

CREATING A SYSTEM OF EXERCISES FOR FORMING  
INDEPENDENT LEARNING SKILLS OF SCHOOL STUDENTS IN  
COMPUTER SCIENCE LESSONS

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**Annotation:** This article develops a system of exercises aimed at developing independent learning skills in computer science lessons for schoolchildren. The exercises are organized step-by-step and are aimed at developing the competencies of algorithmic thinking, problem solving, and independent work. The effectiveness of the system is justified from a pedagogical point of view.

**Keywords:** computer science, independent learning, exercise system, algorithmic thinking, competence.

In the modern education system, the development of independent learning activities of students is one of the important pedagogical tasks. Especially in computer science, students need not only to acquire knowledge, but also to independently acquire practical skills. Because computer science serves to develop logical thinking, algorithmic approach and problem-solving skills.

Today, the insufficient formation of independent work skills in students has a negative impact on educational effectiveness. Therefore, developing a

system of exercises aimed at forming independent learning skills in computer science lessons is one of the urgent issues.

In the context of developing digital technologies, students are required to have the skills to independently obtain knowledge, search for, analyze and use information. Computer science lessons provide a convenient opportunity to form these competencies.

However, in practice, since many lessons are taught in a reproductive manner, students are less involved in independent thinking and work. Therefore, it is necessary to develop independent learning activities through the systematic organization of exercises.

The issues of independent learning activity and its development have been studied by many pedagogical and psychological scientists. In particular, in the theory of developmental education, the active and independent participation of students is considered an important factor. In computer science education, the formation of algorithmic thinking and practical skills of students through a system of independent exercises is scientifically based.

To develop an effective system of exercises aimed at forming students' independent learning skills in computer science lessons and to substantiate its pedagogical effectiveness.

The following methods were used in the study:

scientific and theoretical analysis;

observation;

experimental and test work;

pedagogical modeling;

comparison and generalization of results.

Independent learning skills are the ability of a student to acquire knowledge, complete tasks, solve problems, and control his own activities without the help of a teacher.

In computer science lessons, these skills include:

algorithmic thinking;  
problem analysis;  
use of programming elements;  
working with information;  
checking the result and drawing conclusions.

The system of exercises is organized on the basis of the following pedagogical principles:

Stage-wise - moving from simple to complex;  
Independence - ensuring the active participation of the student;  
Practicality - tasks close to real situations;  
Individual approach - adaptation to the student's level;  
Reflection - analysis of the work done.

Below is a system of exercises that can be used in computer science lessons:

Stage 1: Reproductive exercises: understanding the finished algorithm; reading the code and determining its result; performing simple tasks.

Purpose: to form basic knowledge and concepts.

Stage 2: Partial search exercises: completing the algorithm; finding and correcting errors; choosing a solution to a given problem.

Purpose: developing analytical thinking.

Stage 3: Independent exercises: independently solving a given problem; creating a program; checking and analyzing the result.

Purpose: forming the skills of independent work.

Stage 4: Creative exercises: creating your own project; developing a new algorithm; finding a solution to a problem situation.

Purpose: developing creative and innovative thinking.

**GROUP I: Reproductive (initial) exercises**

Purpose: to understand the concept of an algorithm, to understand the ready-made solution

1) Find the result of the following algorithm:

$$a = 5, b = 3 \rightarrow a = a + b \rightarrow b = a - b \rightarrow a = a - b$$

2) Is the following sequence an algorithm or not? Explain why:

reading a book

going to school

having lunch

3) Write an algorithm that generates numbers from 1 to 5

4) Read the given block diagram (provided by the teacher) and determine the result

5) Write an algorithm for calculating the following expression:

$$S = a + b + c$$

6) Write an algorithm for generating “Hello, world!”

7) Write an algorithm for calculating the square of 10

8) Determine how many steps are in the following algorithm

9) Which operation is performed first in the given algorithm?

$$a = 2 + 3 * 4$$

10) Put the following algorithm in the correct order:

output the result

enter numbers

calculate

### **GROUP II: Partial search exercises**

Purpose: analyze, find the error, complete the algorithm

1) Find the error in the following algorithm:

$$a = 5$$

$$b = 0$$

$$c = a / b$$

2) Continue the given algorithm:

a = 3

b = 4

c = ?

3) Complete the algorithm for calculating the sum of numbers from 1 to n

4) Find the error in the following code:

for i in range(1,5):

print(i

5) Convert the given algorithm into a block diagram

6) Complete the algorithm for generating even numbers

7) What does the following algorithm do?

a = 7

if a % 2 == 0: print("Even")

else: print("Odd")

8) Complete the algorithm for finding the largest number (for 3 numbers)

9) Create an algorithm from the given sequence:

input a number

check

output a result

10) Fix the error:

if a > b

print("big")

### III-GROUP: Independent and creative exercises

Purpose: find an independent solution, create an algorithm

1) Write an algorithm for calculating the sum of numbers from 1 to n

2) Create an algorithm for determining the largest of three numbers

3) Write an algorithm for calculating the factorial of a number

4) Create an algorithm for determining whether a given number is prime

or not

- 5) Calculate the square root of a number entered by the user Write a counting algorithm
- 6) Write an algorithm to generate even numbers from 1 to 100
- 7) Create an algorithm to determine a palindrome number
- 8) Write an algorithm to swap two numbers (without a third variable)
- 9) Mini project: Develop a “calculator” algorithm (addition, subtraction, multiplication, division)
- 10) Creative task: Write an algorithm for the game “Find a random number”

**The effectiveness of the exercise system.** This system provides the following results:

- students' ability to work independently develops;
- algorithmic thinking is formed;
- interest in computer science increases;
- knowledge is consolidated;
- the level of students' mastery increases.

**Recommendations for practical application.** For the effective implementation of the exercise system:

- organizing lessons in an interactive manner;
- using digital tools;
- giving individual tasks;
- differentiation of assessment;
- it is necessary to motivate students.

In conclusion, the formation of independent learning skills in computer science lessons plays an important role in the intellectual development of students. The proposed system of exercises serves to effectively develop students' independent work, thinking and problem-solving skills.

Therefore, the introduction of this system into the educational process is one of the important factors in improving the quality of computer science teaching.

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