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Analysis of the Current Situation of Experimental Teaching of Python Language Programming Experiment

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Abstract

This paper is a research on the teaching design of the experimental class of Python language programming for computer science majors in colleges and universities in the context of teaching practice. The purpose of writing this paper is to improve the traditional way of teaching programming language experimental classes, to form a mode of teaching experimental classes suitable for the characteristics and training objectives of college students, to cultivate students' spirit of exploration and innovation and their ability to learn and practice quickly, and to accomplish the cultivation goal of college education of training technical application talents at the front line of production. Higher education has made great progress in recent years with the development of social economy, and its cultivation goals are different from those of ordinary college education. The traditional teaching process is no longer suitable for college students' education, especially for the highly practical course "Python Language Programming" of computer science major. As a university teacher, we should change the situation that students are left to experiment on the computer or practice programming entirely under the step-by-step guidance of the teacher in the computer programming laboratory class. In order to design a suitable instructional model for a computer language programming laboratory course for college students, this thesis reviews the knowledge about instructional design. Many instructional design experts believe that instructional design should be theoretically based on learning and teaching theories. And under the main influence of learning theory, there are three main models of instructional design, namely, the traditional teacher-centered instructional design model; the student-centered instructional design model based on constructivism and the "dominant-subject" instructional design model which both plays the dominant role of teachers and fully reflects the role of students' cognitive subjects. The "dominant-subject" instructional design model. At the end of this thesis, it is pointed out that the learning-oriented teaching design is consistent with the cognitive rules of students, and applying the learning-oriented teaching design to the teaching of specific laboratory classes and designing the teaching activities as a process of students' active learning will make students learn the methods of acquiring knowledge in the process of active learning and achieve the goal of cultivating abilities, and also hope to be helpful and inspiring to other teachers engaged in teaching computer programming language It is also hoped that it will help and inspire other teachers who are engaged in teaching computer programming languages.

Keywords

Teaching Design; Learning-Oriented; Independent Learning; Collaborative Learning.

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1. Background

The objective need of economic and social development is to vigorously develop higher education, and it has been proved that the low quality and innovation ability of workers have become the bottleneck that restricts our economic development and enhances our competitiveness. We need not only a large number of talents engaged in scientific research and engineering design, but also a large number of specialists engaged in manufacturing, construction and other technical application work in the production line. Higher education is developed in time to meet this need. Therefore, its goal is to cultivate senior applied technical talents who can meet the requirements of modernization, master the necessary basic theories and expertise of the profession, have comprehensive quality and comprehensive ability to engage in the practical work of the profession, and work in the first line of production, construction, management and service.

It has the following distinctive features.

(1) Talent level

Higher education belongs to the category of higher education, and talents in higher education must have basic knowledge, theories and skills corresponding to higher education, master the corresponding new knowledge, new technologies and new techniques, distinguish from ordinary higher education by strong practical hands-on ability and the ability to analyze and solve practical problems in production, and distinguish from secondary education by wider knowledge and deeper basic theoretical knowledge.

(2) Knowledge and ability

Higher education is a kind of education which educates students in some kind of production and management for the purpose of improving the technical level of school industry. It develops teaching plans based on the needs of job groups, determines training objectives and talent specifications on the basis of ability analysis of job groups, specifies morality, knowledge and ability that college graduates should have, and then organizes teaching. Among them, the improvement of knowledge and ability should focus on the adjustment of industrial structure and product structure, face the development of science and technology in the 21st century, constantly update the teaching content, adjust the curriculum structure, pay attention to the horizontal expansion and combination of knowledge, reflect the advanced and application of knowledge, and cultivate the ability of students to master new equipment and new technology. As a result, college graduates have the characteristics of quick start and strong adaptability. The nature of knowledge and ability of talents in higher education reflects the essential attributes of its affiliation with education.

(3) Technicality of talent type

The cultivation target of higher education is the senior technical application talents for the first line of production and service, which is different from the theoretical and discipline-oriented talents cultivated by ordinary higher education, and different from the simple skill-oriented talents cultivated by secondary education. Graduates of higher education not only know the basic theory and basic knowledge of a certain profession, but also have the production operation and organization ability required by a certain job group, and are good at transforming technical intention or engineering drawings into material entities, and can carry out technical guidance and organization management at the production site and solve the problems in production. They should also be good at handling, communicating and using information to guide the improvement of equipment, process and products, and are a kind of composite talents with sufficient professional theory, skilled production technology operation and strong organizational ability.

