Skorin Yu. I.
Ph. D. (Technical), Associate Professor, Semen Kuznets Kharkiv National University of Economics, Kharkiv, Ukraine
ORCID ID: https://orcid.org/0000-0002-4613-3154

INCREASING THE EFFICIENCY OF THE EDUCATIONAL PROCESS THROUGH THE INTRODUCTION OF SIMULATION VIRTUAL COMPUTER SIMULATORS

The analysis of the current state of quality assurance of the educational process and taking into account further trends shows that along with the improvement of traditional tools, a rather new direction appears, namely the development of simulated virtual tools.

This is explained by the following important factors [1]: significant development of electronic and computer technology, due to which personal computers have become a widespread and even necessary tool for students, engineers, scientists and teachers; the range of information and measurement equipment is not always updated as quickly as necessary; violation of various stages of integration and cooperation seriously complicates the process of creating and producing modern means of information and measuring equipment. At present, the rapid development of computer technology and its use in various areas of the economy shows that it is possible to use the powerful capabilities of computerization to improve the measurement process in various systems. The desire to find a better way has led to the creation of virtual tools that have many advantages over traditional ones. These advantages form the basis for the creation of virtual computer simulators (VCS) that are based on the virtualization of measurement and calculation processes. Such simulators can make the learning process more visual and effective, as well as help expand the capabilities of systems.

An important practical task is to ensure that VCS have a visual appearance that fully corresponds to real analogues. This is achieved through the development of non-standard active elements that increase the visibility, quality and efficiency of the educational process.

The relevance of this direction lies in the fact that [2]: the composition of standard means of information and measuring equipment, which is available and necessary to ensure the quality of the educational process, is often significantly limited and needs to be restored, repaired or replaced, so the role of VCS in such cases is important; VCS provide an opportunity to gain practical skills in working with the most modern samples of information and measuring equipment, which, due to technical or economic restrictions, are not yet used in the educational process; VCS can be used by students during self-preparation for classes, since they are easy to operate, do not require special programming knowledge, do not put forward high requirements for the hardware and software of a personal computer, contain hints and comments that help the user perform tasks, detect errors; VCS, in our opinion, should be created, the main purpose of which is modern means of information and

measuring equipment, which are not yet used in laboratories and technical base of an educational institution.

They can also be used to prepare students for work with conventional equipment, for classes, especially in the case of distance learning, that is, in situations where access to conventional equipment is difficult or inefficient. A virtual computer simulator may have additional functions that are not found in real means of information and measuring equipment, for example, to show the physical processes that occur "inside" the device during a measuring experiment, to provide explanatory information, process and store the results obtained, diagnose, check and control the level of knowledge of students, etc. VCS considered in the work have an appearance that fully corresponds to the appearance of real means of information and measuring equipment, for this purpose, non-standard active elements were developed, which are important from the point of view of training efficiency. VCS are especially useful for so-called "instrumental" disciplines, for example, such as "Metrology, Standardization and Certification", "Information and Measurement Systems", "Measuring Instruments and Measuring Equipment", "Technical Measurements", etc. In such subjects, it is possible to effectively use the endless possibilities of virtualization of the educational process.

VCS should reflect the real appearance of real objects, which is achieved through the development of non-standard active elements, which increases visual clarity, quality and efficiency of learning. Specific proposals have also been made to combine traditional and automated methods. These proposals fully comply with the criteria of novelty of scientific research, which are given in the works of such authors as [1; 3].

For the implementation of a software-controlled system, a software model of a hypothetical or actually existing device used to process or measure information, or another object, is created. Control elements, e.g. buttons, switches, knobs, etc., and the logic of the device are carried out thanks to special software. Communication between the program and the technical object is established through interface nodes, which include drivers for external devices such as industrial controllers, digital-to-analog converters, analog-to-digital converters [1].

Virtual tools have a special feature because they are not ready-made industrial devices that exist all the time. They are temporary objects designed to perform certain tasks during measurement experiments. In traditional practice, the value of a physical quantity is determined using special measuring equipment, which is a full-fledged system with a defined purpose and connected to other devices. The main advantage of virtual tools is their versatility and great potential to expand functions without changes in the hardware, only through software improvements [1; 2; 4].

Thus, educational institutions that have limited financial resources can bring to their laboratories highly efficient but affordable data collection devices that enhance the functions of the computer. The results of research on the virtual tool showed that according to the main metrological indicators, the virtual instrument is a complete analogue of an ordinary traditional device. Based on this approach, a virtual measuring complex was created. This complex is implemented in the form of a software solution and received the general name "Virtual Information and

Measurement Laboratory". Computer simulators can be used independently or as part of a comprehensive course of practical classes.

The technique used during a measuring experiment using a virtual simulator is in many cases similar to the technique used when working with information and measuring instruments. The use of the virtual measuring complex is carried out according to the algorithm described in the link [4].

As for the further development of the software package, it should be noted that there are great opportunities for expanding the collection of virtual simulators. Therefore, it is worth considering the option of creating virtual analog simulators for spectrum analyzers and other similar devices. These simulators can be used in the creation of information and measuring systems that are intended for use for research purposes, both as independent tools and as measuring and information systems. The parameters and appearance of such systems can be changed both during their development and during actual use.

References

1. Skorin, Y. I. Shcherbakov, O. V., Ushakova, I. O., & Skorin Y. I. (2022). Improving the Quality of the Educational Process by Developing and Testing the Software of the Information and Measurement System on the Basis of Virtual Computer Simulators. *Bulletin of the Kharkiv National Automobile and Road University*, *96,* 141-145. Retrieved from http://nbuv.gov.ua/UJRN/vhad_2022_96_22.

2. Skorin, Y. I., Shcherbakov, O. V., & Magdalits, T. I. (2012). Virtual measuring and diagnostic devices. *Information processing systems, 4(102),* 65-67. Retrieved from https://repository.hneu.edu.ua/handle/123456789/6513.

3. Radio Shop. (n. d.). *Types of measuring instruments and where they are used.* Retrieved from https://radio-shop.com.ua/uk/vydy-vymiriuvalnykh-pryladiv-i-de-yikh-zastosovuiut?srsltid=AfmBOor58pY-omJkRSpStXmMwcyMFsMNbUxZMHdjhGi-o7F4pn8SWsv8D.

4. NTU "KhPI". (n. d.). *Digital measuring instruments*. Retrieved from https://web.kpi.kharkov.ua/infiz/wp-content/uploads/sites/59/2024/10/TSyfrovi-vymiryuvalni-prylady-175.pdf.