teaching cases should be combined with the students' professional background, such as introducing financial data analysis into the teaching of financial students, introducing financial data analysis for accounting students, and introducing statistical data analysis and visualization for statistical students. In this way, students can not only learn the relevant technology of data processing, but also improve the ability of relevant

business processing. This course will be a powerful support for the development strategy in the new era.

IV. REFORM OF THE TEACHING MODEL OF COMPUTER PUBLIC BASIC COURSE

At present, the teaching effect of the computer public basic course is not ideal for the limitation caused by teaching hours, teaching mode and teaching means. With the development of the new generation of information technology and the appearance of massive open online courses (MOOC) platform, the traditional cramming-type classroom inculcation and teacher-centered teaching mode is no longer suitable for curriculum teaching in the new era. We must make full use of the new generation of information technology to carry out the teaching mode reform and change to the self-learning and student-centered teaching mode [5], [6]. We propose an online and offline flip classroom teaching mode, constantly enrich online teaching resources, gradually improve offline teaching design, and help the teaching reform of computer public basic courses.

A. Explore the Flip Classroom Teaching Mode Combining Online and Offline

Online MOOC teaching method, shooting MOOC videos and building MOOC platform or developing mobile APP help students learn independently. Its advantages are that it is not limited by time and space, learning rhythm can be controlled by them, contents that are not clear can be grasped by watching videos repeatedly, and teachers and students can discuss curriculum-related issues together, so as to effectively improve learning efficiency. Offline flipped-classroom teaching methods are adopted, such as key and difficult problems-solving, work display, discussion and communication, group discussion, special lecture, etc. Its advantages are to help students with difficulties, increase classroom interaction, change classroom management, realize students' personalized learning, and overturn the traditional classroom teaching mode, so as to improve the teaching quality and students' personalized learning ability.

B. Continuously Enriching Online Teaching Resources

In order to stimulate students' learning enthusiasm and subjective initiative, keep abreast of the development of the times, combine the characteristics of disciplines and specialties, highlight the education and teaching idea of "student-centered", establish "problem-oriented" teaching cases, and build a richer curriculum resource bank relying on campus network and Superstar network teaching platform, Wisdom tree network teaching platform, University state network teaching platform, etc. For example, interactive teaching videos, animation demonstration of teaching examples, typical application cases, virtual simulation software, teaching courseware, experimental materials, references and so on, which enable students to learn in close to the actual situation, so as to improve students' interest in learning and self-learning ability.

C. Continuously Strengthening Offline Instructional Design

Through participating in online guidance and combining with online monitoring information, teachers can create situations, raise questions, organize discussions, carry out typical case analysis, organize work reports and evaluations to summarize, comment and explain students' online learning, and form effective complementarity with students' online learning. Offline instructional design is full of wisdom. It involves not only specific teaching content, but also higher education and psychological knowledge, and even rich emotional factors. The quality of offline instructional design will directly affect the overall teaching effect of the course.

D. Gradually Improving the Assessment and Evaluation System

The evaluation mechanism should also be improved with the change of teaching mode. The traditional learning evaluation mode of "2:8" or "3:7" is no longer suitable for the teaching mode under the new media, and cannot fully reflect the students' process-learning effect. As the focus of students' course learning shifts to online mode, online learning process and learning effect (e.g. online question answering, online quizzes, online teacher-student exchanges, etc.) should be integrated into the evaluation system of course learning. At the same time, we should reduce the proportion of final examination and make a comprehensive evaluation of students' online and offline learning effect.

V. TEACHING DESIGN OF COMPUTER PUBLIC BASIC COURSE BASED ON HYBRID LEARNING

A. Analysis of Teaching Objects

Computer public basic course is offered to all students in colleges and universities. Students of different majors have different needs for the teaching content and learning difficulty. According to different majors and professional orientation, we should determine the teaching objectives of the course, highlight practical application, teach students in accordance with their aptitude as far as possible, enable students to learn more useful knowledge and skills, and flexibly use database technology to solve practical problems.

B. Design of Teaching Content

The design of teaching content is the core of implementing blended learning and the key factor of deciding the effect of blended learning. It mainly includes two aspects: one is to make teaching resources suitable for online learning, including teaching "short video" and interactive exercises for real-time learning effect test; the other is to design various teaching activities that can stimulate students' interest in learning.

1) Making teaching resources

The teaching resources of computer public basic course mainly include five aspects: teaching "short video", "real-time interactive exercises", "test questions bank for knowledge points and unit tests" and "practical operation questions for extracurricular outward bound training".