(4) Grass-roots nature of graduates' destinations

Since the students trained by colleges and universities serve the first line of production, the graduation direction of college talents has strong grass-roots nature. For example, the graduates of engineering colleges and universities mainly go to the front line of enterprises to engage in construction, manufacturing, operation, testing and maintenance; the graduates of art colleges and universities

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mainly go to enterprises and institutions to engage in art design; the graduates of economic colleges and universities mainly go to financial departments to engage in financial management work. The grassroots nature of college graduates is the vitality of college education.

(5) Diversity of cultivation means

The complexity of the cultivation goal of higher education determines the diversity of cultivation methods. In the form of teaching, there are not only certain theoretical teaching to make students master basic theory and knowledge, but also a lot of practical teaching such as experiment, internship, design and practical training to cultivate students' comprehensive ability. In the implementation of the object of participation in teaching, there are both full-time teachers of the school, and part-time teachers outside the school and instructors of internship units. In the teaching process to implement two-way, the teacher is the guide, facilitator, organizer and manager of learning, to provide information, consultation and other aspects of support for student learning, students are no longer passive recipients, but active seekers, teaching and learning become a two-way teaching process. The modernization of teaching methods and the wide application of computer and multimedia technology will provide all kinds of information needed for college education and teaching quickly and efficiently, which will greatly improve teaching efficiency and quality.

2. "Python Language Programming" Laboratory Course

2.1 Course Features

Python language programming is a computer programming language course. With the development of information science, the application of computer is becoming more and more widespread, and it is necessary for every computer worker to learn and master a computer language. Python programming encapsulates data and operations on data, and this approach to problem solving is more in line with people's thinking habits, and it is more convenient to use Python to program and easier to maintain software. Therefore, this course has gradually become an important basic course for computer science students in colleges and universities and general colleges and universities. It takes Python programming language as a platform to introduce the ideas and methods of programming. Through the study of this course, students should not only master the knowledge of advanced programming language, but more importantly, they should gradually master the ideas and methods of programming in practice and develop the ability of problem solving and language application, which is a distinctive course focusing on cultivating students' spirit of exploration and innovation and practical ability.

The teaching goal of the course is to let students master the basic concepts, basic syntax and programming methods of the Python language, to master the operation methods of the Python language through hands-on programming practice in the laboratory, and to improve programming skills through practical problem solving.

2.2 Course Implementation

Curriculum implementation is based on the nature, objectives, content framework and the guiding teaching principles and evaluation recommendations of the curriculum as stipulated in the curriculum standards, with reference to the structure, content materials and presentation of the selected textbooks, combined with the teachers' own teaching quality, experience and style, and from the students' learning level, aspirations and habits as well as the teaching equipment, resources and environment, etc., in a purposeful, planned and organized manner. The process of practicing the essence of the manifest curriculum, reflecting the value of the curriculum, and achieving the goals of the curriculum is comprehensive. There are many factors that affect the implementation of the curriculum, both within and outside the education system. Each factor affecting the implementation of the curriculum does not work alone, but also interacts with each other in a complex way. Among these many factors, the most critical elements are: teachers, teaching materials and training bases. The most important factor in the implementation of the curriculum is the teacher. The teacher's attitude toward the course program and the teacher's ability directly determine the effectiveness of the implementation of the

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course program. In fact, teachers are active decision makers in the course implementation process, they have to make appropriate judgments and make corresponding adjustments to the curriculum-related issues at any time. Teaching materials are the carrier of certain educational theoretical ideas, the important basis of the curriculum implementation activities, and the key factor to achieve the goal of talent training. Internship base is a necessary condition for the implementation of the curriculum in colleges and universities, and is an essential part of the practical teaching process. Internship bases can be divided into two categories: on-campus internship bases and off-campus internship bases. On-campus internship bases play an important role in students' initial understanding and mastery of relevant literacy and competence requirements.

