

# Design of Novel Teaching and Learning Mode for Python Course in Zhejiang Shuren University based on ‘Internet+’

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## Abstract:

Before January 2020, the teaching and learning processes in most countries around the globe were completed each day with an offline mode. Teachers and students are already used to and comfortable with daily teaching or learning activities going on in the classrooms. However, the sudden outbreak of a major COVID-19 pandemic has reshaped the teaching and learning mode. With the spread of the epidemic around the world, schools in Europe, the United States and some Asian countries have to adjust their teaching modes emergently. Teachers in all countries around the world have changed their commuting or driving to school modes to working from home modes. In China, all Chinese universities, middle schools, primary schools and even kindergartens have had to shift from offline modes to online modes. Python language is a programming language similar to C++, Java and R. This paper discussed how to improve the original teaching mode of Python language in Zhejiang Shuren University once all the teaching and learning activities are to be based on ‘Internet+’ so as to increase the interactions between teachers and students and ensure the teaching and learning effects.

**Keywords:** Offline, Online, Teaching and Learning, Python, COVID-19.

## I. INTRODUCTION

‘Internet+’ refers to a new form evolved from the emergence of Innovation 2.0 which is an innovative form in informationized age and knowledge-based society. ‘Internet+’ simply means internet and the traditional mode. With the development of science and technology, the information technology platform makes the internet mingle with the traditional mode and bring new development opportunities for the traditional mode. ‘Internet+’ optimizes, upgrades and transforms the traditional model through its own advantages, so that the traditional model can adapt to the current everchanging world and advancing pace of the society.

Python is a programming language designed by Dutch scientist Guido Van Rossum in the early 1990s. Programming language is a language, which can be understood, accepted and processed by computers, written by humans with certain grammatical rules. The Python development environment and core libraries are coded and implemented with C++ language. In recent years, Python language has gradually attracted worldwide attentions. At present, many open-source software packages provide interfaces for Python, which greatly improves the application scope of Python. Visual library OpenCV, 3D visualization library VTK

and medical image processing library ITK equipped Python with processing abilities for 3D graphics. The scientific computation libraries NumPy, SciPy and Matplotlib provide Python with fast array processing, numerical operation, data analysis, data mining and graph drawing functions. In addition, Python can as well grab data from internet, carry out deep learning and AI-based operations and handle and recognize images. The upsides of Python are simple to understand, easy to learn, easy to understand, easy to maintain, versatile, free, open-source, portable, object-oriented, extensible, embeddable, having rich libraries, dynamic and etc. The downsides include single-line statement, confusion for beginners and slow running speed.

Two years ago, python language teaching and learning activities in Zhejiang Shuren University have always been the offline mode. In the computer room, 'JIYU' classroom software<sup>[1]</sup> is installed in the teacher's main computer. The software enables teachers to monitor the computer screens at students' seats through the main computer, restart all students' computers, receive files from students and send courseware to students as shown in Figure 1.

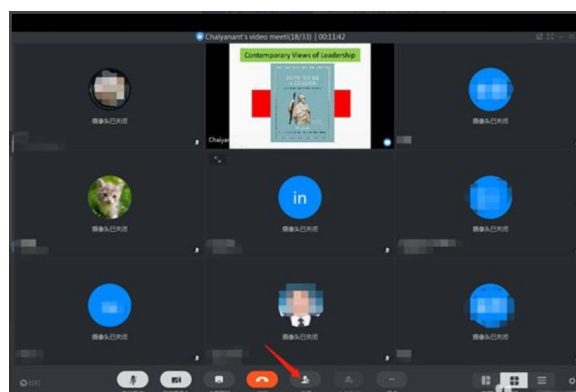


Figure.1 'JIYU' Electronic Classroom Software

In the teaching and learning process, self-compiled textbooks and various self-made Powerpoint coursewares with different styles are mainly used as afterclass materials. And, it is difficult for teachers to meet, discuss and unify the teaching contents and coursewares during either weekdays or weekends in person. After the outbreak of COVID-19, teachers and students had to switch to online teaching and learning mode instantly. In the online teaching mode, DingTalk software<sup>[2]</sup> and Tencent Netmeeting software<sup>[3]</sup> are mainly used tools as shown in Figure 2.



