

METHODOLOGY OF FORMATION OF PROFESSIONAL COMPETENCES OF STUDENTS ON THE BASIS OF PROGRAMMING LANGUAGES

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ABSTRACT

This article shows the formation of professional competencies by teaching undergraduate students in the field of "Professional education in the field of information and communication technologies" to develop pedagogical software products based on programming languages (C ++, Delphi). Methods of application of educational methods in teaching mathematics and natural sciences using programming languages are given. It is based on the importance of interdisciplinary continuity and continuity in the formation of professional competencies of students, such as design, engineering and research.

Keywords: Professional competencies, vocational education, Borland C ++, Delphi7, Simpson method, straight rectangular method.

INTRODUCTION

The importance of the use of programming languages in education is that they are used not only as a means of solving certain pedagogical tasks, but also to promote didactic and methodological development, to create modern and new forms of education. Programming languages play a crucial role in the methodological and didactic development of education, resulting in the development of professional competencies such as improving the quality and effectiveness of education, student design, construction, creativity and research.

It was noted that vocational education in the field of information and communication requires a bachelor's degree in the development of pedagogical software products in the field of professional activity. With this in mind, we present to students the methodology of developing pedagogical software products in the process of practical training and the use of programming languages in finding solutions to the simplest problems.

DISCUSSION

Programming languages are basically divided into two groups: low-level programming languages and high-level programming languages. Low-level programming languages are much more complex than those used to program microprocessors. Currently, high-level programming languages such as C ++, Delphi, Python, Java are used. This is due to the simplicity of programming, the presence of visual components and the perfection of the interface.

Borland C ++ builder6 is an object-oriented visual programming language developed by Borland and still in use today. The Borland C ++ programming language is an integral continuation of the C and C ++ programming languages with high capabilities, i.e. an innovative environment. In order to study the Borland C ++ programming language well, it is

necessary to model simple phenomena and processes in mathematics and science, to place and visualize the visual components in the form, to determine their properties. The inclusion of program codes in the program components and the development of software products with a perfect design will guide students in their professional activities. Creating the necessary software products for various professions and maintenance in the field of computer technology is the basis of professional activity of graduates of vocational education. To develop software products using any type of programming language, you need to start with simplicity and strive to achieve a plan-based result in a specific direction [3], [6].

The use of the FSMU method in teaching students to visualize events and processes using programming languages in practical classes gives effective results. In this case, students:

1. Express their opinions;
2. Give a reason for their opinion;
3. Give an example;
4. Summarize their ideas.

The practical lesson is carried out in the following sequence:

1. The practice teacher gives students the task of finding an analytical solution to the problem of dynamic process.
2. The practice teacher places the visual components in the form of a programming language of the analytically solved problem based on the feedback given by the students;

Visualization in the Borland C ++ programming language is as follows: The programming language is launched Borland C ++ -> File-> New-> Application. The label and button buttons from the standard content are placed one after the other on the form. The System content is then placed in the TPaintBox form. When entering arguments about the function, special attention should be paid to the size of the step and the angle of the shot [5].

1. The internship teacher enters the program codes with the participation of students;
2. Upon completion of the programming work, the compilation process is carried out and divided by the appropriate results after the sequence of shooting angle and speed values are entered;
3. Students give their opinions on the developed program;
4. Give reasons for their opinions;
5. Give an example by changing the sizes given in the problem;
6. The practice teacher summarizes the students' opinions and gives a final conclusion.

In the Borland C ++ programming language, the calculation of flight distance, flight time, maximum ascent height in the motion of an object thrown at an angle to the horizon, the creation of a visual program of the trajectory of motion was carried out. The development of such programs serves to improve the quality of education of students in the development of their professional competencies and their use in practice [4].

Working in the Delphi7 environment is more convenient and high-performance than working in the Turbo Pascal programming language, and is characterized by the use of visual components. If the student has mastered the Pascal programming language well, it will not be a problem. Visual programming facilitates programming and increases the student's interest in creating software tools [1], [2].

Using the Borland Delphi7 programming language, we develop an electronic program that approximates the calculation and error detection of exact integrals in three ways: rectangles, trapezoids, and Simpson methods.

The methods of using the Delphi programming language in the approximate calculation of the exact integral are explained by the practice teacher.