In October 1999, the Department of Higher Education of the Ministry of Education hosted a national conference on high school teaching materials for colleges and universities. The conference required the preparation of a series of high quality teaching materials for computer majors as soon as possible, which are truly unique to colleges and universities and have a complete system to meet the requirements of cultivating technical application talents in higher education. As a basic course for computer science majors in colleges and universities, the course "Python Language Programming" meets the requirements of college students, is easy to understand, describes complex concepts in simple language that readers can easily understand, starts from simple concepts, allows readers to gradually master the complete system of Python language, focuses on training their ability to analyze and solve problems, and strives to Students will be able to write practical applications in Python after learning this course. However, learning computer languages mainly lies in application, and it is impossible to master them just by listening to lectures and reading textbooks.

Therefore, in the implementation of this course, teachers should combine lectures and labs according to the content of the textbook and the teaching resources of the school, and focus on the hands-on practice sessions for students. Hands-on practice is an indispensable part of learning Python language, and many unclear or vague problems can be confirmed through hands-on practice. The debugging of the program written on the machine often reveals problems, and the debugging program can solve the errors that occur and improve the students' ability to analyze and solve problems.

3. Analysis of the Current Situation of Teaching Laboratory Class

Given that the programming class is a high-intensity mental work, it is not something that can be heard or seen, but practiced. Only when students are allowed to do it, they will have a sense of accomplishment, and then become interested in programming, and learn it more easily. Therefore, in the implementation of the curriculum should allow students to use their hands and brains to practice more on the computer. However, there are some drawbacks in the teaching of programming language courses in China, especially in the experimental courses. First of all, the teaching concept emphasizes teaching rather than learning, and attaches importance to theoretical learning and disregards practical learning in the laboratory class, which is good at paperwork and coping with various paper exams, but no way to start when encountering practical problems. Secondly, although more and more teachers gradually realize that the focus of teaching programming courses is to cultivate students' practical programming ability, the teaching mode should be changed from teaching knowledge to cultivating ability, and the assessment should also focus on testing students' programming level. However, due to the large number of students and the heavy teaching tasks undertaken by teachers, it is difficult to achieve fairness, accuracy and efficiency in the process of practical teaching and assessment. Again, in many computer programming language lab classes, teachers tend to let students go free on the computer without good guidance. Students also only passively debug the list of programs that have been compiled before class and get the correct results, without thinking deeply. In the long run, students will lack interest in learning and their ability to analyze and solve problems will not be improved.

Finally, there is a lack of communication between the student body in the laboratory class. Each student is learning as an individual in the classroom, and students lack interaction and cooperation in

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the classroom. And computer is an industry that is closely integrated with other industries. In practice, programmers must communicate and exchange with other professionals to develop software that meets the needs of applications. And nowadays, software development periods are getting shorter, larger, and more invested, and are basically developed in teams. As a member of a team, communication and communication skills are essential to integrate and function as a team.

4. Theoretical Foundations of Experimental Instructional Design

As a discipline, experimental instructional design is rooted in other theoretical foundations. Therefore, it is crucial for a teacher to properly understand these theoretical foundations of instructional design and grasp the relationship between these theoretical foundations and instructional design in order to conduct instructional design in order to improve teaching effectiveness. In the field of instructional design, many instructional design experts believe that the theoretical foundations of instructional design are mainly learning theory, pedagogical theory, communication theory, and system science theory.

4.1 Learning Theory

Learning theory is a psychological theory that explores the nature of human learning and its formation mechanism, while instructional design is to create an environment for learning, to design different teaching plans according to the needs of learners, and to promote the further development of human potential on the basis of giving full play to human potential. Therefore, instructional design must have a broad understanding of learning and human behavior and take learning theory as its theoretical foundation. Due to the different philosophical views and research methods of researchers, contemporary learning theories are divided into two major schools: the behaviorist school and the cognitive school. Behaviorists believe that human mental behavior is implicit and cannot be directly observed or measured.