(a) Tencent Netmeeting Software



(b) DingTalk Software

Figure.2 Online Teaching and Learning Software

These two softwares can share the teacher's computer screen on students' computers and mobile phones. However, they can't monitor each student's computer in real time to learn their progress in coding practice and study results. In addition, they don't provide a platform for online tests. At the same time, the

interactions between teachers and students are limited to the range covering only one teacher and his/her classes. The interaction between all teachers and the interaction between all students and all teachers have not been established yet.

This paper considers improving the current Python course teaching and learning mode by making full use of internet technology to conceive a framework for online teaching and learning. Thus a communication platform for encouraging the interaction among all Python teachers can be established. And a message board module can enable students to pose questions and teachers to answer questions. Furthermore, online examination module and learning resources (files, videos, websites, etc.) sharing module are essential and necessary as well.

## II. GENERAL FRAMEWORK OF ONLINE TEACHING AND LEARNING SYSTEMS

In an information age, teaching and learning mode should be both online and offline. Currently, the offline mode is already very mature. However, the application and development of online systems are far lagging behind. As lockdown measure comes from time to time, it is essential and necessary to conceive a blueprint for online mode.

In our design, the online teaching and learning systems are composed of 5 parts as shown in Figure 3.

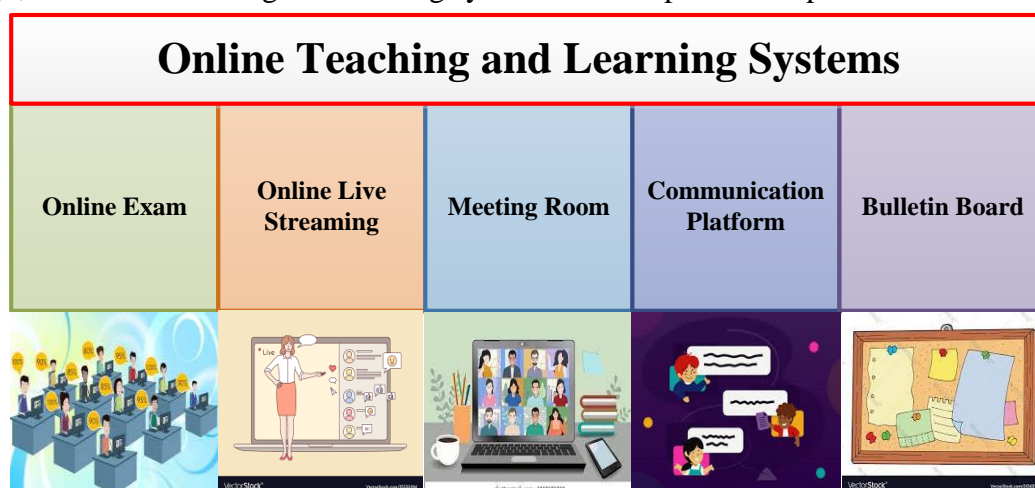


Figure.3 Framework of Online Systems

### 2.1 Online Exam Module

In this module, we should integrate the functions of teachers' information management, classes' information management, students' information management, teachers' teaching tasks management, exam command release, test bank maintenance and students online exam management.

Teachers' information management function can update teachers' status in time. For example, if some teachers' titles change, their premium per class will be adjusted accordingly. Also, there will be some new teachers joining the course team. And some teachers may no longer undertake the teaching tasks due to their resignations or retirements.

Students' information management should be able to reflect the changes and updates of students' situation in time. It will record students' basic information, update students' degradation information and manage students' resit or redo information.