Method 1: Start the Borland Delphi7 programming language, select File-New-Console

Application and $S = \int_a^b f(x)dx$ in the approximate calculation of the exact integral we enter the

program code using the working formula of the rectangular method. It was continuous in the given interval $f(x) = x^2$ we divide the function into 100 right rectangles, the result is displayed in the console window after the compilation process.

According to Newton-Leibniz's law, we calculate the real value of the exact integral:

$$S = \int_2^5 x^2 dx = \frac{5^3}{3} - \frac{2^3}{3} = \frac{117}{3} = 39.$$

Absolute error: $\Delta S = |S_0 - S| = 0.31455$, relative error: $\varepsilon = \frac{\Delta S}{S_0} 100\% = 0.81\%$ **[Error!]**

Reference source not found.].

Method 2: We use the visual environment of the Borland Delphi7 programming language to approximate the exact integral in straight rectangles, trapezoids, and Simpson methods. In the modeling process, we generate graphs of functions in all three methods and the result in a single form. To do this, run the Borland Delphi7 programming language and create a new form. Pusk-Delphi7-File-New-Application. The form contains three TPaintBox from the System component, three TMemo from the Standard component, six TButtons from the Standard component, and nine TEdit components from the component palette. After renaming the property and entering the program code, we will be able to perform the compilation process [10], [8].

For the straight rectangular method $f(x) = x^2$, for the trapezoidal method $f(x) = \sin(x)$, As for the Simpson method $f(x) = e^{-0.01x}$ we choose functions such as. After the compilation process, graphs are generated when each Button is pressed sequentially, and the result is displayed in TMemo if values are entered in the corresponding cells (TEdit). We can get results by changing the number of pieces, the limit values as we wish.

Using straight rectangles, trapezoids and Simpson methods $f(x) = x^2$ dividing the function into 10, 100, 200, 500, 1000 pieces in the range, we determine the absolute and relative errors in the approximate calculation of the exact integral using the program.

Table 1: The results obtained in the approximate calculation of the exact integral

Number of pieces	Straight rectangular method	ΔS	ε	Trapezoidal method	ΔS	ε	Simpson method	ΔS	ε
10	35,89	3.10	7.96%	40,24	1.24	3.19%	40,08	1.08	2.78%
100	38,68	0.31	0.81%	39,12	0.12	0.31%	39,12	0.12	0.30%
200	38,84	0.15	0.40%	39,06	0.06	0.15%	39,06	0.06	0.15%
500	38,93	0.06	0.16%	39,02	0.02	0.06%	39,02	0.02	0.06%
1000	38,96	0.03	0.08%	39,01	0.01	0.03%	39,01	0.01	0.03%

Using the table (see Table 1), an electronic program for determining absolute and relative errors by developing a database in the programming language Borland Delphi7 was developed (Figure 1):

