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DEVELOPING STUDENTS' CREATIVITY THROUGH ROBOTICS

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The use of digital programming and design in the educational process is an important tool for developing creativity. Today, technologies provide opportunities to enhance students' creative thinking skills by introducing innovative approaches into the learning process [27]. In this regard, programs such as Lego Digital Designer and Scratch are among the most effective tools, as they help students not only acquire technical knowledge but also develop creative approaches.

Lego Digital Designer: Developing Creativity through Simulation

Lego Digital Designer (LDD) is a digital construction tool that allows users to create and test various projects virtually. This program serves not only to develop engineering skills but also to foster creativity [27]. Through LDD, students learn the following aspects:

- **Design and construction skills:** While creating virtual projects using Lego constructors, students learn the basics of design and apply creative approaches.
- **Problem-solving:** By addressing challenges encountered during the implementation of projects in a virtual environment, students develop independent thinking and learn to find new solutions.
- **Innovative approach:** Through virtual construction tools, students have the opportunity to apply technologies in practice and test their creative ideas in action.

To create a creative environment in the educational process using the LEGO Digital Designer (LDD) program, it is essential first to ensure that the software has been downloaded safely. For this, it is recommended to download it from the official LEGO website or other trusted software sources [3]. Once the program is installed, it is important to introduce students to the three-dimensional workspace and the program interface. Attention should be given to the following aspects:

1. **Introduction to the interface and tools:** Explain the main tools, buttons, and tabs in the program to the students. Provide a clear explanation of key components of the interface, including 3D objects and model creation tools, so that students can work comfortably within the software.
2. **Explaining the program's capabilities:** With the help of the LEGO Digital Designer platform, students can create models of various sizes. These models may vary in complexity, so when explaining the program's capabilities, it is important to emphasize that students' creative potential is unlimited [4]. It is also advisable to showcase the variety of LEGO parts available in the program.
3. **Teaching practical tasks:** Once students are fully familiar with the program, it is necessary to provide teacher-created video lessons or practical assignments. These lessons should demonstrate how to create LEGO models and guide students step by step through the process. Since the modeling process can take a considerable amount of time, it is important to explain to students how to manage their time effectively while working in the program.
4. **Time management:** To prevent students from spending too much time in front of the computer, it is advisable to divide the practical sessions into 15–20 minute segments. Teach

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students how to save their models and continue working on them later. Since LDD allows models to be saved, students can resume their work whenever needed.

5. **Developing creativity:** With LEGO Digital Designer, students can enhance their creative thinking and problem-solving skills. The wide variety of bricks and accessories available in the program enables them to design diverse models, thereby expanding their logical and creative thinking abilities. Moreover, this process helps them discover new approaches in creating and modeling their own projects.
6. **Development of technical skills:** Students can improve their technological literacy and develop technical skills using LEGO Digital Designer. This program is an important platform not only for fostering creativity but also for technical development. Through the program's 3D interface, students learn design, understand engineering principles, and apply technologies.

System Requirements for LEGO Digital Designer. The following minimum system requirements are necessary for the LEGO Digital Designer program to run efficiently:

- System requirements for Windows: Operating system: Windows XP, Windows Vista, Windows 7, or Windows 8 (Windows 10 or higher versions are also recommended)
- CPU: 1 gigahertz or faster processor
- Graphics card: 128 MB video memory, compatible with OpenGL 1.1 or higher versions
- RAM: 512 MB or higher (recommended — 1 GB or more)
- Hard disk space: 1 GB of free space
- **System requirements for Mac OS:**
- Operating system: Mac OS X 10.5 or later
- CPU: 1 gigahertz or faster processor
- Graphics card: 128 MB video memory, compatible with OpenGL 1.1 or higher versions
- RAM: 1 GB
- Hard disk space: 1 GB of free space

Launching LEGO Digital Designer and the Interface

Each time you launch the LEGO Digital Designer program, a "Welcome" message appears on the screen. On this screen, you can choose one of the following main options:

