



USING THE PROBLEM-BASED DESIGN METHOD IN TEACHING PROGRAMMING LANGUAGES

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Annotation

The article provides information on how to effectively use design and problem-based learning methods when teaching a programming language. Information is provided about the methods of teaching the programming language and their differences, about the work of scientists who carried out scientific activities based on these methods. Examples of projects executed in the Python programming language are based on design and problem-based learning.

Keywords: design method, problem-based learning method, Programming, python, working with modules, methodology.

INTRODUCTION

Choosing the right way to teach a programming language is of great importance and relevance in the modern information society. Programming is one of the basic skills needed in many fields such as information technology, science, business, and even art. The right teaching methodology can significantly improve the quality and effectiveness of learning by helping students develop an understanding and understanding of the programming language.

The choice of teaching methods also plays an important role in maintaining the motivation of students. Some methodologies, such as project-based learning or problem-based learning, allow students to interact with real-world tasks and put their programming skills into practice. This helps to increase the interest and motivation of students, as they see the application of their knowledge in the real world.

In addition, the importance of choosing the right teaching methodology is related to the individual characteristics of the students. Some students learn better through visual or interactive methods, while others prefer more traditional approaches such as lectures and exercises. Adapting the teaching methodology to different learning styles and needs of students can improve the quality of learning and contribute to successful mastery of the programming language.



Methods

The methods used in teaching a programming language represent various approaches and strategies that help the learner effectively learn the basics of programming and develop skills in this area. Examples of these methods include:

Design method (project-based learning): This method is based on providing the student with real or simulated projects that they must complete using a programming language. This helps the student to learn from practical experience, as well as develops skills of cooperation, problem thinking and independence. The application of this method in teaching the Python programming language and creating various projects can be found V. A. Slepov researched and gave examples of projects that can be created using his Tkinter module[1].

Reverse learning (inverted learning). In this method, students study theoretical material in advance by reading study materials before class or watching video lectures. Then, in the lesson, the teacher conducts active discussions, asks questions and performs practical exercises to apply and test the concepts of the students. This method ensures self-development and promotes active participation in learning. Regarding the application of this methodology in the Python programming language, A.P. Tonkix conducted a study. He provided data on the development of students' self-learning skills in reverse learning[2]

Pair programming (pair programming). This method involves the collaboration of two programmers working together on the same computer. One writes the code, the other analyzes and suggests optimization. This method develops communication skills and collaboration. Laura Bell, Michael Branton-Spall, and others believe that pair programming is one of the most acceptable ways to inform a new student about the process when they join a group[3].

Problem-based learning. In this method, students face real or simulated problems that they need to solve using a programming language. This requires analyzing the problem, planning a solution, and implementing it. This method develops analytical thinking and the ability to apply knowledge in practice.

We consider the problem-based design method to be effective in teaching a programming language. Because projects are offered to the student in the form of small tasks. Having found a solution to these problems, it will be possible to create a primary project.

RESULTS

Jointly Supporting Design Methods and Problem-Based Learning Programming language learning depends on many factors, including students' knowledge levels, their learning preferences, and available resources. However, to integrate design and problem-based learning methods when teaching programming languages, the following general order is recommended:

Introductory explanation and presentation: The lesson should begin with a brief introduction to the topic and an explanation of the proposed project or problem that students will be solving.



Demonstration and discussion of concepts: Students are required to demonstrate the basic concepts and methods they use to develop or solve a problem. These concepts need to be discussed and student questions answered.

Work in groups or pairs: To solve a problem collectively, it is necessary to divide students into groups or pairs. This allows students to collaborate, exchange knowledge and ideas, and develop communication skills.

Practical application and independent work: Students must be given the opportunity to apply their knowledge and skills in practice. It is necessary to allocate time for independent work and experimentation with the proposed project or problem.

Feedback and discussion of results: Students should be encouraged to share their results and observations. It is desirable that feedback and recommendations for improvement be provided.

Final Discussion and Realization: The lesson should end with a discussion of what students have learned and how it can be applied in practice. It is advisable to ask questions that stimulate thinking and awareness.

This routine allows students to gain an introduction to the topic, learn essential concepts and techniques, apply their knowledge and skills, and recognize their accomplishments.

We will consider the application of the problem-based design method in teaching the programming language in the example of teaching how to work with message boxes, i.e. dialogue windows, from the tkinter module of the Python programming language. In this case, it is possible to offer the following problematic projects:

1. Create an input field, button and text in the window. Print a yes/no dialog when the button is pressed. This is how programmers do it:

```
from tkinter import *
from tkinter import messagebox as mb
w=Tk()
w.title("Receive a mailing address ")
ent=Entry(w)
ent.pack()
def do_it():
    oyna=mb.askyesno(title=" Confirmation ",
                    message=" Are you sure you want to add information?")
Button(w,text=" Acceptance ", command= do_it).pack()
lb=Label(w,text="")
```



```
lb.pack()  
lb.mainloop()
```

Now an additional condition will be added to this program.

2. When the yes button in the dialog box is selected, the information entered by the user should be reflected in the window. Close the dialog box when the No button is clicked.

Additional conditions can be added after this task is completed.