Classes' information management function can reflect which students are in which class, and whether a student in the class drops out or joins in.

Teachers' teaching tasks management function can associate teachers with classes. And it will enable the teachers to set online exam timetables and issue examination commands for their own classes.

The test bank maintenance function allows teachers to input all sorts of questions and corresponding answers that have been discussed and acknowledged collectively by all the course teachers into the system. Thus, the online test paper generation function and auto-scoring function can be secured.

The online exam and monitoring function have students to log in to the test paper webpage to finish choice, blank-filling and coding questions. Coding questions can be submitted in compressed files and the system will generate MS.word test papers for teachers to assess and score. During the exam, teachers can monitor each student's computer screen to prevent cheating. At the same time, the exam system should have the function of IP detection so as to avoid the students are sitting too close to each other in the computer lab.

## 2.2 Online Live Streaming Module

Here, we should copy the functions of 'JIYU' software which is popular in computer labs. Teachers can conduct live streaming teaching activities online and monitor each student's computer screen meanwhile. At the same time, teachers can interact and communicate with their own students at a sidebar area.

## 2.3 Meeting Room Module

Meeting room function creates a platform for teachers to face each online. In the meeting room, teachers can discuss about the course contents, teaching plans and textbooks. And the most important aspect is to unify the contents and style in the teaching courseware which is a Powerpoint file. It is very essential to highlight the contents and codes in the Powerpoint file with different colors to help students to reinforce their understandings and consolidate their knowledge as shown in Figure 4.

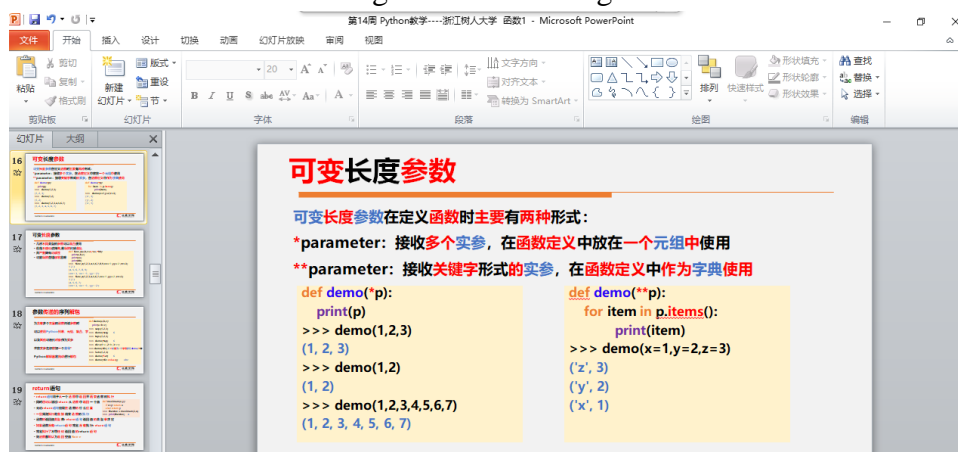


Figure.4 Powerpoint File

## 2.4 Communication Platform Module

In the communication platform, all course teachers and all students can join in a chat room to talk about teachers' teaching quality or solve python questions together. At the same time, teachers can communicate with students about the time for live streaming classes so as to make up for missed offline classes caused by their own personal affairs, meetings, training activities, field researches, etc. Thus, the risks of committing violations of regulation in teaching activities are about to be reduced.

## 2.5 Bulletin Board Module

In bulletin board module, teachers can announce the official notice of suspensions and adjustments of classes confirmed by the educational administration department. At the same time, teachers will publish the relevant teaching and learning resources of python course through bulletin board. The contents include unified teaching courseware, electronic teaching materials, teachers' self-recorded course teaching videos and a variety of online resources with links.

