Research on Inquiry Teaching of R Language Foundation Based on Mobile Learning Platform Under the background of big data

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Abstract: With the rise of mobile Internet, the development of big data technology changes with each passing day. R language foundation is an important course for computer application technology, big data technology and application, cloud computing technology and application, and etc. At present, there are some problems in the teaching of "R Language Foundation" course, such as insufficient preview of students before class, lack of active thinking and participation in classroom implementation, and single assessment method. The inquiry teaching of "R Language Foundation" based on mobile learning platform can change the traditional cramming teaching and adopt the student-centered teaching method. The teaching mode can guide students to think in an orderly way, actively participate in learning tasks and activities, give full play to students'learning autonomy, and the teaching effect is good.

1. Introduction

At present, the big data industry is developing rapidly. Many colleges and universities offer courses related to big data. According to the current development trend of big data industry and the current situation of talent training in our college, a professional course "R language foundation" has been set up. For the teaching of this course, with the help of mobile learning platform, inquiry teaching can be integrated to change the traditional "transfer accept" cramming teaching mode. In order to improve the teaching quality effectively, it is necessary to carry out "doing in learning" and "doing in learning" in inquiry, improve students' initiative in learning, guide students to think actively and cooperate in teams [1-2].

R language foundation is a practical professional course for computer, big data, cloud computing and other majors. In the course, the teacher should not only emphasize the explanation of theoretical knowledge, but also pay attention to the organization and design of experimental content, so as to achieve the purpose of learning for use [3]. Mobile learning platform and inquiry teaching are well applied in the course of R language foundation.

2. Current problems

2.1 Insufficient Preparation Before Class

In the teaching of R language foundation course, if there is no preview link or there is insufficient preview before class, it is difficult for teachers to effectively guide students' learning process in the classroom, and it is inevitable that teachers will dominate the classroom. Teachers can not meet students' personalized needs for the content to be learned according to the actual situation, which will greatly reduce the teaching effect [4].

2.2 Low Participation of Students in Classroom Teaching

The teaching contents of R language foundation course mainly include R language overview, installation and use of graphics operation tool RStudio, data structure (vector, matrix, array, etc.), reading and writing of data files, application of control flow statements, common operations of data preprocessing (data sorting, data cleaning, etc.), drawing and visualization modules. The traditional teaching mode of classroom teaching plus experiment is relatively single, and students have been in the state of passive reception. The students' subjective initiative can not be effectively exerted, and the practical application ability of analyzing and solving problems can not be effectively improved. This is especially true for higher vocational students, who have a certain enthusiasm for learning, but many students are lazy and lack the ability to think actively. So in the classroom teaching, the teacher should try to guide students to think in an orderly way [5].

2.3 Simplification of Assessment and Evaluation Methods

Although "R language foundation" course examination has changed the traditional way of paper examination, but at the end of the term, it is carried out by computer operation. That is to say, students are required to make use of the R language knowledge they have learned and program it according to the requirements of the test questions within the specified time. Then the teacher gives the usual scores according to the attendance, class performance, experiment and so on. At last, the final grade and usual grade are combined to give the general evaluation of the semester. However, this method is still a result evaluation, and students are prone to plagiarism at the end of the term. Therefore, in the classroom teaching, the teacher can use the way of group completion of projects and reporting, and use student self-evaluation, inter group evaluation, teacher evaluation and other forms of formative evaluation, which is conducive to students' sense of achievement and interest in the course [6].

3. Inquiry Teaching

The guiding ideology of inquiry teaching is to guide students to explore consciously and initiatively under the guidance of teachers, and master the methods and steps of understanding and solving problems. Through collecting data, designing and carrying out experiments, students conduct research in investigation, observation, discussion and other activities, and finally come to a conclusion. It can be seen that in the process of inquiry teaching, the main position and initiative ability of students have been strengthened [7].

The carrier and core of inquiry teaching is the problem. Learning activities are carried out around problems. The most important point of inquiry teaching is to set the questions to be answered, which is the starting point of further inquiry. From the perspective of teaching, teachers need to carefully consider according to the teaching purpose and content, put forward problems with moderate difficulty and reasonable logic, and gradually guide students to think actively and orderly.

4. Implementation of R language foundation inquiry teaching based on mobile learning platform

Taking the section of "drawing statistical chart" as an example, this paper explains the implementation process of inquiry teaching in the course of "R language foundation". R language mobile learning platform is used in pre class guidance, classroom implementation and after class review. Task driven method, case analysis method and discussion teaching method are used. Under the guidance of problems, students can learn by doing. The content of this section is 4 class hours in total. The teaching focus is to master the basic steps of drawing statistical chart. The teaching difficulty is to collect and import data according to the actual application requirements, and select the appropriate type of statistical chart and draw it.