Chapter content "fragmentation". In the computer public basic course, the content of teaching chapters is very clear and clear, with strong coherence and logic. According to the characteristics of the content of the chapters and the specific

teaching objects and teaching requirements of different majors, it is necessary to "fragment" the knowledge points of the content of the corresponding chapters so that they can be explained clearly in the corresponding teaching "short video".

Recording teaching "short video". According to the content of each chapter of "fragmentation" and the task-driven teaching strategy, according to the basic ideas of teaching task introduction, theoretical concept analysis, technical method explanation and practical application examples, the corresponding teaching "short video" is recorded. In order to make students pay more attention and achieve the best teaching effect when watching teaching videos, referring to the 7 + 2 principle of psychology, the length of each teaching video should be controlled in about 8 minutes, which should not be too long, otherwise it will directly affect the learning effect of this part of the content.

Designing real-time interactive exercises. Real-time interactive exercises are used for students to conduct interactive exercises in the process of watching "short video" of teaching, so as to real-time detect the learning effect of students on the corresponding knowledge points. Question types mainly include: single-choice questions, judgment questions, filling in the blanks and other objective questions. Question quantity 3-5 is appropriate. After each teaching "short video" is completed, there are related exercises to consolidate students' understanding of the current knowledge points. Every week after the completion of the study task, there are relevant unit test questions to comprehensively test the students' mastery of the knowledge points of the week.

Constructing examination questions base of curriculum. In order to make the test results more scientific and reasonable, the course group needs to select typical test questions according to chapters, set up a course test database, and strive to fully cover the knowledge points of the course, and update and supplement the test database from time to time. Question types include single-choice questions, multiple-choice questions, judgment questions, blank-filling questions, operation questions and so on, so as to comprehensively examine the basic concepts and basic technology of the database.

Designing outward bound training questions. Outward bound training is an optional topic, aiming at examining students' comprehensive ability to use computer technology through multiple perspectives and in an all-round way. In the course of developing training questions, we try to solve practical problems flexibly by using computer technology in combination with the daily practical application background, and promote the transformation of computer knowledge and skills to computer products, so that students can personally feel that computer public basic course is useful.

2) Organizing online learning resources

The teaching resources on the online learning platform are published weekly according to the syllabus and teaching plan of computer public basic course. According to teaching objects, teaching objectives, learning tasks and testing requirements, all kinds of teaching resources (including teaching videos, teaching courseware, real-time interactive exercises, unit and stage test questions, extended training questions and experimental databases, etc.) are gradually opened to students according to the teaching cycle, so that students can reasonably arrange their online learning time and successfully complete the course.

3) Designing teaching activities

According to the teaching resources, teaching objectives, teaching means and learning tasks of computer public basic course, various teaching activities are carried out to enable students to complete video viewing, online testing and outward bound training in a limited time. In addition, students can carry out real-time discussions and interactive exchanges with classmates and teachers on hot and difficult issues through the interactive platform of curriculum, so as to achieve the goal of mutual learning and common improvement.

VI. IMPLEMENTATION OF THE TEACHING PROCESS OF COMPUTER PUBLIC BASIC COURSE BASED ON HYBRID LEARNING

The teaching process of computer public basic course based on hybrid learning is mainly divided into three parts: teachers' pre-publishing online learning tasks, students' self-learning online and interactive learning offline classroom. The online learning platform is fully utilized, combined with traditional classroom teaching, task-driven mode is adopted, teaching tasks are completed step by step in stages, and curriculum learning is carried out step by step. In the process of learning, students' autonomous learning ability could be continuously improved.

A. Publishing Online Learning Tasks

Task-driven learning can effectively improve students' learning enthusiasm and initiative. Teachers emphasize the teaching tasks, learning objectives, key and difficult points, schedule and assessment methods of knowledge points in relevant chapters in the classroom, and publish the next online learning task so that students can formulate specific and feasible learning plans according to their own learning situation. Published online learning tasks should be specific, clear, operable, and easy to carry out online and enhance interest in learning.

B. Developing Online Self-regulated Learning

According to the learning tasks issued by the teachers in the classroom, students use their spare time to watch the short video of teaching in a planned way, and complete real-time interactive exercises, knowledge point tests and unit tests and other related learning tasks. In order to solve the problems that students encounter in the online learning process in a timely manner, the course counselor takes a weekly and regular online way to interact with students in real-time, answer questions and solve doubts. Students can also communicate with each other through the course learning group, discuss the problems existing in learning, and exchange learning experience and learning experience.