### III. CURRENT PROGRESS TOWARDS NEW 'INTERNET+' MODE

Currently, an online exam platform has been developed with javascript and applied for 2 years. This system helps teachers a lot in saving their time on working out test papers. This exam platform mimics the system adopted by Zhejiang Province educational bureau in China.

The student login page is shown in Figure 5. The test paper interface is shown in Figure 6. The teacher login interface, classes management application, test paper submission management page and test bank maintenance function are presented in Figure 7-10.



Figure.5 Student Login Interface

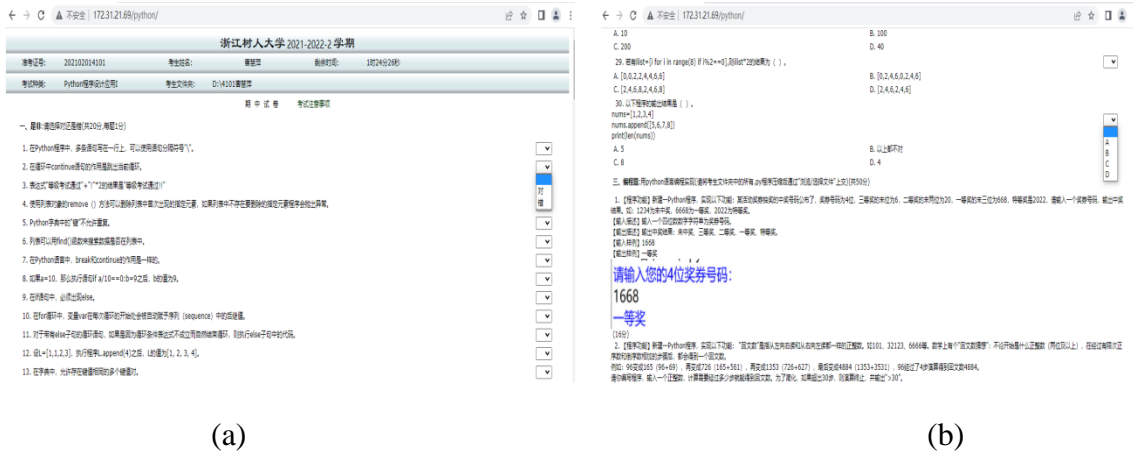


Figure.6 Test Paper Interface





后台管理系统请使用ie9及以上的浏览器，否则一些页面将无法打开!

要在系统中实施一次课程考试，必须按次序做好以下工作:

1. 检查任教班级是否存在。选择“基础数据”->“考生管理”菜单，进入考生登录帐号管理界面，检查任教的班级是否存在，若存在，则进入下一步，否则联系教务员导入学生数据;
2. 设置教学任务。选择“教学计划管理”->“教师任课安排”菜单，进入教学任务安排界面，添加任教的班级。教学班以同时参加一场考试为准，如一次需有4个班同时参加考试，则组班时需将这4个班组成一个教学班;
3. 设置组卷参数。选择“考试环境”->“组卷参数管理”菜单，进入组卷参数设置界面，添加或修改试卷的组卷参数：考试时间、出卷的题型、题数及相应的难度系统比例。若以前已创建了组卷参数，则可以省略;
4. 发布考试命令。选择“考试环境”->“考试命令发布”菜单，进入考试命令发布界面，选择考试类型后，选中要考试的班级、考试开始时间后，单击“确定”按钮即可。

因考试系统是基于Web的，浏览器会保存上次的浏览信息，只要进入时发现异常（如明明已进入了考试状态，但浏览器还是显示处在测试状态，或倒计时时间不正确等），就需要做刷新就行了，一次不行就再刷一次;

