

# Modern technologies and their use in education

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## Abstract

Virtual reality and 3D technology can be considered very nice tools for the development of young students and their engagement in teaching. The article contains a brief summary of all subspecies of 3D technologies and always describes the way in which the technology can be used. At the same time, there is, among other things, a specific example of the use of both technologies. This only confirms that they can connect and use each other in parallel. This is also the main idea of the whole article. Realize that you can use tools you may already know for other purposes that may move your teaching or your students to their better future.

**Keywords:** 3D technology, 3D printing, 3D scanning, virtual reality (VR), augmented reality (AR)

## Introduction

3D technologies and VR have been very current and popular technologies in the last few years, which are gradually entering the environment of primary and secondary schools. Not surprisingly, these are technologies that are relatively readily available and bring a lot of desirable experience for students who encounter these technologies. It is desirable not to avoid any of these sectors, because they complement each other and can be wonderfully interconnected. Lots of people have huge expectations from virtual reality and it is obvious that they will literally affect our future lives.

## 3D technology

In production, design and other production and creative activities, we always start from a design - a vision that we want to materialize, to create a real 3D object. The following steps with the use of modern technologies can help us with this. This process can also be adapted for use in education at primary and secondary schools.

The first step to implementation is to create a 3D model. We have several paths to this. The first is 3D modeling - creating a three-dimensional object in a CAD program on a PC or tablet. Today, there are several different approaches to 3D modeling. Another option is to use the interesting 3D scanning technology, thanks to which we are able to scan an existing three-dimensional object and scan its construction and convert it to digital form, where we can again make adjustments in CAD software. As you can see, 3D scanning can save us a lot of time because we don't have to. Create a model from scratch, but we are able to bounce back from some acquired structure and just modify it. Special 3D scanners are used for 3D scanning. For the field of education, we will mention mainly photogrammetry. Photogrammetry is a technology that allows us to create a 3D model from ordinary photos taken with a camera or mobile phone. This process requires a special program, such as Meshroom. Thanks to photogrammetry, no expensive special equipment is needed, so it is a very convenient way to scan 3D in a school environment.

The last of the 3D technologies that will be mentioned here is 3D printing. In the last few years, it has flourished and has spread to production in companies, households and schools. 3D printing allows us to produce our own plastic 3D models at home or in schools (Kloski, 2017). This idea alone is absolutely amazing, no matter how 3D printing can be involved in the educational process and awaken in students the need to think, design, solve problems e.t.c. This opens another door to the world of technology.

## Virtual reality

Historically, virtual reality is defined, perhaps surprisingly, until the 18th century, when artists and painters of the time created landscapes that were designed to transport observers to a painted place. Yes, this is possible consider the beginnings of virtual reality. (VR in construction practice) Čermák a Navrátil (1997) present the concept of VR as a possible way to overcome human phobias. To emphasize the feeling of transfer to another place, attempts were made to insert paintings on the inner walls of cylinders (Pilný, 2020). There we can already meet a great resemblance to today's approach to the VR. Today, we are able to capture a 360° photograph with a single image on a special camera. Which once took hours and months of work can now be done easily. And if we look at today's completely commonly used Google Maps, which contains the so-called street view, which can use us precisely through 360° imaging can take us virtual to almost any place on our planet.

However, the concept of virtual reality hides much more than just this, gradually the industry began to divide into augmented, virtual and in recent years also mixed reality. It may seem a bit confusing for users, but it's not complicated. Virtual reality - complete immersion in a virtual world or environment using virtual glasses (VR headset). We do not perceive the world around us. It is used for various virtual tours and simulations, staff training and more. The advantage is experiencing situations and personal viewing experiences. The second most common term is augmented reality - the connection to the real world. Thanks to this, we are able to use a smart device (mobile phone, tablet) to view objects that we perceive with blending into our everyday life. Here it is used again in teaching or as a connection with 3D technologies for the visualization of 3D objects, which we want to create, for example, using 3D printing.

There are a lot of applications and programs for virtual reality, several of which even allow you to create your own virtual worlds, program minigames, create virtual tours from 360° photos and more. This is suitable for participation in teaching. It is possible to use this technology for program teaching, where instead of turning on the LED lights we can program 3D objects, set our own three-dimensional simulations, and then view all this using VR in a VR headset or in AR using mobile phones or tablets.

## Practical task

The ideal approach to these technologies is to solve specific assigned tasks. Pupils are given a task or problem to solve or come up with a solution and document the whole process during the process and finally evaluate and present to others. Our example can be the design of a lamp. It often happens that the structure of a portable lamp falls or somehow breaks. Most people just throw it away and buy a new one. However, it is often only a damaged structure and here it is offered to use modern technology and engage a little imagination. It is good to include a story in such an approach, which will draw students in and make it easier for them to think about the situation. It is always necessary to define some basic parameters - maximum

dimensions, determine the materials they can use, determine the specific budget for the material, precisely specify the available tools and implements, machines.

A 3D printer is available, so we can print a new complete body of a destroyed piece of lamp. But this brings us to obtain a 3D model. If we still have the destroyed original body hidden, then we can scan it using a 3D scanner and thus obtain a 3D model. To engage the imagination, however, we move on to creating a new custom 3D model. Our main focus is to follow the maximum specified dimensions. We can view the created models using augmented reality, or even a virtual one in the form of a virtual tour. Thanks to this, we can verify that we are satisfied with the model and move on to 3D printing and subsequent addition of components from a broken lamp. After completing the assembly, we return to the evaluation and some summary of the work. We can use virtual reality again. We do not have to stick to the classic presentation in Powerpoint from MS or Keynote from Apple, but we can use the already mentioned virtual environment, in which we can insert images, videos, texts and of course 3D models and gradually perform from initial designs to the finished product.

## Conclusion

3D technology and virtual reality are easily sympathetic modern technologies, which certainly have great potential. There are a number of options for approaching the individual elements, which is why it is important to start introducing students from the youngest possible age. This can open the door to a big world for them, where the experienced production process from design to finished product will be very useful for them.

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