

# Teaching Exploration of Python Language Programming Course based on Internet of Things Engineering

Yafei Wang, Feifei Wang

Information Engineering College, Pingdingshan University, Pingdingshan, 467000, China

**Abstract:** Aiming at the problem of low comprehensive ability of students taught by the traditional teaching method of programming course, this paper studies the teaching method of Python language programming course based on Internet of things engineering. First, build the teaching level and teaching objectives of Python language programming. According to tf-idf weight method to obtain the knowledge points of Python language programming course, on the basis of the established teaching levels and teaching objectives, hybrid teaching means are adopted to achieve the teaching objectives and complete the research of teaching methods based on Internet of things engineering. Through the comparative experiment with the traditional teaching method, it is proved that the teaching method based on Internet of things engineering based on applied research has higher comprehensive ability and superiority.

**Keywords:** Internet of things engineering; Python; Programming; Course teaching; TF - IDF

## 1. Introduction

The Internet of things is based on the Internet, broadcast television networks, traditional telecommunications networks and other information carriers, so that all ordinary physical objects can be independently addressed to achieve interconnection network. The Internet of things engineering technology involves a wide range of aspects, including computer technology and sensor technology. Python is a general programming language at the forefront. It is a powerful programming language. With its elegant, clear and concise syntax, it can free beginners from the details of grammar and focus on solving problems and analyzing the logic and algorithm of the program itself. Python also has a large number of excellent third-party function modules, which are very helpful for interdisciplinary applications [1]. After years of development, Python has become an important programming language.

With the wide application of information technology, high-level language programming has become a compulsory course for students in various universities. However, due to the limitations of teaching methods and teaching resources, most schools focus on the basic concepts and knowledge of program design and simple case analysis of program design in the teaching of this kind of course. Some schools have added knowledge of data structure and algorithm analysis to the teaching content. Traditional teaching methods are mainly aimed at daily teaching examinations. Although they can complete the answers of programming examinations, it is difficult to train stu-

dents' ability to apply the programming knowledge they have learned to solve practical problems. The extensive application of Internet of things engineering can further improve the teaching effect [2]. Therefore, based on the above analysis, this paper will explore the teaching method of Python language programming course based on Internet of things engineering.

## 2. Teaching Method Design of Python Language Programming Course based on Internet of Things Engineering

### 2.1. Teaching level and teaching objective of Python language programming

Under the background of the Internet of things engineering, the teaching of Python language programming course is carried out for students, so that students can be familiar with Python programming syntax through learning and be able to write simple programs to solve problems using the basic Python development environment. And learn to use Python library, finally have the ability to use Python to develop Internet of things application projects. Therefore, the teaching goal designed in this paper is to carry out teaching for students of different majors and divide the teaching level of Python language program design course into two levels. One is the common computer course, as a non-information professional Python language introduction program design; The second is the professional application course, which is aimed at the professional students with a certain programming foundation [3].

The teaching objectives of the two levels of teaching are different. As a public computer course, the Python language programming course includes the teaching of basic language knowledge and basic algorithms as well as the Python ecosystem. Figure 1 (a) shows the intersection between the basics of the Python programming course and the Python ecosystem, but the former is the

focus. The content of the course should highlight the basic algorithm appropriately, and the teaching should be combined with the professional characteristics, such as the introduction of scientific computing module library for engineering majors, and the introduction of natural language processing module library for language majors.

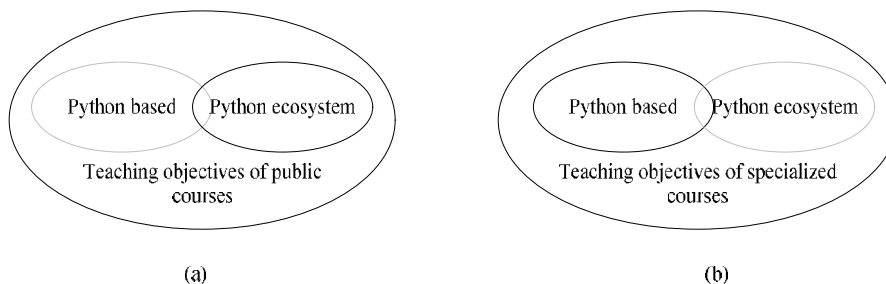


Figure 1. Schematic diagram of teaching objectives of Python course

As a professional application course, Python language programming course does not need to start from the basic algorithm logic and focus on the application of third-party libraries. It introduces the approaches and methods to solve the problems in the discipline domain with Python, as shown in figure 1 (b). There is a cross between the Python programming course basics and the Python ecosystem, but the latter is the focus. Students can quickly grasp the basic knowledge of Python programming based on their original learning experience of other programming languages. After determining the teaching level and teaching system, acquire the knowledge points of the Python course for teaching.