What can be directly observed and measured is the individual's outward behavior. They advocate an objective approach to studying the objective behavior of individuals, and propose the idea that "psychology is behavior". This is the famous stimulus-response (SOR) linkage formula. Behaviorism places special emphasis on the design of external stimuli and advocates the use of small steps in the presentation of instructional information and timely reinforcement if students show correct responses, which is the idea of procedural instruction, which has a typical objectivist tendency. Although behaviorism's application of the conclusions drawn from experiments on mechanical learning in animals without any constraints to teaching was later severely criticized by many, the strategies of behaviorist learning theory that emphasize control of the learning environment, the idea of objective behavior and reinforcement, and individualized learning that respects students' self-paced learning are still instructive today, especially in the area of behavior modification (i.e., learning of attitudes). The contribution of behaviorism is unmatched by other learning theories. With the development of brain science, research on psychological cognition has gradually increased, and the cognitive school of thought has become dominant. The cognitive school rejects the behaviorist view of learning as a mechanical, passive S-R association and advocates the study of the individual's internal mental activity. The cognitive school believes that learning is an individual's active information processing process, and that instruction should prepare teaching activities in the order of mental processing of information and should conform to human cognitive habits of thought. The cognitive school can also be divided into two main branches, the information processing school and the constructivist school, depending on the researcher's concerns and research methods. The main concern of the information processing school is the mental processing of individuals, and its main contribution is the mental model of information processing.

The following figure is a more detailed explanation of the use of information processing models in instructional design, based on the information processing models proposed by Gagne and others. It is important to note that the information processing school does not answer the question of whether the results of individual processing are consistent with the original information; the default is the

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objectivist view that the knowledge one learns is objective. As another branch of cognitivism, constructivism holds that knowledge is not obtained through transmission by teachers, but is acquired by learners through meaning construction with the help of other people (including teachers and learning partners) in certain contexts, i.e., social and cultural contexts, and with the use of necessary learning materials. Constructivist psychologists are not concerned with the details of mental processing, but with the psychological factors that influence information processing. The concept of schema is the theoretical contribution of this branch. The view of knowledge held by constructivism is subjectivist in the sense that what one learns is subjective, a subjective understanding of the objective world. In this respect, the constructivist view of knowledge is consistent with Marxist philosophy. It is opposed to the objectivism supported by cognitivism. It is important to note that the information processing school and constructivism form a complementary strength rather than a mutual exclusion. The information processing school is concerned with the process of processing and not with the result of processing, while constructivism is concerned with the result of processing and believes that schemas affect not only the result of information processing (gaining subjective understanding of information) but also the process of processing.

Overall, the main insights of the cognitive school for instructional design include: the learning process is a process in which learners actively receive stimuli, actively participate in meaning construction and active thinking; learning is influenced by learners' original knowledge structures, and new information can only be learned by learners if it is accommodated by the original knowledge structures (through the process of assimilation and conformity); attention should be paid to the relationship between the subject structure and learners' cognitive structures in order to The organization of teaching activities should be in line with learners' information processing model. Therefore, the instructional design process should pay special attention to learner analysis and learning content analysis, ensure the coordination of subject structure and learners' cognitive structure, and organize instructional activities according to the information processing model.

4.2 Instructional Theory

Instructional theory is the science of studying the general laws of teaching and learning for solving teaching problems. Instructional design is a scientific process of solving teaching problems and proposing solutions. In order to solve teaching problems well, we must follow and apply the objective laws of teaching, so instructional design cannot be separated from instructional theory. The research and development of teaching theories in ancient and modern times and in China and abroad have provided rich scientific basis for teaching design. Confucius, a great educator in ancient China, put forward the teaching ideas of "teaching according to the material", "learning and thinking together" and "inspiration and guidance"; Mencius put forward the ideas of "self-seeking" and "self-learning". Mencius proposed the teaching methods of "self-seeking", "gradual progress", and "concentration and persistence". In modern times, Liang Qichao and Cai Yuanpei advocated that teaching should pay attention to the development of children's personality, give full play to their subjective initiative, and cultivate their independent learning ability. This has enlightened us today by emphasizing the students' point of view and learner analysis. The development of modern foreign teaching theories is divided into three main stages: the budding period, the modern formation period and the modern development period.