考试过程中学生可以关闭浏览器退出考试系统，只要重新登录就可继续原来的考试。如重新打开浏览器时出现还在倒计时等不正常状态，刷新就可。

Figure.7 Teacher Login Interface

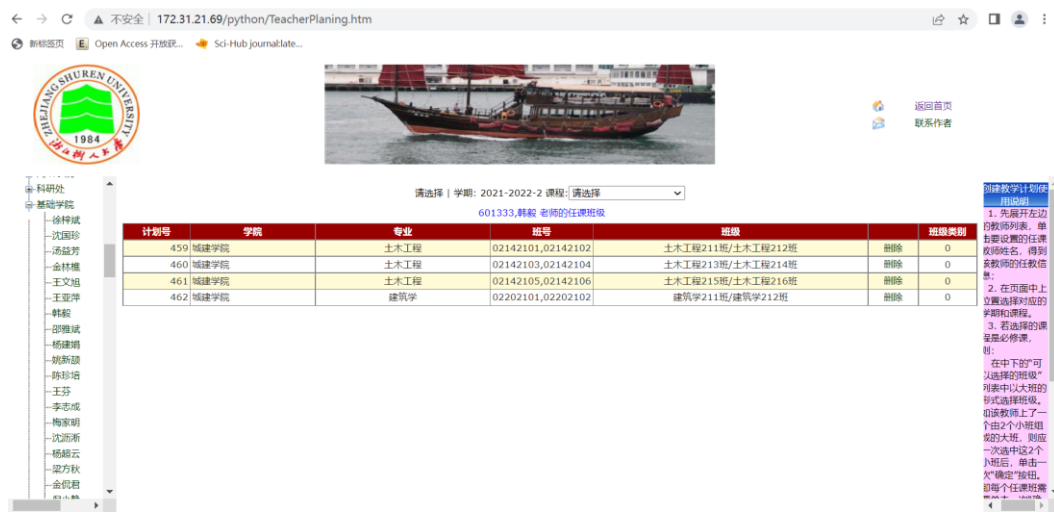


Figure.8 Class Management Interface



Figure.9 Test Paper Submission Management Interface

题号	章节	题目	题型	知识点	难度	选项A	选项B	选项C	选项D	考试吗?
7944	基本语法-31	运行以下程序, 输入66, 输出的结果是: ( )   x=input()  y='11'  print(x+y) 	单项选择题	顺序结构	应知应会	6611	77	1166	运行时出现错误提示	期中/期末/补考/重修/选修
7945	基本语法-31	a1='89', a2=a1*2, 则max(a2) 的结果是: ( )	单项选择题	运算符	提升级	'9'	'8'	'178'	'8989'	期中/期末/补考/重修/选修
7946	基本语法-31	len("123/n2")的计算结果是: ( )	单项选择题	字符串函数	应知应会	6	3	4	5	期中/期末/补考/重修/选修
7961	基本语法-31	表达式eval("2020/10")的结果是 ( )	单项选择题	eval()	应知应会	202.0	0	2020/10	202	期中/期末/补考/重修/选修
7962	基本语法-31	若已执行import math, 可用于计算方程a*x <sup>2</sup> +b*x+c=0一个实根的是 ( )	单项选择题	math	提升级	$x = \frac{-b + \text{math.sqrt}(b^2 - 4*a*c)}{2*a}$	$x = \frac{-b + \text{sqrt}(b^2 - 4*a*c)}{2*a}$	$x = \frac{-b + \text{sqrt}(b^2 - 4*a*c)}{2*a}$	$x = -b + \text{sqrt}(b^2 - 4*a*c) / 2*a$	期中/期末/补考/重修/选修

Figure.10 Test Bank Maintenance Interface

#### IV. CONCLUSION

In this paper, we presented a scheme for designing an online teaching and learning platform hoping to facilitate a noval ‘Internet+’ teaching and learning mode. The new python course mode will bring loads of benefits for teachers and students. Right now, there is still a long way to go towards fully deployment of the new online system since only the online exam function is built up. And, even if the new system is completed someday and applied in the future, how to quantify each teacher’s workloads is still a tricky thing.

#### V. FOUNDATION

This paper is granted by Talent Project of Zhejiang Shuren University (KXJ1420601).

#### REFERENCES

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