Figure 1. Preparing LEGO Digital Designer for Use

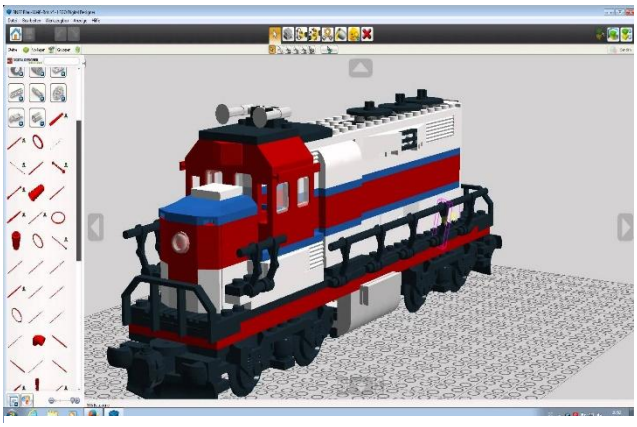

Figure 2. Designing a Locomotive in LEGO Digital Designer

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1. **LEGO Digital Designer mode:** In this mode, you can create any model you want using various LEGO® parts. This mode is designed for creative designs and includes a wide collection of LEGO pieces.
2. **LEGO Mindstorms® mode:** This mode is designed for virtual simulation of LEGO Mindstorms® robots and their parts. Here, you can create various robot models and have the ability to program them.
3. **Digital Designer design section:** In this section, you can create large projects. By using red bricks, you can implement large-scale designs. This is intended for designing big and complex models.

Learning practical exercises using LEGO Digital Designer. You can watch the video lesson by scanning the following QR code.

By scanning this QR code, you can learn how to use LEGO Digital Designer and create projects.

To reinforce the covered topic, scan this QR code and answer the questions.

Creating Game Programs in the Scratch Environment

The Scratch programming environment allows children to create their own animated and interactive projects. In this environment, games, cartoons, presentations, and other creative projects can be developed. Through Scratch, students can share their projects worldwide, exchange experiences with other users, and expand their knowledge.

Scratch primarily relies on its block-based programming system. In this system, users write code by connecting program blocks of different colors and functions. The Scratch environment is similar to the Lego constructor, where users assemble projects by using individual program blocks in a similar way.

Learning Programming with Scratch

In the Scratch environment, you can start with simple shapes and create engaging games and animations. This environment not only helps students learn programming easily but also supports the development of their creativity and logical thinking skills. Scratch allows students to engage in the creative process by making their own animated stories, presentations, models, and games. Projects can be shared online with the international community and viewed by other users. Scratch is a new educational environment designed to teach programming to school students. In Scratch, users can create various animations and interactive projects. This environment provides opportunities to make movies, interact with different objects, change appearances, move objects around the screen, and establish interactions between objects.

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Scratch is based on a block-based programming system where program blocks are presented in different colors. These blocks connect to form programs, much like building with Lego bricks. When users execute simple commands, many objects with various properties interact to create complex models.

Starting to program with Scratch is very simple and user-friendly, making it suitable not