In the budding period, Socrates, Plato and Cicero proposed and used the methods of dialogue, practice and imitation; in the modern formative period, Diesdorffer, Herbart and Pestalozzi explored the teaching procedures; in the modern development period, Gagne, Bruner and others explored the design of teaching activities with students as the main body. Many teaching perspectives, principles and methods put forward in these three periods provided important references for instructional design. after the 1950s, the research on modern teaching theories has achieved fruitful results. For example, Skinner's procedural teaching theory, Bloom's classification theory of educational objectives, Ausubel's meaningful learning theory and the "prior organizer" teaching procedure. Among them, Zankov's developmental teaching theory, Bruner's "structure-discovery" teaching theory and

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Babanski's optimization theory of teaching have had great influence on the emergence and development of instructional design. In his developmental teaching theory, Zankov put forward the ideas of "general development of students" and "nearest developmental zone", which provide the basis for the formulation of learning objectives; Bruner's "mastering the basic structure of the curriculum" and "discovery learning". Bruner's ideas of "mastering the basic structure of the curriculum" and "discovery learning" have laid the theoretical foundation for the innovation of teaching design; Babanski's theories of "teaching system" and "optimization of teaching" have laid the theoretical foundation for the use of systemic learning. Theories such as "teaching system" and "teaching optimization" put forward by Babanski provide the basis for studying teaching with a systematic approach and analyzing the teaching process comprehensively and scientifically.

Commonly used instructional design patterns and characteristics Patterns are a theoretical and simple form of reproducing reality. Instructional design patterns are the theoretical and simple forms of instructional design using the systemic approach gradually formed in the practice of instructional design, that is, a stable structural form formed after theoretical generalization and abstraction of teaching activities. At present, there are three types of popular teaching design models: the traditional teacher-centered teaching design model, the student-centered teaching design model based on constructivism, and the "dominant-subject" teaching design model which not only plays the leading role of teachers but also fully reflects the role of students' cognitive subjects. The traditional teacher-centered instructional design model is teacher-centered, in which teachers use lectures, books and various media as teaching tools and methods to impart knowledge to students, and students passively accept the knowledge imparted by teachers. In this model, the teacher is the active instructor; the students are the passive recipients of external stimuli; the teaching materials are the contents instilled by the teacher to the students; and the teaching media are the means instilled by the teacher to the students. Obviously, the traditional teaching design model is based on the "transfer-receive" teaching theory and the "stimulus-response" learning theory of behaviorism. The student-centered instructional design model based on constructivism is student-centered, and the teacher plays the role of organizer, guide, helper and facilitator in the whole teaching process.

Through the use of context, collaboration, conversation and other elements of the learning environment to give full play to students' initiative, enthusiasm and creativity, students can effectively construct the meaning of the knowledge they learn. In this model, students are the active constructors of the meaning of knowledge; teachers are the organizers, instructors, helpers and facilitators of the teaching process; the knowledge provided by the teaching materials is no longer the content taught by teachers, but the object for students to actively construct meaning; the media is no longer a means to help teachers teach knowledge, but a cognitive tool for students to actively construct collaborative learning and conversational communication. In this model, teachers, students, teaching materials and media have completely different roles and relationships with each other compared to traditional teaching. The theoretical basis of this model is the constructivist theory of learning. The "dominant-subject" instructional design model is in between the above two models, and it retains the basic process of "transmission-reception", while modifying this "process". "It uses computer-based educational technology as the core, under the guidance of constructivist theory, to make students think, explore and discover more actively through human-computer interaction, thus forming a new stable form of teaching activity process. It absorbs the strengths of the first two models and avoids the negative factors of both. Sometimes the teacher is at the center of the whole process of teaching activities in order to play a leading role, and sometimes students are actively thinking and exploring with the help of the teacher; sometimes the teaching media are used as tools to assist teaching, and sometimes as cognitive tools for students' independent learning; the elements of teaching materials also have different roles and connections with each other. The "dominant-subject" teaching design model is the product of combining modern education theory, education technology and specific teaching practice.

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5. Characteristics of Learning-based Instructional Design

The characteristics of learning-based instructional design are summarized in the following aspects.

(1) "Learning" as the center

In other words, the core issues of the design are the learning problems (content), learning activities and students, which are the most important aspects of the design. All other teaching aspects are centered on how to "learn" the learning content; how to enrich and develop students' cognitive structure; how to develop students' comprehensive quality; how to make students creative and creative thinking ..... to carry out. The role of the teacher has changed considerably, he or she is the guide and helper of learning, playing the role of a learning partner. It is because the design puts "learning" in the center that it is called "learning"-centered teaching design.

