

FORMATION OF STUDENTS' INTELLECTUAL ABILITIES USING THE DESIGN METHOD

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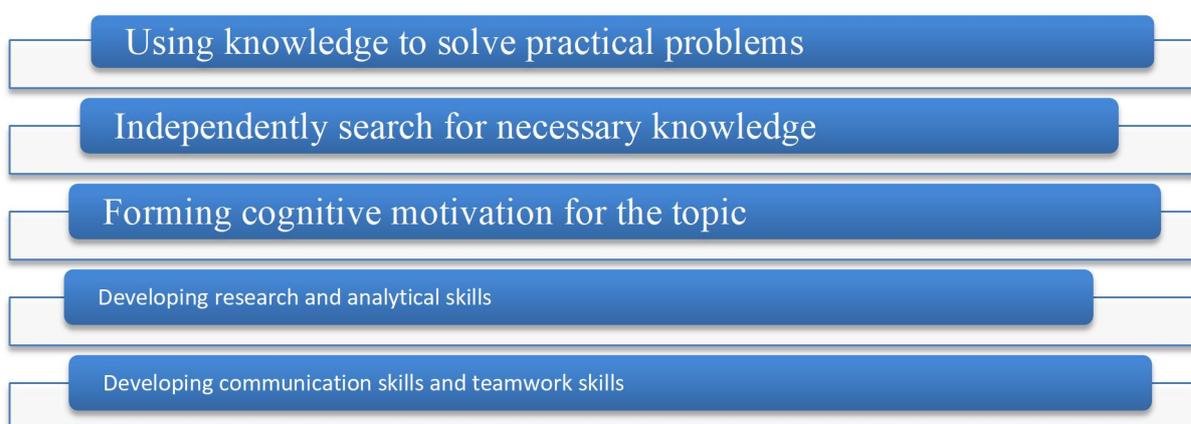
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Annotation: This article is devoted to the problems of using the design method in the formation of students' intellectual abilities, and it discusses the application of this method based on programming languages. In the process of learning programming languages, great importance is attached to the development of students' logical thinking skills, problem solving, and creative approach.

Keywords: intellectual abilities, design method, logical thinking.

Learning programming languages plays a crucial role not only in understanding computer technologies but also in shaping students' intellectual abilities. With the development of information technologies in our time, there's a growing need to foster students' skills in logical thinking, problem-solving, and creative approaches. Therefore, it is appropriate to use the design method to develop intellectual abilities during the programming language learning process. This aims to increase students' knowledge levels and teach them how to successfully apply modern technologies.

The design method is a teaching approach used for the systematic and consistent formation of students' intellectual abilities. This method aims to teach students not only to acquire information but also to apply their learned knowledge in practice. In the study of programming languages, project-based approaches are widely used to develop skills such as creating a system, solving problems, and developing algorithms. This method fosters creative thinking, a thorough approach to problems, and the abilities of logical analysis and synthesis in students.



The capabilities of the project method are presented below:

The problem of forming intellectual abilities and skills for students is linked to the contemporary pace of knowledge renewal and the necessity to adapt to systematic activities when working with

modern information technologies. This demands the importance of developing students' independent learning methods and their ability to apply them in practice.

It's advisable to select topics for laboratory, practical, seminar, and independent study sessions that facilitate the development of intellectual abilities through the core subjects of programming languages. Many pedagogical scholars have conducted research and expressed their views on the practical application of the design method. For instance, according to I. B. Barisheva, when working on projects, students learn the theoretical aspects of programming, methods for developing projects, ways to implement them, and gain experience in describing the work performed and the results obtained. [1]

L.I.Dyatlova offers the following thoughts on this method: "...applying the project method in extracurricular activities increases interest in conducting research and practical work, and leads to the formation of skills for public defense of one's projects. All of this, in turn, helps to improve the quality of education and increase interest in the chosen specialization." [2]

Programming is a means of implementing ideas and solving problems. Learning it helps students develop logical and algorithmic thinking, and cultivate skills like applying theoretical knowledge in practice, which will be beneficial in various aspects of their lives.

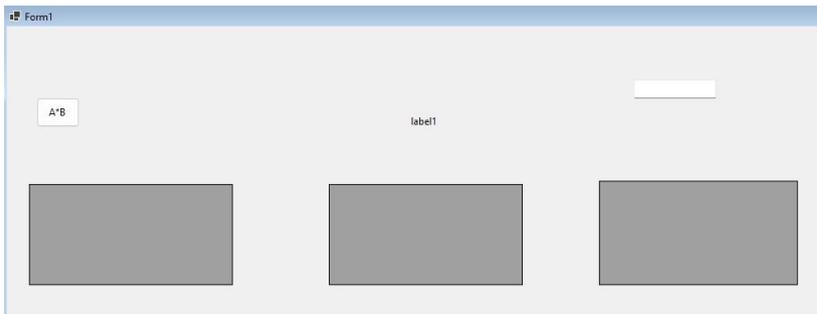
The stages of creating a project, in our opinion, consist of the following:

- Choosing a project topic
- Considering the project's structure (design) based on its goals and objectives
- Gathering the necessary information base
- Selecting the software
- Implementing the project
- Analyzing the results and making necessary adjustments

The practical application of project-based methods in forming students' intellectual abilities involves several stages. In the first stage, students become acquainted with the fundamentals of programming and mathematical models. Then, through practical exercises, they are taught to solve various problems, which reinforces the core concepts used in programming. Finally, students are assigned to develop a program based on a project, which encourages them to work independently and apply their knowledge in practice.