2.2. Acquire course knowledge

The following figure shows the process of corpus preprocessing of course knowledge. Teaching resources related to Python language programming courses are collected from the course resource database, and the collected course teaching resources are preliminarily preprocessed to remove useless information in these course teaching resources. After the initial processing of the course teaching resources into txt text format, and then txt text segmentation processing, to obtain the knowledge points of the course.

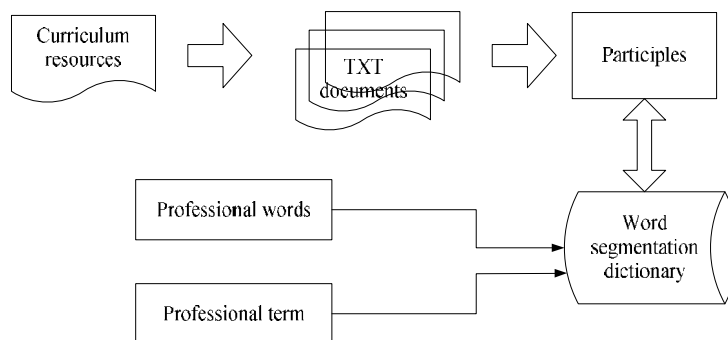


Figure 2. Course knowledge pretreatment process

In this paper, Rwordseg's own participle dictionary is used for word segmentation, and there is a problem of not being able to identify the new words and professional terms in the professional field. By means of custom dictionary, professional new words and professional terms

are added into the participle dictionary to conduct word segmentation again. After word segmentation, construct the VSM vector space model of feature words in Python language programming course and txt document, and use TF-IDF weight method to judge the occurrence frequen-

cy of feature words, so as to obtain the knowledge points of meta-course [4].

Through statistical analysis of the word frequency obtained by word segmentation, this paper establishes the relevant feature words of Python language programming course and the document word frequency matrix between the course resource documents, thus forming the VSM spatial vector model of course-related feature words and course resource documents. TF-IDF weight method is used to determine whether the feature word is a knowledge point in the Python language programming course, so as to obtain the knowledge point contained in the course corpus. The specific formula of TF-IDF weight method to obtain knowledge points of the course is as follows:

$$d_{tk} = f_{tk} \times \lg \frac{N}{n_t} \quad (1)$$

In formula (1),  $f_{tk}$  refers to the word frequency of relevant feature word  $t$  in the Python language programming course in the course resource document  $k$ ,  $d_{tk}$  refers to the weight,  $N$  refers to the number of documents in the course resource document set, and  $n_t$  refers to the occurrence frequency of relevant feature word  $t$  in the whole course resource document set. The higher the frequency of the target word  $t$ , the greater the weight  $d_{tk}$ . After obtaining the meta-knowledge points in the course according to the weight, the compound knowledge points in the course are acquired [5-6].

First, judge whether the knowledge points formed by the combination of two meta-knowledge points are compound knowledge points. Set knowledge points  $A$  and  $B$ , and the combination of knowledge points  $A$  and  $B$  to form a new knowledge point is  $AB$ . The new knowledge point  $AB$  is regarded as a string, and the tightness of the combination between the new knowledge point  $AB$  is obtained through relevant calculation in the class phrase string model, and the tightness of the combination between  $AB$  is used to judge whether  $AB$  is a compound knowledge point of the course [7]. In natural language processing, mutual information is usually used to measure the degree of interdependence between two concepts. The mutual information between course knowledge point  $A$  and course knowledge point  $B$  can be expressed as follows:

$$MI(A, B) = \log_2 \frac{P(A, B)}{P(A)P(B)} \quad (2)$$

In formula (2),  $P(A, B)$  represents the probability of the new course knowledge point  $AB$  appearing in the course resource document,  $P(A)$  represents the probability of course knowledge point  $A$  appearing in the course resource document, and  $P(B)$  represents the probability of

course knowledge point  $B$  appearing in the course resource document [8-9]. According to the above formula, mutual information value  $MI(A, B)$  is used to quantitatively estimate the probability of becoming compound knowledge point between knowledge point  $A$  and knowledge point  $B$ . The greater the mutual information, the higher the degree of integration between knowledge points  $A$  and  $B$ , and the greater the probability of two knowledge points becoming compound knowledge points. The smaller the mutual information is, the lower the degree of integration, and the smaller the probability of two course knowledge points becoming compound course knowledge points. After acquiring the teaching knowledge, design the teaching level and teaching system of the course according to the Python language program, and combine the knowledge points to determine the optimal teaching means to achieve the teaching goal.

### 2.3. Determine teaching tools

According to the teaching level and teaching system studied in 1.1, this paper adopts the mixed teaching method as shown in the figure below. Mixed teaching is the combination of theoretical knowledge and practice. In the teaching process of blended learning, while teaching students basic knowledge, teachers set up a variety of practical scenarios to promote students' own learning and improve their learning enthusiasm and initiative.

In the beginning, the teacher-oriented students teach the basic knowledge of Python language programming and guide the students to learn. During the learning process, students learn knowledge in stages, solve the situation programming problems set by teachers, and actually check the procedures in the Internet of things engineering. Through practice test, students can constantly optimize their programming thinking and improve their Python programming ability. According to the different needs of students of different majors, design the practical content of Python language programming course. For the students of non-related majors, they should master the basic knowledge and solve similar problems according to the programming cases they have learned, so as to draw inferences by analogy. For students majoring in relevant majors, it is necessary to provide effective information technology support for students to master the programming ability to solve complex professional problems [10]. In addition to taking the practice form of students solving practical problems independently, we can also make full use of network technology to realize virtual experiment, simulation experiment and network simulation experiment, so as to improve students' ability to solve problems. Another important content of mixed teaching is the two-way evaluation between students and teachers. Teaching evaluation runs through every link of teaching. On the one hand, students' evaluation of teachers can promote teachers to improve their teaching level. On the other

hand, teachers make an overall evaluation of the learning situation of the class and summarize the teaching experience. Two-way evaluation can improve the teaching effect of mixed teaching method better. So far, I have

completed the research on teaching method of Python language programming course based on Internet of things engineering.

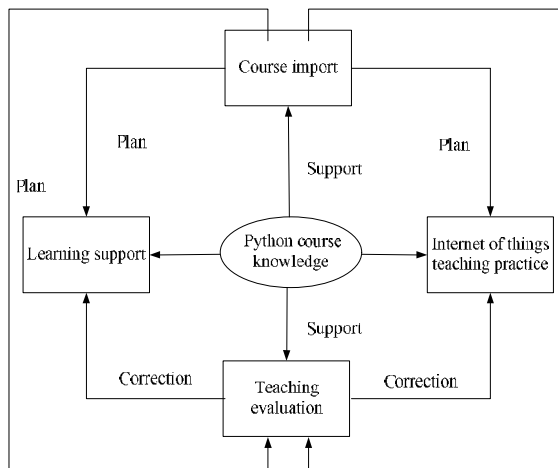


Figure 3. Schematic diagram of hybrid teaching methods

### 3. Teaching Effect test

This paper studies the teaching method of Python language programming course based on Internet of things engineering, and verifies the actual teaching effect of the teaching method studied in this paper by means of experiments.

#### 3.1. Test content

This experiment selected in I, II two teaching level and teaching resources in colleges and universities were similar. The teaching effect of the teaching method studied in this paper is verified in the form of comparative experiment. The control group of the comparison experiment is the traditional teaching method of Python language programming course, while the experimental group is the teaching method of Python language programming course based on Internet of things engineering studied in this paper. From the programming time, the succinct de-

gree of the program, the successful operation of the program, the logic of the program, and the writing of the program language in accordance with the norms, the students' learning effect was comprehensively measured from five aspects. Through the comparison of experimental indicators, the advantages and disadvantages of the teaching method in the experimental group and the control group were compared.