(2) Openness with "learning" as the main focus

The openness of the teaching design is mainly manifested in three aspects: firstly, the learning content is open, and the selection of the content is mainly based on the syllabus and textbooks, but in addition, the selection of the learning content should be closely combined with the needs of society. Secondly, students' learning behavior is open, and this openness is mainly expressed in the interactive behavior, students should not only interact with teachers but also interact with other students and the external environment. Thirdly, students' thinking activities are open. One of the guiding ideas of "learning"-based teaching design is to cultivate innovative talents, and the thinking of innovative talents must be active and open. In addition to these three aspects, the evaluation of learning and the time and space of learning are also open, and even the teaching design activity itself should be open, so that more people can participate in it.

(3) Interactive student learning

Learning activities are interwoven with various interactive behaviors: students interact with machines and media; students have to interact with teachers and peers to share the joy of information and success; students also have to interact with online resources and online peers to get more support and resources; students may also have to interact with nature to realize the dream of returning to nature, to shape the natural nature of human beings and to cultivate their emotions. In the interaction, teachers, students, peers, and learning media can all become controllers of the interaction process.

6. Creative Cultivation of Innovative Students

The purpose of "learning"-based teaching design is to pay special attention to the cultivation of students' creative ability and innovative thinking, and to create a variety of innovative environments and time and space for students, which is the inevitable requirement of "learning"-based teaching design and its soul. It is the soul and a distinctive feature of the design.

7. Evaluation of "Learning"-based Instructional Design

It has the roles, types and functions of general evaluation, but the main thing is the consistency of its evaluation standards with the needs of modern society, which is an important basis for formulating evaluation standards. At the same time, the evaluation form tends to be more and more intelligent and allows real-time and off-site evaluation, which improves the scientific and credibility of evaluation and provides valuable feedback information for design workers.

8. Learning Objectives

Because the initiative of learning is in the hands of students, and students generally do not know much about the overall learning content, so it is difficult for students to grasp the learning objectives accurately, coupled with the influence of students' self-control, perseverance, learning strategies and other factors, completely independent "learning"-based learning activities, its learning objectives Although the learning effect is good, the efficiency is low, which is a difficult point of the current

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"learning"-based teaching design. The guiding principles of learning-based teaching design Professor He Ke-kou believes that in learning-based teaching design, we should follow the following principles.

(1) Emphasize student-centeredness

In instructional design, it is important to clarify the significance of "student-centeredness", from which we can obtain design results that are different from other concepts. Furthermore, constructivism considers the three elements of student-centeredness to be the exercise of initiative, the externalization of knowledge, and the achievement of self-feedback.

(2) Emphasize the importance of "context" for constructing meaning

Learning is always connected with certain social and cultural backgrounds, and learning in actual contexts enables learners to assimilate the new knowledge they have learned by using the relevant experiences in their original cognitive structures, so as to give the new knowledge some meaning; if the original knowledge cannot assimilate the new knowledge, the process of adaptation, i.e., the transformation and reorganization of cognitive structures, should be induced. In short, the meaning construction of new knowledge can be achieved only through assimilation and conformity.

(3) Emphasizing the key role of "collaborative learning" in constructing meaning

Constructivism believes that the interaction between learners and their surroundings plays a key role in the understanding of learning content. This is one of the core concepts of constructivism. Students are organized and led by teachers to discuss and communicate together, to build and become part of a learning community. In such groups, theories, perspectives, beliefs, and hypotheses are critically examined together; consultations and debates take place, first within and then with each other. Through such a collaborative learning environment, learners' thinking and wisdom can be shared by the whole group, and the whole learning group can jointly complete the construction of the meaning of what they have learned.

(4) Emphasis on the design of the learning environment (rather than the teaching environment)

Constructivism considers the learning environment as a place where learners can explore freely and learn independently to support and facilitate learning. In this environment, students can use a variety of tools and information resources to achieve their learning goals, and in the process, students can not only receive help and support from teachers, but students can also collaborate and support each other.

