



3D technologies for education: time to prepare teachers of the future

Bakhodir Eshchanov, Adiz Israilov, Zayniddin Arzikulov

Chirchik State Pedagogical University

bakhodir.eshchanov@gmail.com, isroilov.adiz@gmail.com, zayniddinsam@gmail.com

Abstract: The article discusses the types of 3D technologies, their application in various stages of the educational process and diverse situations, as well as what place 3D technologies are able to take in the educational process of teachers in future.

Keywords: 3D Digital Silk Road, NAWA, cultural heritage, 3D technologies, virtual reality, 3D scanning, 3D printing, 3D modelling

Introduction

Today, 3D technologies are rapidly being implemented in all industrial sectors around the world. One of the most important features of 3D technologies is that they allow learning through experience and studying of many issues which are difficult or impossible to solve. 3D technology allows the invisible to become visible and the inaccessible to be accessible. In particular, 3D technologies and virtual reality are being implemented in the educational system, which in its turn contributes significantly in the field of training of competitive specialists, improving the quality and efficacy of education. In accordance with the Decree of the President of the Republic of Uzbekistan “On approval of the Concept for the Development of the Higher Education System until 2030”, priority areas for the systemic reform of higher education in the Republic of Uzbekistan have been determined. The first place is given to a qualitatively new level of the educational process of independently thinking and highly qualified staff with modern knowledge and high spiritual and moral qualities, to modernisation of all levels of education, to the development of knowledge and skills of teachers based on advanced educational technologies. Considering the above-mentioned, it is important to note that 3D technologies play an important role in the training of future teachers.

Methodology and materials

Future teachers should be very much aware of 3D technologies. To date 3D technologies are introduced into the educational system and occupy a significant place in it. First, it should be answered what is 3D technology and what types of it exist? 3D technologies mainly include:

1. 3D modelling
2. Virtual reality (VR)
3. 3D printing

There are diverse types of 3D technologies in the educational system nowadays. The role of the three technologies listed above is quite significant, so the discussion will be focused on these three types as well as how they can be used by future teachers. Based on current requirements and needs of modern industry, 3D modelling and digital animation are inextricably bound up with many industrial sectors. It can be observed how the processes in these industrial sectors are directly related to 3D modelling and presenting them to observers in the animation form, and yet the demand for it is steadily growing. It is known that during data exchange, information received via a human visual perception organ is perceived most



3D DIGITAL SILK ROAD
(PPI/APM/2019/1/00004)

INTERNATIONAL ACADEMIC PARTNERSHIPS PROGRAMME

effectively, and leaves a deep imprint in memory. Particularly, the information transmitted to the audio carrier also effects positively. It should also be noted that data exchange is carried out not only by words and sounds, but also by images, colours, shapes and dynamic movements. An eloquent evidence of this are the scenes and characters created by means of 3D computer programs for various films, cartoons, clips and other socio-cultural shows broadcast on television, which is a mass medium, and all of it can brought into action. Besides the work on many objects of scientific research and the results obtained are also based on computer modelling. Setting the task of training highly qualified specialists who will show their intellectual abilities, 3D modelling will become one of the cornerstones of this process in future.

3D modelling is applied in the educational process with the help of the following software tools.

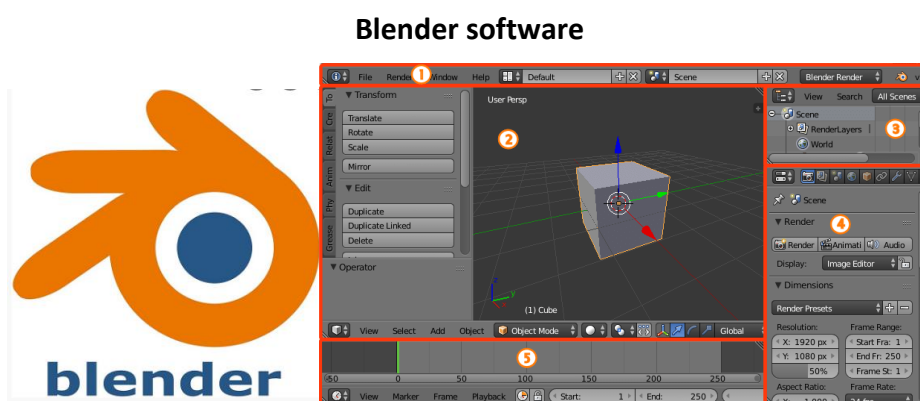


Fig. 1. Blender software and its workspace

Blender (Fig. 1) is a free and open-source 3D modelling software developed from the ground up. Learning to work in this program is worth it in view of its exceptional ease and constant availability to knowledge recipients. Pegagogical HR can solve many educational problems using this software.