4.1 Pre Class Guidance

The teacher releases the preview task list on the mobile learning platform to let students preview in groups. Students prepare in groups to complete task one on the mobile learning platform (as shown in Figure 1). Students select topics closely related to daily life, acquire and collect data on this topic (such as pollution index, house price data, sleep time data, etc.), input data in Excel and save them. In this way, students can choose their own topics and stimulate their interest.

At the same time, students should prepare several thinking questions before class.

Fig.1. preview tasks released to mobile learning platform before class

4.2 Classroom Implementation

Classroom implementation is divided into five steps: import new lessons, case analysis, assignment, presentation and review, and summary and reflection.

Import new lessons: Show students the charts of specific cases (as shown in Figure 2) to arouse their interest.

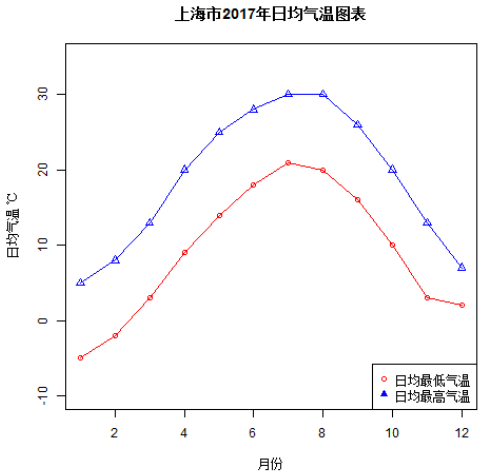


Fig.2. New lesson case

The teacher uses the problem leading method to let the students review the content of the preview before class. These questions are relatively simple and easy to start with, leading to the focus of this lesson.

Case analysis: Taking the statistical chart of daily average temperature as an example, the basic steps of drawing the statistical chart are explained.

The teacher demonstrates the operation, explains the procedure and highlights the key points of this lesson, as shown in Figure 3. Explain the three basic steps of drawing program: create chart data, draw statistical chart and save statistical chart file. Explain the plot () function.

Fig. 3. shows the basic steps of drawing a statistical chart

Ask the question: what happens if the scale range of the coordinate axis is not set in the plot function?A "chipping" diagram like Figure 4 will appear. Each student downloads and debugs the program by themselves, realizes the difference between "top clipping" and "foot clipping", and completes the subtask one of the case analysis task list: "foot clipping".

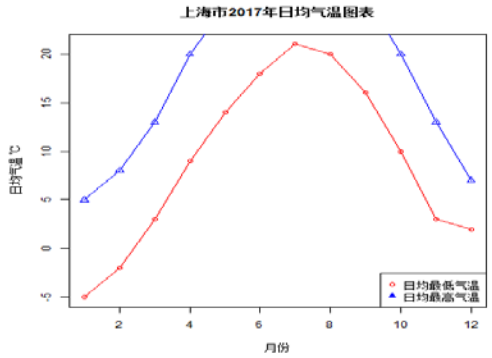


Fig. 4. The formation of "cut top" figure

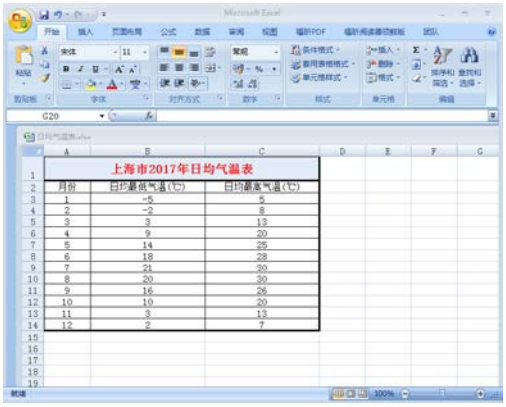
Students debug the program, and debug the color, symbol, legend, coordinate range, etc. Each student downloads the debugging program and completes the sub task 2 of the case analysis task list: debugging the appearance program of the statistical chart.

The problem leading method is adopted to carry out step-by-step progress, and finally leads to difficulties.

Teachers ask new questions:

Question 1: the above method of directly listing data is applicable to the situation of less data. When the data changes, people need to modify the program directly. This will cause a lot of problems. What should I do?

The method is to import data sets, such as data from Excel files, as shown in figures 5 and 6. The code shown in the red box in Figure 6 is the process of importing and reading data.