(5) Emphasize the use of various information resources to support "learning" (rather than "teaching")

In order to support learners' active exploration and meaning making, students should be provided with a variety of learning resources in the learning process. Students are told how to access learning resources, where to access them, and how to process and use them effectively.

(6) Emphasize that the ultimate purpose of the learning process is to complete meaning construction (rather than to accomplish teaching objectives)

The whole teaching design process revolves around the center of "meaning construction", whether it is independent exploration, collaborative learning or teacher guidance, all activities in the learning process should be subordinated to this center, and all should be conducive to completing and deepening the meaning construction of the knowledge learned. All activities in the learning process should be subordinated to this center and be conducive to the completion and deepening of the construction of the meaning of the knowledge learned.

These principles, tested by teaching practice, are generally accepted, and instructional design based on these principles can achieve twice the result with half the effort.

9. Independent Learning in Closed Laboratories

9.1 Designing the Learning Environment

For students to be fully engaged in learning activities, they must be confronted with problems that are personally meaningful or relevant to them. Traditional schooling often isolates students from real-life problems, and this isolation poses a barrier to meaningful learning. The use of multimedia

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technology creates problems that are realistic for students and at the same time relevant to the topic being studied. These problems and situations contain a variety of forms: factual situations - the application of modern educational technology to provide objective, real facts about scientific phenomena, morphological structures, or historical materials, literature, etc., so that students gain access to real Contextual context - the application of modern educational technology to provide real or simulated, similar images of episodes, scenes, and phenomena according to the content of the course of study, so that teachers and students can establish a common experience, so that students can form representations through observation and perception; demonstrative context --Applying modern educational technology to provide a series of standard behavioral patterns for learners to learn skills through imitation and practice; Principle Situations --Applying modern educational technology to provide the complete process of the operation, growth and development of a typical thing. The principle context - the application of modern educational technology to provide the complete process of the operation, growth and development of a typical thing, and with the help of language description, to help learners break through the learning difficulties and master the scientific principles; inquiry context - the application of modern educational technology to provide the phenomenon and process of a thing, using text or language, to set up doubts and raise questions. A computer programming language is a symbolic language artificially designed for writing computer programs to describe, organize and derive computational processes. A general computer programming language involves three aspects: syntax, semantics, and semantics, and a computer program = algorithm + data structure + programming methods + language tools and environment.

For a student who is new to the "Python Language Programming" course, he or she often finds the course boring, logical and difficult to understand, and loses interest in learning the course. In the long run, it will be difficult for students to form their programming ideas and lose their motivation to learn completely. Moreover, for most students, even if they learn the programming language well, it is difficult to refine practical algorithms for real problems. Therefore, in addition to the lectures in the programming language course, the design of the learning environment in the laboratory is also very important.

At the same time, in the laboratory, teachers should try to create a relaxed and harmonious learning atmosphere based on the principle of improving students' self-motivation, and give them careful, detailed and enthusiastic guidance to help them improve their interest in learning and build up their confidence in learning. And more importantly, in order to help students analyze the actual problem and abstract the mathematical model for programming, teachers can use modern educational technology to create animated simulated problem situations for specific topics to stimulate students' interest in learning, on the one hand, and give students an intuitive understanding of the problem and facilitate the analysis and modeling. For example, in a closed lab exercise with "control structure" as the experimental content, in order to let students program to determine whether the customers in a department store have exceeded their credit card overdraft limit, the teacher can create an animation to simulate the customers' shopping and spending situation, and guide students to pay attention to the key of problem solving during the animation process, and gradually build Mathematical modeling for programming.

9.2 On-site Autonomous Programming

According to the constructivist learning theory, students as learning subjects construct their own knowledge structure in the process of interacting with the objective environment (meaning the content learned). Teachers should guide students to explore the understanding with regularity in the practice of problem solving and programming, and sublimate the perceptual understanding to the height of rationality. Only in this way can students learn by example, especially for a course with flexible knowledge application like computer language. For the lab exercises in the Python Language Programming lab course, they generally consist of two parts: the exercise questions and the reinforcement exercises and debugging exercises that follow them. The intensive exercises are for students to make changes to the solution templates. These exercises are designed to deepen students'

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understanding of Python and how to solve a similar programming problem or how the program can be applied to another solution, i.e., to learn by example.