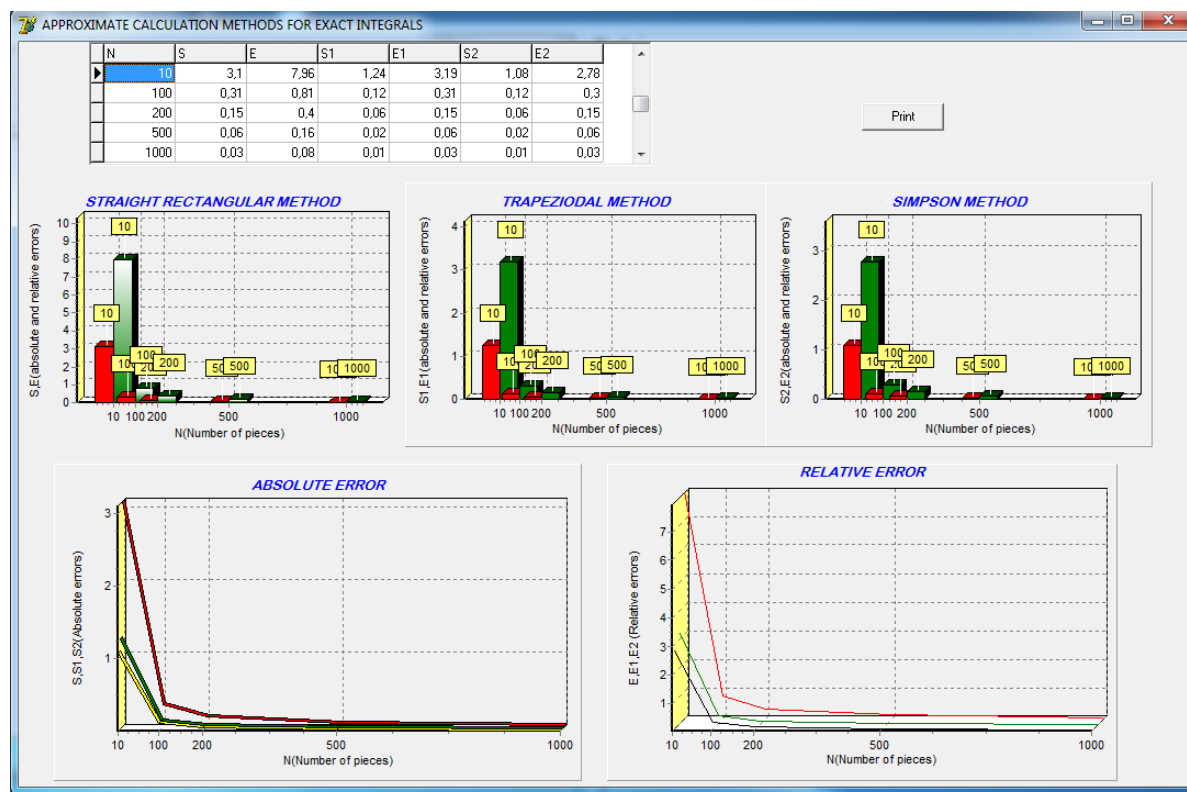


Figure 1. Error calculation program in Delphi 7 environment

If we change the table values of the given functions, the graph also changes accordingly, and the computer automatically generates the program code. From the graphs, the Simpson method shows less error than the trapezoidal method, and the trapezoidal method shows less error than the rectangular method.

During the practical training, students express their opinions, give reasons, give examples of the methods shown. The practice teacher summarizes the ideas and draws a final conclusion.

The most important task in finding the solution of a definite integral in programming languages using the methods of approximate rectangles, trapezoids, and Simpson is to apply it to physical processes. The work done on the elongation of the spring, the work done on moving the body in a variable gravitational field, the change in mass in spacecraft motion and the time interval of energy in the reduction of gravity, the integration with non-initial functions, the functions are given in tabular form. takes place. In general, given the integration of integration into the mathematical and natural sciences, the application of the above method to all departments is a practically important process [4].

The internship teacher teaches students to apply their theoretical knowledge in practice using the demonstration method of teaching:

1. Introduces the condition of the matter;
2. Gives a solution to the problem;
3. Develops a visual program of the process in the programming language;

4. Graphs are generated;
5. Graphs are edited;
6. The final conclusion is reached;
7. Students are given additional assignments.

There are many types of pedagogical software tools, mathematical software packages and programming languages that can be used in the educational process today, although their use is not limited. It is important to choose a modern software tool that suits the professional activities of students from a methodological point of view, with a creative approach to each department of mathematics and natural sciences. Continuous use of modern software tools in scientific-practical, creative work on the basis of competent approaches ensures the uniform development of co-educational methods and modern programming languages, along with the formation of students' professional competencies [7], [9; 58-64-b].

CONCLUSION

Thus, we have selected and implemented software tools for students of the bachelor's degree program "Professional education in the field of information and communication technologies" in accordance with the curriculum and professional activities in the process of practical training in mathematics and science.

The use of C ++ and Delphi programming languages, developed by Borland in order to develop students' professional competencies, was demonstrated in the educational process [5].

Observations show that there are some misunderstandings in the development of pedagogical software products in collaboration with educators and future vocational education programmers. This is due to the programmer's low knowledge of the relevant subject or the teacher's lack of knowledge of programming languages. To overcome this problem, every educator who teaches future vocational education programmers should apply programming languages to all branches of science and direct students to professional activities. Such an approach serves to shape the professional competencies of future vocational education programmers along with the development of challenging pedagogical software products.

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