3. If the user input is an email address, print it to the window.

In this case, the programmer must check the entered string for several parameters and issue a dialog box only when these requirements are met. The check can be done step by step as follows:

1. The presence of the @ symbol in the string
2. On the line. the presence of
3. The @ sign must come before the period and there must be a letter between them
4. The first character must be a letter
5. The two characters at the end of the line are written

4. Check if the information entered by the user can be a postal address. If there is an e-mail address, a dialog box will ask whether it is really accepted or not. If the result is selected, the information should be displayed on the screen, otherwise, the input field should be left empty. If the postal address is entered incorrectly, an error warning window will be displayed.

At this stage, the following program is created:

```
from tkinter import *  
from tkinter import messagebox as mb  
  
w = Tk()  
w.title("Receive a mailing address ")  
ent = Entry(w, font="Arial 36")  
ent.pack()  
  
def bajar():  
    s = ent.get()  
    k = s[-2] + s[-1]  
    if s.find("@") < (s.find(".") - 1) and s.find("@") > 0 and s[0].isalpha() and k.isalpha():  
        win = mb.askyesno(title=" Confirmation ",  
                           message=" Are you sure you want to add information?")  
        if win:  
            lb.config(text=s)  
            ent.delete(0, END)
```

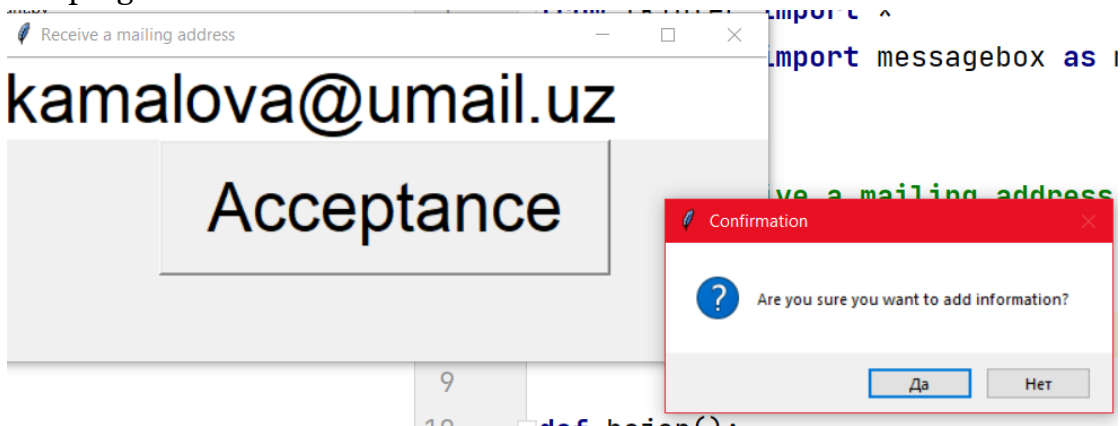


else:

```
ent.delete(o, END)
```

```
Button(w, text=" Acceptance ", command=bajar, font="Arial 36").pack()  
lb = Label(w, text="", font="Arial 36")  
lb.pack()  
lb.mainloop()
```

The program looks like this:



After that, the task is given to find the flaw in the program, that is, the value that causes the error. In this case, learners find the value that leads to the error and make the appropriate change so that this error does not occur.

The next project work will be carried out in the following stages.

Task 1. Create a window for the user to enter the time and print this time to the screen in hours and minutes.

Task 2. Check that the information entered by the user is hours and minutes. If the information is incorrect, print a warning dialog box.

Task 3. Determine by how many degrees the hour hand has turned.

The program code is presented in the following form:

```
from tkinter import *  
from tkinter import messagebox as mb  
w=Tk()  
w.title("The angle formed by the hour hand ")  
Label(w,text="HH:MM enter the time in the view ",font="Arial 36").pack()  
ent=Entry(w,font="Arial 36")  
ent.pack()
```

```
def do_it():
```



```
n = ent.get()
s = n[0:2]
m = n[3:]
if s.isdigit() and m.isdigit():
    if int(s) < 24 and int(m) < 60:
        t=str((int(s)%12+int(m)/60)*30)
        lb.config(text=t)
    else:
        mb.showwarning(message=" The time was entered incorrectly ")
else:
    mb.showerror(message=" Information must be entered ")
Button(w,text=" Determination ", command= do_it,font="Arial 36").pack()
lb=Label(w,text="",font="Arial 36")
lb.pack()
w.mainloop()
```

Bugs and optimizations in the program are discussed.

DISCUSSION

The combination of design and problem-based learning in programming language teaching helps students achieve a number of positive outcomes and goals. Project-based learning and problem-based learning allow students to put their programming language knowledge into practice. By solving real or simulated problems, students develop practical skills.

In both project-based learning and problem-based learning, students must analyze situations, search for solutions, and make decisions based on information and logical reasoning. It develops their critical thinking skills, ability to analyze and solve complex problems. During the implementation of projects, students work together. Collaboration and teamwork, especially with pair programming, require active collaboration and communication between students. It helps students develop communication skills such as expressing their thoughts clearly, listening and communicating with each other. Since working on projects and solving real-world problems is a more interesting and hands-on form of learning, students' interest in learning a programming language increases.

Project-based learning and problem-based learning provide opportunities for students to share knowledge, experiences, and ideas. This provides students with useful feedback. The combination of these methods helps students gain a deeper understanding of the programming language, improve practical skills, and develop valuable skills necessary for a successful career in programming.



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