I, II participants of the 800 students in two universities, in order to guarantee the uniqueness of experimental variables and the results of scientific and effective, all of the students didn't accept before taking on the Python language program design course of other teaching resources input, but has a certain use other computer language programming basis. Before the teaching of experimental subjects, the comprehensive ability of all students was tested from five perspectives. Computing I, II two schools to participate in the average comprehensive performance of the students in the experiment.

Table 1. Average comprehensive scores of students participating in the experiment before the experiment

Test point of view	School I	School II
Programming thinking	7.1	7.0
Logical thinking	7.9	8.0
Programming time	6.5	6.6
Degree of simplicity	4.3	4.5
Programming success rate	6.3	6.2

As can be seen from the above table, the comprehensive quality of the students participating in the experiment in the two schools is not much different, which meets the

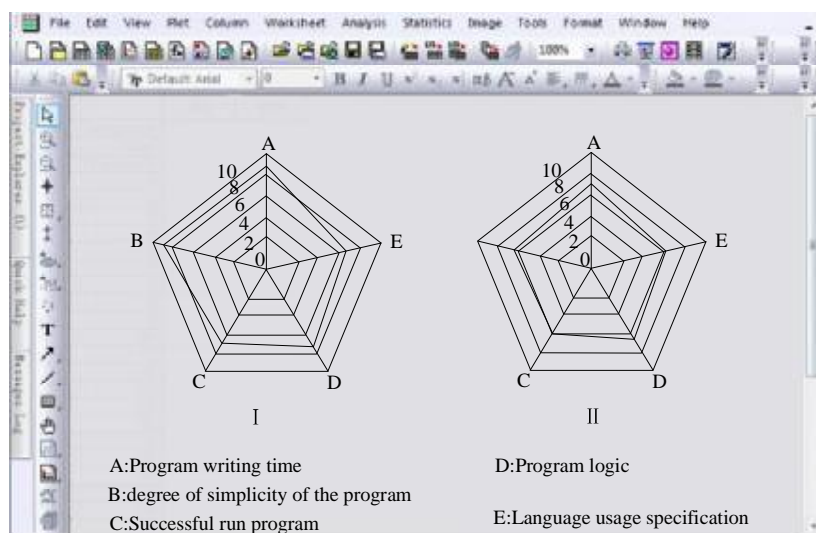
requirements of the experimental subjects in the comparative experiment. I university students by the method of experimental teaching, II students at the university of

application in the control group teaching method. Namely I students at the university of application program design course teaching method, this article research II university students used the traditional program design course teaching methods. During the experiment, control other experimental variables and complete the experiment verification. After the end of teaching, students participating in the experiment will be assessed with the same assessment method. Statistics of all students as-

essment results, and analysis of assessment results, draw the corresponding conclusions.

**3.2. Test results**

The test results of the teaching methods of two groups of Python language programming courses are shown in the following figure. The information in the figure is analyzed and the experimental conclusion is drawn.



**Figure 4. Teaching method test results**

According to the above figure, group I to participate in the average comprehensive performance than of the students in experimental group II to participate in the average comprehensive performance of the students in the experiment. Group I experiment the students' comprehensive performance and its participation in the experiment before the average comprehensive performance contrast, various aspects ability has obvious improvement; Group II experiment the students' comprehensive performance and its participation in the experiment before the average comprehensive performance, the specification of the programming language and programming operation success rate on small, almost no improve other aspects. For the teaching purpose of Python language programming course, programming logic, program success rate and program conciseness are important indicators to measure the quality of a program. In the case of the teaching resources are all in the same level, compared with the traditional teaching method group II student, applied in this paper, the design method of teaching group I students can better realize the Python language program design course teaching purpose. To sum up, the teaching method of Python language programming course based on Internet of things engineering designed

in this paper has better teaching effect and higher practical value.

**4. Conclusion**

Python language has become a commonly used computer language, proficiency in running Python language for programming operations is the basic requirement for students. This paper studies the teaching method of Python language programming course based on the Internet of things engineering. Through the comparison experiment with the traditional teaching method of programming course, it proves that the research method in this paper can improve students' ability to a greater extent and make them more proficient in mastering and applying relevant knowledge, which has advantages.

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