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USING MODERN INTERACTIVE TOOLS IN TEACHING THE SUBJECT OF "PROGRAMMING"

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Abstract: This article discusses the theoretical foundations, practical aspects and impact of the effective use of modern interactive tools in teaching programming. The role of interactive technologies in the formation of students' motivation, creative thinking, and problem-solving skills is widely considered. The article argues that it is impossible to imagine teaching without learning platforms, software tools, and virtual environments that facilitate the coding process, provide real-time exchange of ideas, and have the ability to simulate and visualize. The advantages, difficulties, and solutions of using interactive methods are also analyzed.

Keywords: Programming, interactive learning, digital technologies, online platforms, virtual labs, algorithmic thinking, simulation, real-time analytics, learning motivation, STEAM.

Аннотация: В статье рассматриваются теоретические основы, практические аспекты и влияние эффективного использования современных интерактивных инструментов в обучении программированию. Широко рассматривается роль интерактивных технологий в формировании мотивации, творческого мышления и навыков решения задач у студентов. В статье утверждается, что невозможно представить обучение без обучающих платформ, программных средств и виртуальных сред, которые облегчают процесс программирования, обеспечивают обмен идеями в режиме реального времени и обладают возможностями моделирования и визуализации. Также анализируются преимущества, трудности и решения, предлагаемые использованием интерактивных методов.

Login

Nowadays, the world education system is undergoing rapid changes. Technologies such as digital transformation, the development of artificial intelligence, IoT, Big Data are deeply penetrating not only industries, but also educational processes. In particular, teaching programming using modern methods is becoming increasingly important not only for teachers, but also for students. Because for today's students and pupils, traditional lectures, writing code on the board, or repeating the same examples reduce motivation.

Therefore, interactive tools, that is, technologies that actively engage the learner in the process and teach coding in a visual way, have become an integral part of the educational process.

1. The essence of interactive teaching in programming

Interactive teaching is a method that increases student engagement in the learning process, encourages independent research, and allows students to test their ideas in real time.

Interactivity in programming is based on the following principles:

1.1. Activity and direct participation

The student writes the code, sees the result immediately, analyzes the errors. This supports the constructivist approach.

1.2. Visual learning

Complex algorithms are explained through graphics, diagrams, and animations.

1.3. Speed of feedback

Interactive tools automatically detect errors and immediately show the reader solution options.

1.4. Increased learning motivation

Gamification, ratings, badges, and points systems keep the reader engaged.

1.5. Pair programming

Students write code together, solve problems, and develop communication skills.

2. Modern interactive tools used in teaching programming

2.1. Online code editors and computer simulators

These tools allow students to start programming through a browser.

The most commonly used platforms are:

- **Reply**
- **Code.org**
- **Scratch**
- **JSFiddle**
- **Python Tutor**
- **Google Collaborate**

Advantages:

- No installation required.
- You can access it from any device.
- The teacher sees the code in real time.
- Very convenient feedback mechanisms have been created.

2.2. Visual programming environments

Very effective at primary and secondary levels.

Examples:

- **Scratch**
- **Blockly**
- **App Inventor**
- **Tynker**

Through them, the student learns complex codes using visual blocks. This is very convenient for developing algorithmic thinking.

2.3. Simulation and animation tools

It shows complex processes in a way that resembles real life:

Examples:

- **Python Tutor**— shows step-by-step execution of the code.
- **AlgoExpert**— teaches algorithms in video + code format.
- **Flowchart tools**— Lucidchart, Draw.io, Miro.

These tools make it easier to visualize how the code works.

2.4. Virtual laboratories

In programming, a virtual lab is an online platform that simulates a real computer environment.

For example:

- **AWS Educate Lab**
- **Cisco Packet Tracer**
- **GitHub Classroom**

Students will have the opportunity to create, test, and version control their own projects.

2.5. Gamification platforms

Gamification encourages competition among learners.

Popular platforms:

- **CodeCombat**
- **CodeinGame**
- **Kahoot**
- **Quizizz**
- **HackerRank**

Such tools add interest and motivation to the learning process.

3. The role of interactive methods in teaching programming

3.1. Problem-based learning

A problem is given, the student independently searches for it, creates a code. For example:

- "Create a password verification program for a banking system"
- "Create an algorithm to make the robot turn left"

3.2. Project-based learning

Students will complete a real-life project:

- Create a website
- Mobile app development
- Create a game

Interactive platforms are very useful in this process.

3.3. Pair programming and team coding

The teacher organizes students to write code in pairs or small groups.

3.4. Live coding techniques

The teacher writes live code during the lesson, and students view the results simultaneously.

4. Advantages of using interactive technologies in programming science

4.1. Integration of theory and practice

The student writes code and gets immediate results.

4.2. Quick error detection

The platforms provide automatic diagnostics.

4.3. Easy understanding of complex algorithms

Graphic visualizations facilitate reader understanding.

4.4. Extensive opportunities for independent learning

The student can practice both at home and on the phone.

4.5. Time savings for the teacher

The opportunity for lesson automation is high.

5. Problems and solutions

5.1. Insufficient Internet speed

Solution: Offline platforms (Pycharm Edu, VS Code Live Share).

5.2. Distraction of students from interactive tools

Solution:

- Proper time management
- Supervised use of gamification

5.3. Lack of methodological guides

Solution: Creating methodological guides for teachers in local languages.

Conclusion

The use of modern interactive tools in teaching programming makes the educational process more effective, interesting and based on practical skills. With the help of interactive technologies, students develop important competencies such as algorithmic thinking, creative approach, problem analysis, and teamwork. Therefore, working with modern platforms, implementing virtual laboratories, and using gamification elements are becoming an important part of the teacher's skills today.

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