THE USE OF 3D PEN IN THE PROCESS OF TEACHING TECHNOLOGY STUDENTS

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Abstracts

3D-technology are booming at the present stage of human development. 3D-pen can print on a new three-dimensional level. All these technologies help to improve modern technology lessons.

***Keywords**: High vocational education, modern information technologies, science and technology, technologies of the future, 3D-pen.*

1 RELEVANCE

A 3D pen is a tool that can draw in the air. You can think that it`s a kind of magic, , but it`s just another technological breakthrough in the field of 3D modeling.

A gadget that will forever change the idea of what "drawing" is, because now you can draw not on only paper, but in space!

The device resembles an FDM printer, but the scope of its application is really immense. By means of it you can not only practice drawing and carrying out some experiments in the creation of artistic masterpieces, but you can definitely solve many problems of everyday chores.

To date, there are two types 3D pens: cold and hot. The first ones are printed rapidly polymerizing resins- photopolymers.

"Hot" pens use various polymer alloys in the form of bobbin tube with a plastic thread.

The principle of the hot 3D pen (Pic. 1) is extremely simple.

Pic. 1

Unlike conventional devices for writing and drawing, instead of ink, a 3d pen is filled with a plastic thread. Most of the pens available in the retail market use a conventional polymer rods, which are bought for printers that use layer-by-layer technology.

In the back of the case there is a special hole in which the filament is inserted. The built-in mechanism automatically lays on ink to the extruder, where it is melted and extruded into the molten form to the outside.

The metal tip of the print head heats up to a temperature of 240 ° C, so working with the device, basic safety rules should be adhered to.

Despite the fact that 3D pens are equipped with a built-in fan to accelerate the process of solidification of plastic, neglectful attitude towards the device is directly connected with the risk of getting burns.

The dimensions of the pen make it easy to hold it in one hand. Minor noise during the operation of the built-in mechanism does not distract from 3D modeling.

FDM-pen supports quick replacement of the rod, which makes it possible to combine colors and materials directly during drawing. The material used there can be different ABS or PLA.

In everyday life ABS plastic is used more often. It is durable, wearproof, well-suited for the bonding of plastic products. To its drawbacks tend to be a slight shrinkage and the presence of a characteristic smell of burnt plastic.

Patterns from PLA are more qualitative, that is explained by an underrated melting point. In addition, this compound is made from natural ingredients, which makes it biodegradable.

At the same time, the application life of such a filament is noticeably less than that of ABS alloys.

As noted above, cold pens are filled with a photopolymer resin (Pic. 2).

Pic. 2

The device is devoid of heating elements, therefore it can be safely entrusted even to small children. The photopolymer instantly solidifies under the influence of a powerful built-in ultraviolet light source.

Using cold ink allows you to apply fanciful drawings on the exposed skin areas without the risk of burning yourself. The material has no smell, but is presented in a huge number of colors. There are transparent, biodegradable, colored, elastic, conductive and even luminous in the dark resins.

Of course, a 3D printer is capable of creating complex shapes, repeating exactly the elements of the programmed model. But 3D printer has a number of its own exclusive advantages:

1. First of all, it's weight. Modern gadgets weigh from 40 grams. They are easily held in the hand even by a child. Small size and ergonomic design allows you to take the device on business trips or on vacation.

2. Some devices are equipped with rechargeable batteries, which makes it possible to use them far from the access points to the power supply network.

3. Furthermore, the small size of the pen allows you to draw even in hard-to-reach places (Picture 3).

Pic. 3

4. The device significantly expands the scope of fine art. If you do not care about art, then your children will definitely like this device. The pen will be an excellent toy for children. It will not only help to brighten up leisure time and take a fresh look at modern entertainment, it also contributes to broaden the child's outlook, the development of spatial thinking and the finemotor skills.

5. Another argument in favor of 3D pens is an affordable price. With similar capabilities with a desktop printer, the cost of a pen is a fraction of the number. You can buy several copies for your family at once in order to evaluate the charms of 3D printing yourself.

Do not forget that the 3d pen is an electric appliance. It operates from an outlet with 220v, so it has the the same safety arrangements as when working with other kind of power tools. It should be noted that during drawing, the pen point heats up to a temperature of 270 degrees, which can easily cause a burn on the exposed skin. Therefore, it is prohibited to grasp fingers with a metal or ceramic nozzle while working with the device. Apart from that, the pen is absolutely safe. The used plastic alloys, such as ABS and PLA, are harmless and non-toxic. It is noteworthy that cold pen with ultraviolet emitter operate on batteries, so they do not need to be connected to the power supply network. In addition, they do not have hot parts, which excludes any danger associated with injury. Such devices can safely be entrusted to children. [1]

2 PROJECT

3D-pen is especially relevant at the lessons, as an advanced method of creating technical products. It is able to provide indispensable assistance in the teacher`s extra-curricular activities. It allows you to access and effectively occupy children and create a variety of souvenirs, gifts, technical details..

We have developed a study group program for the development of 3D pen for students of all ages.

Topic 1 (1 hour) - a brief history of 3d pens and its ability in the whole world

Topic 2 (1 hour) - Preparation for work (setting the pen, studying its device, rules of use)

Topic 3 (1 hour) - the first pilot project (for all the same) to develop the principles of work: finding ideas with students, mastering the simplest figures.

Topic 4 (3 hours) - Project implementation: the teacher shows a step-by-step implementation of the project, and the students repeat after him, choose the color range themselves, save the project.

Topic 5 (12 hours) - Creativity of students: students come up with their project, implement it in further studies, ask all questions of interest to the teacher.

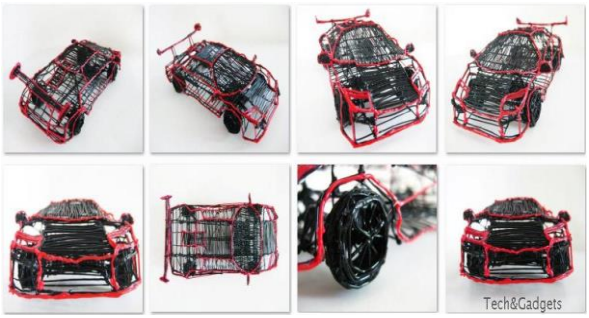
3 RESULTS

The results of students' work on mastering the 3-D pen can be various objects of the applied arts.

For example, we have chosen such items: an elegant bracelet with various floral patterns (Pic. 4) for a beloved mother, as a gift for International Women`s Day. The model of a sports car (Picture 5), as a gift to a father, uncle, brother on February 23. Model of the Eiffel Tower (Pic. 6),

technical products, as objects of extracurricular activities of students.

Pic. 4



Pic. 5

Pic. 6

Today, it's safe to say that 3D pens are not seasonal gadgets. Multifunctionality, convenient dimensions and affordable price make them not just an addition to the desktop 3D printer, but its alternative. Having such a device at your fingertips, you will be able to realize many of your ideas, as well as solve most household problems in just a few minutes.

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