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APPLICATION OF ANIMATION TECHNOLOGIES IN EDUCATION

As new technologies are introduced into the life of a modern person and into education, it has become obvious that the flow of information that falls on young people will contribute to the achievement of educational goals to the extent that students are trained to perceive information and use it.

Animation is one of the favorite genres of children and adolescents. Computer animation expands the possibilities of traditional animation, allows you to do whatever a person's fantasy wants, or to imitate what exists in nature.

Computer animation is the process of creating a series of images that appear one after the other, synchronized into a coherent whole, and cause the so-called image animation effect. The animation shows the mode of operation of many elements. It is widely used in the teaching of various technical, medical and natural sciences [1].

Educational animations are animations designed to facilitate learning. Computer generated images have allowed animation to help students understand and remember information that is much easier and cheaper to create than in previous years. Traditionally, animation has required specialized, labor intensive techniques that were time consuming and expensive.

Computer animation is used to display dynamic content because animation can show changes over time (temporal changes), which is especially useful for learning processes and procedures. Animation can reflect both positional changes (translations) and shape changes (transformations), which are fundamental to the study of this type of subject [2].

There are differences when creating animations in 2D and 3D. When creating 2D animation, pre-production involves creating a plot of the finished animation. Since each frame in animation is very time consuming, it is very important to take the frames right in preparation for production. Reanimating a shot is very expensive, especially when compared to real-time shooting. Most of the animations are storyboards, with the main action in each scene drawn in comic book form. Storyboards are usually pasted onto large sheets of Styrofoam or poster. During pre-production, the storyboard is checked for consistency and parts of the storyboard can be redrawn multiple times.

3D animation process. Getting started with animation is a conceptualization in which we aim to lay out all the nuts and bolts that can be put on the table to create a complete storyline. After that, the scriptwriting process begins, along with frame positioning and camera angles that can portend scenes well. Storyboarding helps complete the storyline by helping creators imagine what the story will look like. Postproduction is the last step in the process and refers to tasks that must be completed or completed after filming or filming is over. These include editing the raw footage for slicing scenes, adding transition effects, working with voice and

sound actors and dubbing, to name just a few of the many tasks in post production. Thus, it can be noted that the creation of animation is a complex and time-consuming process, but the use of animation in education is very reasonable.

The use of animation in education supports students' cognitive processes and helps them better understand the subject. Teachers can include interesting and fun animations in classroom lectures. This helps them make the teaching and learning process fun and rewarding, and the teaching process visually appealing. Various complex theories and procedures can be easily explained through animation. For example, teachers can use animation to explain how the solar system works or to demonstrate complex physical processes. The teaching material of various subjects such as science, foreign language, etc. can be visualized using animation.

On the other hand, in computer science lessons, students learn to create animation elements using various packages. When conducting classes, a project-based teaching method is effective: the implementation of an individual or group project on a topic chosen by students [3]. To create animation during the course of a project, it is necessary to combine individual and group forms of activity.

As a rule, the general advantages and benefits of using animation in teaching students can be indicated in the following paragraphs:

1. Improving skills and abilities. Interactive animation takes less time to learn difficult things for students and gives them more fun learning difficult things.

2. Interactivity. Interactivity is the interaction of the student, the learning system and the learning material.

3. Involvement. Interactive learning with real-time animation, simulations, video, audio, graphics, feedback, expert advice, and Q&A keeps learners interested and strengthens skills.

4. Flexibility and safety. Many things are dangerous to do in the learning process in real life, such as experiments in physics and chemistry.

5. Motivation. Because animation is an inspiring and interactive way of flexible learning and training, students will be more motivated to learn more and more.

6. Eliminates frustration. Computer animation is a high-level way to measure student decision-making.

7. Practicality. Computer animation is able to represent real life situations that students face every day.

8. Consistent. All students learn the same principles and skills.

9. Immediate feedback. Students will receive immediate feedback from the animation system that will improve their skills and abilities.

10. Attracting and retaining attention. Animation is useful when it is important to quickly grab and hold the audience's attention.

11. Display of design prototypes. Animation is a dynamic tool for creating objects that don't yet exist in reality.

12. Data modeling is a good tool for creating 3D models using scientific data.

13. Display of processes or relationships that are usually not visible. Since animation can show imaginary objects in motion, it is ideal for demonstrating

processes and relationships that cannot be observed in reality.

14. Highlighting certain actions in a complex sequence. Animation can display motion for part of a complex operation, thus clarifying functions that would otherwise not be possible to isolate and view independently [4].

However, there are also limitations to the use of animation in education:

- some information about real training will be lost in the animation program;
- computer animation programs can work well from a technical point of view, but are difficult to fit into the curriculum;
- inability to adapt to account for different levels of students in a group or class;
- requires extensive memory and storage space, special equipment for high-quality presentation;
- animation cannot display reality like video.

There are various technologies for creating animation. Let's look at some of the popular animation applications.

Unity is a cross-platform game engine developed by Unity Technologies, first announced and released in June 2005. The engine can be used to create 3D, 2D, virtual and augmented reality games, as well as simulations and more. The engine was adopted not only in video games, but also in cinema, automotive, architecture, mechanical engineering and construction [5].

Unity gives users the ability to create games and interactions in both 2D and 3D, and the engine offers a core C # scripting API for both the Unity editor as plugins and the games themselves, as well as drag and drop functionality.

Maya is a 3D computer graphics application that is used to develop video games, 3D applications, animated films, TV series, and any kind of visual effects. This software has the potential to create heavy models that help us create Ultra 3D effects that create a realistic look for the user.

Blender is a cross-platform application that runs on Linux, macOS and Windows systems. Blender also has relatively small memory and disk requirements compared to other 3D rendering kits.

Cinema 4D (C4D) is a versatile 3D program created by Maxon, popular for its motion graphics module MoGraph. Cinema 4D is widely used in product visualization, architecture, medicine, advertising, film and television, and the gaming industry.

Adobe Animate (formerly Adobe Flash Professional, Macromedia Flash, and FutureSplash Animator) is a multimedia and computer animation program developed by Adobe Systems [6].

Thus, at present, multimedia and animation technologies are actively used in education, which act as a teaching tool and an object of study.

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