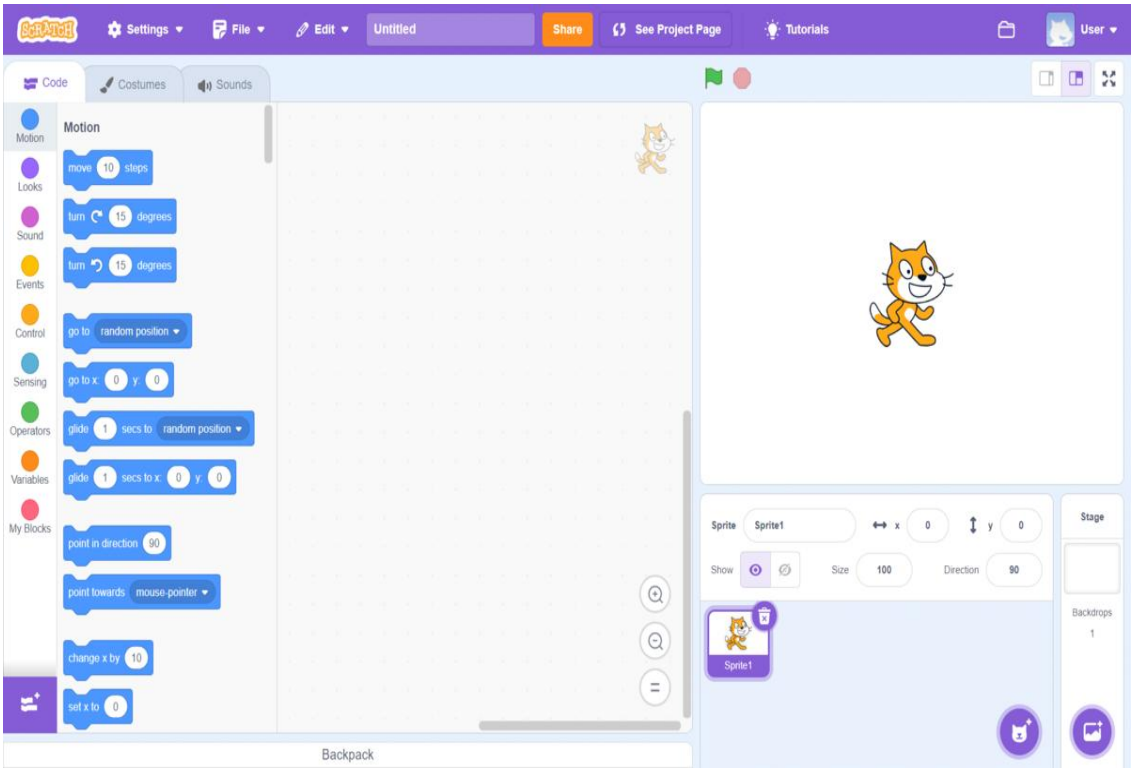

Figure 3. Scratch Program Workspace

only for older students but also for younger learners as an educational tool. This, in turn, eases the introduction to programming and creates opportunities for children to develop their creativity.

The Scratch workspace is the main interface for developers or students where all the key tasks are performed. This workspace consists of several sections, each serving a specific purpose. Below are the main parts of the workspace:

Stage:

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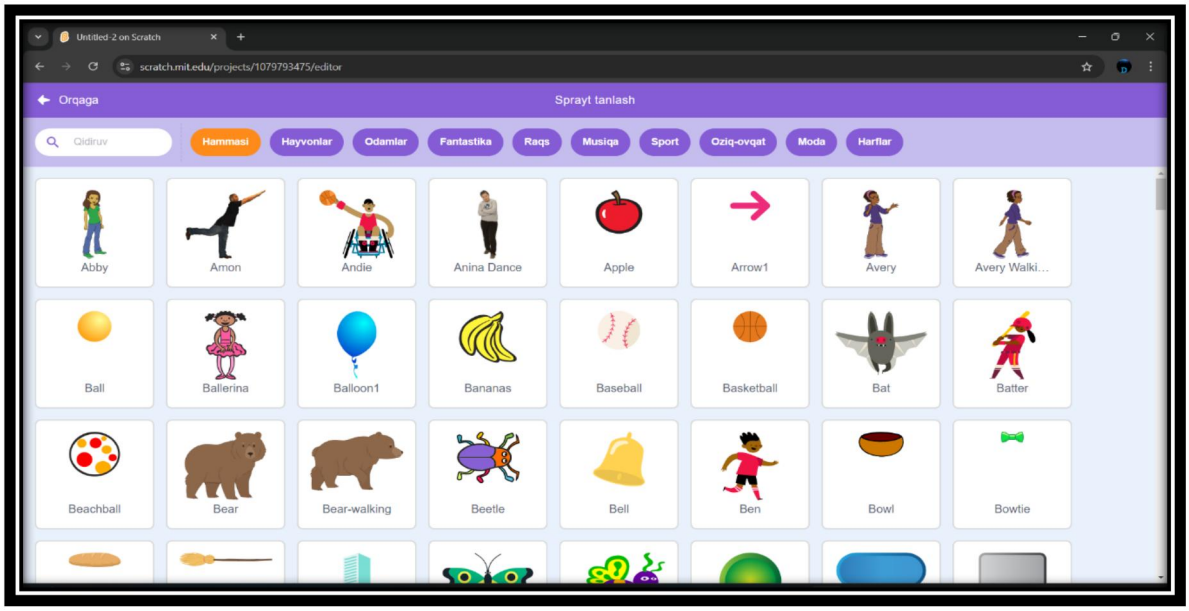
The stage is the primary area in the Scratch environment where the program's processes are visually displayed. This area shows the movements and interactions of sprites and other elements set by the user. The stage typically has a size of 480x360 pixels, but users can dynamically change the background and stage dimensions. Sprites move on the stage, allowing users to create interactive games or stories in their projects. Additionally, the stage plays an important role in visualizing the programming process.