Bishop3D Software

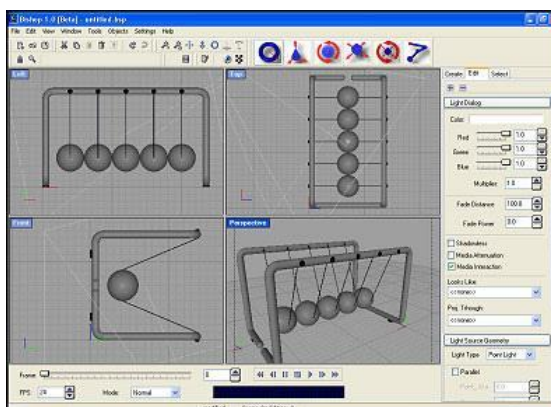


Fig. 2. Bishop3D software and its workspace



Bishop3D (Fig. 2) is very popular and allows easy creation of very accurate images and 3D models for its users, and can be installed on almost any computer. Google Sketchup, DesignWorkshop Lite, C3D Surf, FreeCad and many other software apps can be used in 3D modelling.

3D Studio MAX software

3D Studio MAX is a new stage in 3D modelling and visualisation. This program allows to create professionally high-quality animation and 3D models. It can be used with both 2D and 3D objects. Besides, the program creates high-quality animated films and demonstration programs in certain disciplines.

Virtual reality (VR) and 3D printing

One of the most popular spheres where virtual reality (VR) is widely used is education. Virtual environment allows to effectively simulate various events both in daily routine and at work. Moreover, there is a possibility to organise the learning process more effectively. VR technology proves its usefulness, especially in such cases where the process of professional training presents a threat to human health and life. In point of fact, according to research by international scientists Gallagher and Cates, VR is widely used to simulate surgical processes. Undoubtedly, medicine is not the only field where VR technologies are beneficial. In addition, VR technologies can be widely applied in diverse areas such as nuclear engineering, mining, etc. which can harm human life. A notable example is reducing radiation conditions as a result of nuclear processes among young scientists using VR technologies or preserving the health of future miners from harmful factors in the process of studying underground mining.

In recent years, VR technologies have been increasingly used due to the wide range of possibilities that science provides in various fields. Considering the possibilities of improving the educational process using VR technology is today's major challenge. VR contributes to changing the human mindset, at the same time increasing the desire to acquire new knowledge.

It should be noted that there are so many types of 3D printers that there is a problem how to choose and apply them in the educational system. A 3D printer is a device that carries out the process of making 3D solid objects. This device is capable of making the desired 3D shape from a plastic material at a very high resolution. Currently, in many developed countries every school has 3D printers that allow students to create their own objects and devices.

Conclusions

3D technologies can be applied in the educational process of many spheres, so the following conclusions can be drawn: in the secondary education it is very important that every student could choose the subject of preference and use modelling and 3D printers and be aware of modern trends in the process of profession choice; in medical education – simulating human organs and their structure, further improvement of the acquired knowledge; in physics and chemistry – applying virtual reality in laboratories to improve education quality; implementation of 3D technologies by teachers in the spheres of design, architecture and engineering to visualise situations by using 3D models that are difficult to imagine in the teaching process.



References

1. Miłosz, E., Miłosz, M. (2020). Worldwide education of culture heritage using new technologies – “3D Digital Silk Road” portal case study. *INTED: 14th International Technology, Education and Development Conference*, pp. 1812-1818.
2. Mukhamedov, G., Eshchanov, B., Khodjamkulov, U. (2021). The importance of the great silk road in the development of science. *Intangible Cultural Heritage of the Silk Road from the Area of Modern Uzbekistan*, Monografie, Lublin, pp. 163-170.
3. Eshchanov, B., Arzikulov, Z. (2020). Using distance learning in collaboration with social networks in teaching photonics and optoinformatics. *International Journal of Scientific & Technology Research*, volume 9, issue 2, pp. 6218-6222.
4. Miłosz, M., Miłosz, E., Montusiewicz, J. (2020). Determination of ceramic tile colour surface areas on the medieval Sher-Dor Madrasah mosaic in Samarkand – Problems and solutions. *Digital Applications in Archaeology and Cultural Heritage*, vol. 16, pp. 1-6
5. Eshchanov, B., Egamberganov, I. (2020). Using distance learning in collaboration with social networks in teaching photonics and optoinformatics. *International Journal of Scientific & Technology Research*, volume 9, issue 2, pp 3809-3815.
6. Eshchanov, B., Otajonov, Sh., Arzikulov, Z. (2021). Using of the information technologies in teaching optics at school. *Journal of Physical Education and Sport*, vol. 21, issue 6, pp. 2570-2577.

Acknowledgments: This research was funded by the Polish National Agency for Academic Exchange (NAWA), grant number PPI/APM/2019/1/00004.