9.3 Evaluation of Learning Effects

The evaluation of the effect of independent learning in the closed lab is mainly a combination of formative and summative evaluation. In each laboratory class, besides guiding students' learning, teachers should also evaluate the programs written by students, i.e., give scores and make records. The criteria for evaluation are whether the program can pass debugging, whether it can solve the corresponding problems, whether the operation results are correct, whether the functions are perfect, whether it conforms to the programming habits, and whether the program is efficient. In the process of scoring the students' evaluation, the teacher should promptly explain to the students where the problems lie so that the students can solve the problems in the classroom. They should also offer timely praise to students who have good program results, so as to form a good competitive learning atmosphere among students. Since "Python Language Programming" is a practical course, especially for college students, the written test at the end of the semester can no longer meet the requirements of the teaching objectives, nor can it be used as the final grade to evaluate students' learning in this course. Therefore, students should also be given an on-line independent programming test at the end of the semester as a summative evaluation of students, but in order to fully motivate students' interest in their usual learning and active participation in programming experiments, the average of students' independent learning experimental scores should be used as part of the summative evaluation at the end of the semester, i.e., the summative evaluation of students' independent learning has two parts: the average of usual scores and the final on-line assessment scores. Conclusion Student-centered teaching is the center of our current educational reform.

10. Conclusion

In this paper, after referring to the basis of a large number of theoretical studies on the subject, it is found that whether the instructional design can be used rationally directly affects the effectiveness of teaching. Through the use of learning-centered teaching design in the experimental class of "Python Language Programming" in colleges and universities, the authors have studied the influence of this teaching design on college students' programming experiments using computer programming language. Through the collaborative learning in the open lab, students can improve their interest in learning, strengthen their awareness of active participation, enhance their ability to find problems and solve them, cultivate the spirit of collaboration, and exercise the ability to communicate with others. It has a positive effect on the development of college students' quality and the cultivation of their ability. It meets the requirements of college students' training objectives and the requirements of modern education and teaching.

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References

[1] Chang H H, Hsieh P H, Fu C S. The Mediating Role of Sense of Virtual Community [J]. Online Information Review, 2016, 40 (7):882 -899.

[2] Zárraga C,Bonache J. Assessing the Team Environment forKnowledge Sharing: An Empirical Analysis[J].International Journal of Human Resource Management,2003,14 (7) : 1227-1245.

[3] Nonaka I,Takeuchi H. The Knowledge-creating Company: How Japanese Companies Create and the Dynamics of Innovation [M]. New York: Oxford University Press,1995.

[4] Bostrom R P. Successful application of communication techniques to improve the systems development process [J]. Information and Management, 1989, 16 (2): 279-295.

[5] Xiao Yuewen, Wang Mingyu. Talking about the status quo and development trend of online education. China Business Theory, 2017(18): 176-177.

[6] Earl L., Katz S. Leading Schools in a Data Rich World. Corwin Press, 2006, 23(2): 9-16.

[7] Zhang Junchao. Institutional Research and University Management in the Age of Big Data[J]. Higher Education Research, 2014(1) : 128.

[8] Chen Lei. Application of Big Data in Teachers' Online Education Environment--Taking Courses in Zhejiang Province as an Example[J]. Continuing Education, 2017, 31(9): 7-11.

[9] Yang Xianmin, et al. Development Strategy and Path Choice of Wisdom Education in China [J]. Modern Educational Technology, 2014(1) : 14.

[10] Liu Bin, Zhang Wenlan. Research on the Influencing Factors and Structure of Online Course Learning Experience [J]. Modern Educational Technology, 2017, 27(09): 107-113.

[11] Zheng Lei. Online Learning and Quality Assessment Research [J]. Shenzhou, 2014, 14.

[12] Zhang Wei. Strategies for improving the participation of college students in online learning. Zhejiang Normal University. 2011.11-12.

[13] Maclaughlin E J, Supernaw R B, Howard K A. Impact of distance learning using videoconferencing technology on student performance [J]. American Journal of Pharmaceutical Education, 2004, 68(3): 1-6.