To confirm the above points, we will partially outline the stages of creating a "Matrix Calculator":

1. We'll present one version of the form window for matrix multiplication, intending to create it in C# (here, the student can use elements of their choice, including: TextBox, Label, DataGridView, Button, etc.).
2. We'll provide a variation of the form window for matrix multiplication, assuming it will be created in C#. (Here, the student is free to use elements they prefer, such as: TextBox, Label, DataGridView, Button, and so on).



3. Gathering necessary information (we'll list some of them):

Theoretical information	
<p>To multiply matrices, the number of columns in the first matrix must be equal to the number of rows in the second matrix. The resulting matrix will have the number of rows from the first matrix and the number of columns from the second matrix.</p>	
<p>Given matrices A and B, the elements of the resulting matrix are defined as follows:</p>	$C = \begin{pmatrix} a_{11}b_{11} + \dots + a_{1n}b_{n1} & a_{11}b_{12} + \dots + a_{1n}b_{n2} & \dots & a_{11}b_{1p} + \dots + a_{1n}b_{np} \\ a_{21}b_{11} + \dots + a_{2n}b_{n1} & a_{21}b_{12} + \dots + a_{2n}b_{n2} & \dots & a_{21}b_{1p} + \dots + a_{2n}b_{np} \\ \vdots & \vdots & \ddots & \vdots \\ a_{m1}b_{11} + \dots + a_{mn}b_{n1} & a_{m1}b_{12} + \dots + a_{mn}b_{n2} & \dots & a_{m1}b_{1p} + \dots + a_{mn}b_{np} \end{pmatrix}$

4. In the next stage, a code (the main part of the project) that provides the necessary results will be created in a programming language for the software and project implementation. This requires specific knowledge and actions. We outline some of them:

Definition	Result
Ikki matritsa elementlarini tasodufiy yaratish hodisasi tugmasiga biriktilishi mumkin	<pre>int[,] nums2 = new int[5, 5]; Random rnd = new(); int[,] nums1 = new int[5, 5]; for (int i = 0; i < 5; i++) for (int j = 0; j < 5; j++) { int num = rnd.Next(1, 5); nums2[i, j] = num; int num1 = rnd.Next(1, 5); nums1[i, j] = num1; }</pre>
Natijaviy matritsa elementlarini yaratish kodi	<pre>for (int i = 0; i < 5; i++) { for (int j = 0; j < 5; j++) { nums3[i, j] = 0; for (int k = 0; k < 5; k++) nums3[i, j] = nums2[i, k] * nums1[k, j]; } }</pre>

5. As mentioned, this stage is crucial and labor-intensive. The code snippets above are designed to randomly generate matrix elements, and the results are obtained based on these values. To foster students' intellectual abilities, it is recommended that they learn to obtain results when editing the elements of the created matrices (i.e., when new values are provided). In this case, they must independently study the dataGridView1_CellValueChanged event and be able to use one event within another, which might look like this:

1-Event

```
private void dataGridView1_CellValueChanged(object sender, DataGridViewCellEventArgs e)
{
    for (int i = 0; i < 5; i++)
        for (int j = 0; j < 5; j++)
            { nums1[i, j] = System.Convert.ToInt32(dataGridView2.Rows[i].Cells[j].Value);
              nums2[i, j] = System.Convert.ToInt32(dataGridView1.Rows[i].Cells[j].Value); }
    for (int i = 0; i < 5; i++)
        { for (int j = 0; j < 5; j++)
          { nums3[i, j] = 0;
            for (int k = 0; k < 5; k++)
                nums3[i, j] = nums3[i, j] + nums2[i, k] * nums1[k, j];
            richTextBox1.Text += nums1[1, 1] + Environment.NewLine;
            //dataGridView3.Rows.Add(nums3[i, 0], nums3[i, 1], nums3[i, 2], nums3[i, 3], nums3[i,
4]);
          } }

    for (int i = 0; i < 5; i++)
        { for (int j = 0; j < 5; j++)
          dataGridview3.Rows[i].Cells[j].Value = nums3[i, j]; }
}
```

1-Event

```
private void dataGridView2_CellValueChanged(object sender, DataGridViewCellEventArgs e)
{ //bir hodisa tarkibida ikkinchisini chaqirish
  dataGridView1_CellValueChanged(this, e);
}
```

We present the result of a part of the program:

3	3	1	1	4
4	4	2	2	2
4	1	3	1	1
2	2	2	2	4
4	3	3	1	3

4	1	1	4	2
4	1	2	3	4
3	4	2	3	1
2	2	3	1	1
4	4	2	3	4

45	28	22	37	36
50	28	26	42	36
35	23	17	32	20
42	32	24	34	32
51	33	25	44	36

Utilizing the design method in forming students' intellectual abilities is one of today's modern educational requirements. This method serves not only to impart knowledge but also to develop various types of intellectual activities in students, such as independent thinking, problem analysis, decision-making, and creative approaches. Students engaged in the learning process through the design method gain the opportunity to test their knowledge and skills in practice by solving real-life problems.

In conclusion, employing the design method is an effective and promising approach to shaping students' intellectual abilities. It plays a crucial role in achieving the main goals of modern

education: fostering independent, creative, and critical-thinking individuals.

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