上海市2017年日均气温表

月份	日均最低气温(℃)	日均最高气温(℃)
1	-5	5
2	-2	8
3	3	13
4	9	20
5	14	25
6	18	28
7	21	30
8	20	30
9	16	26
10	10	20
11	3	13
12	2	7

Fig. 5. Data from Excel

```
# 导入图表数据
install.packages("openxlsx")    # 安装能处理xlsx文件的包openxlsx
library(openxlsx)    # 载入包openxlsx的资源

readFilePath<-"D:/worksp/授课案例/日均气温表.xlsx"    # 读取文件日均气温表.xlsx的路径
mydata=read.xlsx(readFilePath,sheet = 1)      # 读取文件日均气温表.xlsx的sheet1数据页
mydata1<-mydata[2:14,2]   #取日均最低气温(℃)这一列的数据
mydata2<-mydata[2:14,3]   #取日均最高气温(℃)这一列的数据

# 设定统计图文件名
png(file = "上海市全年日均气温.jpg")

#绘制统计图
plot(mydata1,type = "o",col = "red", xlab = "月份", ylab = "日均气温 ℃", xlim = c(1,12),ylim = c(-10,35),
     main = "上海市2017年日均气温图表",pch=1)
lines(mydata2, type = "o", col = "blue",pch=2)

leg.tex<-c("日均最低气温","日均最高气温")
legend ("bottomright",leg.tex,col=c("red","blue"),pch=c(1,17))

#保存统计图文件
setwd("D:/worksp/授课案例")
dev.off()
```

Fig. 6. Code to import and read data

Question 2: for an application, how to select the right type of statistical chart to draw? If simple data calculation is involved, which functions can be used? How to beautify the statistical chart? (voting and topic discussion can be adopted for class)

Then let each student download the corresponding program, debug, and complete the sub task three of the case analysis task list: draw bar chart.

Assignment: Take the group as the unit, complete the content of task 2 on the course platform: according to the excel file obtained in task 1, draw the statistical chart with R language and beautify it, as shown in Figure 7.

Fig. 7. Task 2 and the works completed by group 3

Students' activities include autonomous learning, group discussion and experiential exploration. They cooperate to complete the five steps of importing datasets, calculating data, drawing charts, beautifying charts and saving files. Students cooperate to explore and realize "learning by doing".

Teachers should guide, prompt, remind and praise in time to achieve "teaching while doing".

presentation and review: It consists of students' presentation and comments. Each group displays the results, exchanges the experience, and realizes the joy of success. Process evaluation method is adopted. As shown in Figure 8, the work is a chart of online music and mobile music users penetration, which is completed by a group of students.

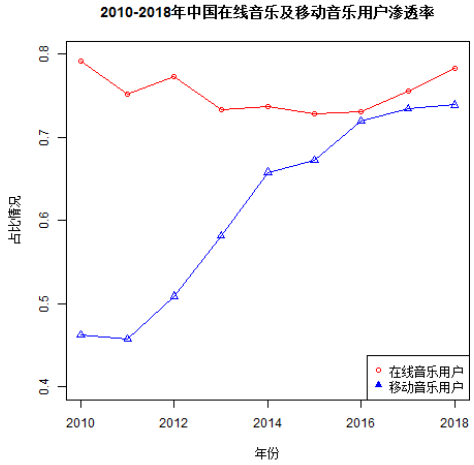


Fig. 8. Students' works

Summary and reflection: Review knowledge and emphasize key and difficult points.

4.3 Review After Class

Consolidate what you have learned. Around the theme of "micro steps", each student uses R language to draw their own micro steps statistical chart.

5. Teaching reflection

Teaching reflection is as follows[8-10]:

1) In the pre class preparation stage, the tasks proposed should be simple and easy to carry out, so as to guide students to think in connection with actual life. Students should not consider the specific implementation details first, so that they can focus on the overall idea, choose the appropriate topic, and understand the relationship between the data.

2) Based on the mobile learning platform, "R language foundation" inquiry teaching, from pre class preview to classroom implementation, all adopt the method of problem leading and progressive layer by layer, leading to the key and difficult points. Coding and debugging are used to solve the problem. It can guide students to think in an orderly way, transform the learning of single programming skills into the training of thinking and the learning of methods, which is conducive to the cultivation of compound talents.

3) In teaching, task driven is the commander in chief. In case analysis, task arrangement and other links, the process of learning while doing is adopted, so that students can learn happily in practice and master technology more quickly.

4) Considering the gap of students' efforts, in the case analysis stage, each student is required to rewrite and debug the program according to the teacher's explanation of each problem. In this way, students will be inspired by the successful debugging of the program. In the stage of task arrangement, a large comprehensive task is completed by group cooperation for the selected topic. Students can cooperate with each other and help each other. They can not only cultivate the sense of team, but also cultivate and stimulate creative thinking, so that every student can get something.

5) The teaching methods include explanation, debugging procedures, quick answer, voting, topic discussion, presentation and comment. The students have a high interest in learning. The interaction between teachers and students is good. The teaching effect is good.

6) Homework is similar to group task in classroom. Each student is required to be able to draw inferences from one example and complete independently, which is an intensive training and breakthrough of personal ability.

6. Conclusion

Based on the mobile learning platform, "R language foundation" inquiry teaching, uses task driven method, case analysis method, and discussion teaching method. Under the guiding ideology of inquiry teaching, students should focus on Problems and learn by doing. Students can learn independently, cooperate with each other, summarize and reflect. In the process of evaluation, results display and mutual evaluation are used to increase formative evaluation. The application of R language mobile learning platform and inquiry teaching improves the overall teaching effect.

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