Figure 4. Sprites

2. Sprites:

Sprites are the main objects in Scratch. They are characters that perform interactive and animated actions within the user's project. Each sprite follows various commands and moves visibly on the stage. Sprites can change color, apply animations, or interact with other sprites. For example, interactive stories can be created by making sprites swim or move around.



Additionally, sprites allow adding sounds or creating events.

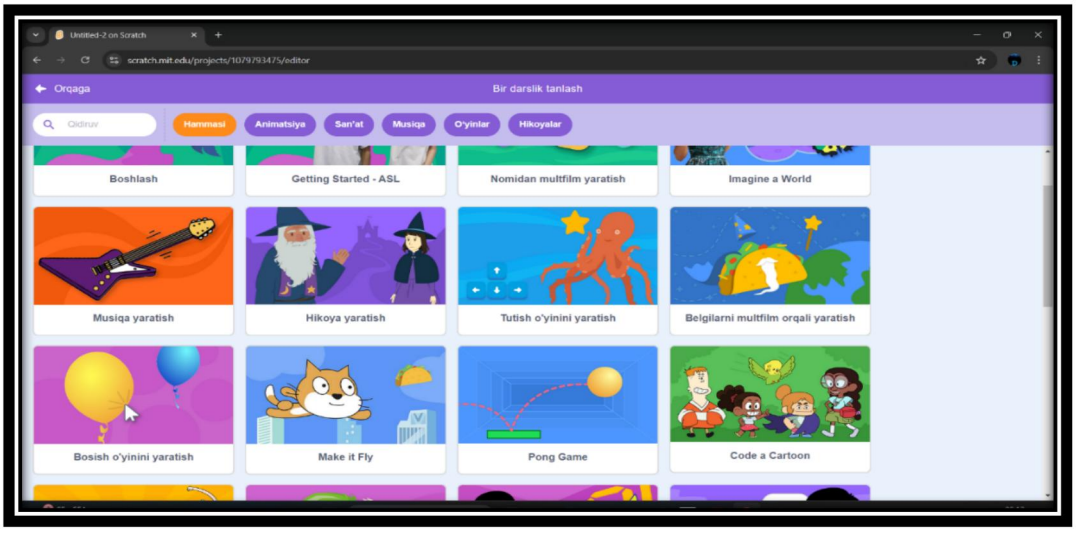


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Figure 5. Using Built-in Tutorials in Scratch

Learn practical exercises using the Scratch program. You can watch the video lesson by scanning the QR code below.

By scanning this QR code, you can learn how to use the Scratch program and create projects.
After watching the video lesson, create a game independently by yourself.

Conclusion. Robotics offers a powerful platform for enhancing students' creativity by integrating hands-on learning with problem-solving and critical thinking. Through designing, building, and programming robots, students engage in an interactive educational process that nurtures innovation and imaginative skills. Incorporating robotics into the curriculum not only strengthens technical competencies but also fosters collaborative teamwork and independent thinking. As a result, robotics education plays a vital role in preparing students for future technological challenges while unlocking their creative potential.

References:

1. O‘zbekiston Respublikasi Prezidentimizning 2020-yil 29-oktyabrdagi PF- 6097-son “Ilm-fanni 2030-yilgacha rivojlantrish” konsepsiyasi
2. "Robotics: Control, Sensing, Vision, and Intelligence" Muallif: R. Siegwart, I. R. Nourbakhsh, D. Scaramuzza Yil: 2011 Bet: 5-12 (robototexnikaning tarixi va asosiy tushunchalari haqida)
3. "Introduction to Autonomous Robots" Muallif: G. Antonelli, R. B. E. S. Baras, E. B. G. C. Morandi Yil: 2017 Bet: 19-30 (avtonom robotlar va ularning rivojlanishi)
4. "Robotics: Foundations, Applications, and Future Directions" Muallif: Michael A. G. (Ed.) Yil: 2018 Bet: 3-10 (robototexnika tarixiga oid ma'lumotlar)
5. "Artificial Intelligence: A Modern Approach" Muallif: Stuart Russell, Peter Norvig Yil: 2016 Bet: 27-35 (sun'iy intellekt asoslari va uning robototexnikaga ta'siri)
6. "The Robotics Primer" Muallif: I. J. N. Yil: 2006 Bet: 13-22 (robotlarning tarixi va mexanikasi)
7. “Informatika va Raqamli Texnologiyalar” o’quv qo’llanma Muallif: O’.S. Eshaliyev, Z.SH. Nurmamatov, J.X. Xayitov Yil: 2024