Through online learning platform, teachers can view students' learning records and have relevant statistical data, including the learning situation of short video teaching, the completion of interactive exercises, knowledge points and

unit tests, and the interaction between teachers and students. At the same time, they can also learn about the interaction between students and the hot issues of courses concerned by students through the course learning group. Teachers use platform statistics and course learning group information to fully understand students' online learning situation, the use of course teaching resources and students' mastery of knowledge points, in order to improve teaching resources and enrich classroom teaching content.

C. Completing Offline Classroom Learning

Online learning is the main part of students' curriculum learning. Off-line classroom learning is the summary of students' online learning by teachers and the release of online learning tasks in the next stage. According to the statistical data of the online learning platform and the discussion theme of the course learning group, teachers in the classroom answer questions face to face, analyze and summarize the common problems in the process of students' online learning, and explain them in depth. In addition, through random spot checks, on-site questioning and in-class assessment, teachers have a comprehensive understanding of students' online learning, so as to optimize the teaching design.

VII. CONCLUSIONS

With the development of new generation information technology, higher financial and economic colleges and universities are constantly updating their educational and teaching concepts, optimizing their personnel training models, and putting forward the development strategy of "embracing the new era and creating new economy and management". As a general platform course to support "new economy and management", computer public basic courses need to be reformed with their teaching contents and modes in order to meet the requirements for computer applications of financial and economic college students in the new era, especially for data processing. Therefore, we propose to revise the teaching content and update the teaching mode, give full play to the special role of the new generation information technology in the teaching of computer public basic courses, and comprehensively improve students' information literacy and computer application ability.

CONFLICT OF INTEREST

We declare that this article content (JU2071) has no conflict of interest.

AUTHOR CONTRIBUTIONS

P. S. Wang, Z. C. Wang and Q. J. Ma concuted the research; P. S. Wang and Z. C. Wang wrote the paper; all authors had approved the final version.

REFERENCES

[1] X. H. Zhou, "On the teaching of university computer basic course based on computational thinking," *Journal of Changsha University*, vol. 32, pp. 117-119, March 2018.
[2] H. L. Li, "Research on current situation and reform scheme of computer basic course teaching in colleges and universities," *Journal of Changzhi University*, vol. 35, pp. 88-100, April, 2018.
[3] Y. Gu, W. Song, and M. H. Liu, "The teaching reform and practice of basic computer courses in universities by ability training-guided," *Teaching in Chinese Universities*, vol. 8, pp. 52-54, August 2012.
[4] P. S. Wang and T. Chen, "Research on teaching reform of database application course based on mixed learning," *Journal of Jixi University*, vol. 16, pp. 11-13, November 2016.
[5] J. L. Zhang, Y. Wang, and B. H. Zhang, "Research on the flipped classroom teaching model," *Remote Education*, vol. 19, pp. 46-51, August 2012.
[6] Z. X. Jiang, Y. Zhang, and X. M. Li, "Learning behavior analysis and prediction based on MOOC data," *Computer Research and Development*, vol. 52, pp. 1-14, March 2015.

P. S. Wang was born in Anhui, China. He received the B.S. degree in computer science and technology from Anhui Normal University, China, in 1995, and the M.S. degrees in computer science and technology from Hefei University of Technology, China in 2006, and the Ph.D. degrees in computer science and technology from Nanjing University of Aeronautics and Astronautics, China, in 2013.

Since 2007, he has been with the School of Management Science and Engineering, Anhui University of Finance and Economics, China, where he is currently a professor. His research interests include information security and privacy protection.

Z. C. Wang was born in Anhui, China. He received the B.S. degree in computer science and technology from Anhui Normal University, China, in 1993 and the M.S., and Ph.D. degrees in computer science and technology from East China Normal University, China, in 2003, and 2008, respectively.

Since 2008, he has been with the School of Management Science and Engineering, Anhui University of Finance and Economics, China, where he is currently a professor. His research interests include cryptography and information security.

Q. J. Ma was born in Anhui, China. She received the B.S. degree in ideological and political education from Anhui Normal University, China, in 2000 and the M.S. degrees in ideological and political education from West China Normal University, China, in 2009.

Since 2009, she has been with the School of Business Administration, Anhui University of Finance and Economics, China, where she is currently a lecturer. Her research interests include ideological and political education of undergraduate.