



## USE OF COMPUTER IMITATION MODELS IN TEACHING QUANTUM ELECTRONICS

**Fayziev Mirzaali Asfandiyorovich**

Head of the Department of Pedagogy, Samarkand State University, Candidate of Pedagogical Sciences, Associate Professor

e-mail: [fma@rambler.ru](mailto:fma@rambler.ru), Tel.: +998979180612

**Norkulov Odil Oltinbekovich**

Samarkand State University, independent researcher

e-mail: [odiljon1985@rambler.ru](mailto:odiljon1985@rambler.ru), Tel.: +998979323185

Article history:	Abstract:
<p><b>Received:</b> 11<sup>th</sup> August 2021 <b>Accepted:</b> 13<sup>th</sup> September 2021 <b>Published:</b> 14<sup>th</sup> October 2021</p>	<p>The article deals with the use of computer simulation models in the teaching of quantum electronics, the latest achievements of information technology in education, the analysis of existing scientific publications on the application of software in the educational process, the problems in this area. , the relevance of the idea put forward. It was noted that the peculiarities of teaching physics, the impossibility of observing them in natural conditions, the difficulty of explaining such processes in the traditional method of teaching. In the science of "quantum electronics" created a computer simulation model of processes that can not be observed in natural conditions. The results obtained are given, the importance is stated.</p>

**Keywords:** Education system, information technology, physics, teaching physics, quantum electronics, quantum generators, laser, maser, photon, computer simulation model, methodology.

### INTRODUCTION.

The XXI century is characterized not only by a sharp increase in the volume of scientific and technical information, but also by the fact that technology has reached a qualitatively new level. Therefore, the content of education, which includes the latest achievements of science, also needs to be radically updated. At the same time, one of the urgent tasks is the system of continuing education, including the introduction of information and communication technologies in the teaching of physics in higher education, computerization of the educational process.

An analysis of the existing scientific publications on the application of software in the educational process shows that the issue of using software in the educational process is given great attention around the world. MVSosedko, a Russian scientist, conducted research on the activity of students in educational activities on the basis of new information technologies, L.S.Zauer identified the didactic conditions for the introduction of information technology. The dissertation of A.N.Burov, M.N.Maryukov, M.I.Ragulina, O.P.Solobuto, A.V.Yudakov and others deals with the use of new information technologies in the teaching of mathematics [2].

Many countries have been using English in education in general and expanding teaching in English as a medium of instruction (EMI) in particular in the last few decades (Tsui 2018). In EMI teaching, the instructors use English to teach academic subjects for students whose first language is not English (Chang 2010) [10].

Scholars argued that communication and information exchange are the main component of cross-cultural learning process; they help people reach a mutual understanding of each other's culture [11]

The works of Uzbek scientists S.S.Gulamov, A.H.Abdullaev [3] and M.X.Lutillaev [1] show that the creation of a virtual stand and their application in the educational process is one of the most pressing issues today. A.M.Pulotov [4] conducted research on the simulation model and methods of using it, predicting the level of knowledge that students will acquire in the future on the basis of their knowledge of the subject "Informatics and Information Technology".

### MATERIALS AND METHODS.

There are such peculiarities in the teaching of physics that the phenomena and events that take place in the macro world (galaxy) and the micro world (nucleus, electron, etc.) are studied, it is impossible to observe them in natural conditions. In the traditional teaching method, such processes are explained orally through pictures, diagrams. Students, on the other hand, do not have a high level of mastery of the knowledge imparted in this way, and it is difficult to remember it for a long time.

To solve these problems, there are now opportunities to use modern information and pedagogical technologies. The solution of these problems depends in many ways on the teacher, his pedagogical and scientific skills, training to be able to effectively use their skills in practice. At present, teachers need to have new teaching methods and mechanisms for methodological and technical support for their professional activities. Experienced teachers who teach using new teaching methods allow students to adequately visualize physical processes and, consequently, to develop the necessary knowledge and skills.

This work is devoted to the organization of effective teaching of "Quantum Electronics" on the basis of computer simulation model on the basis of modern information and pedagogical technologies.

The results of a number of scientific studies on the theory of teaching show that to date, teaching has been conducted mainly on the basis of traditional explanatory methods [5].

In traditional teaching methods, teaching materials are mainly expressed in the form of texts and formulas, and it is almost impossible to demonstrate them directly in the teaching process. Assimilation of learning materials presented in this form is generally accepted by the student in a sequential manner, so the level of mastering and memorizing them will not be high [2].

Traditional teaching methods require a large amount of information to be presented in detail by the teacher, the repetition of the given information to be repeated many times, the use of the reproductive method in the learning process, and the teacher's based on authoritarian activity [7].

Great success has been achieved in training specialists in various fields on the basis of traditional teaching methods. However, from the point of view of the era of high technical development and the requirements of a market economy, the shortcomings of traditional teaching methods are also manifested. Traditional teaching methods pay little attention to teaching students to acquire independent knowledge, develop critical thinking skills, and democratize the learning process.

Today, so much scientific information has been collected from each subject that it is impossible to convey it to the listener during the hours allotted in the curriculum using traditional teaching methods.

There are currently a number of teaching methods available to address these issues, among which teaching based on modern information technology tools is of particular importance. Examples of the capabilities of modern information technology are hypertext, hypermedia, graphics, and computer audio programs. The creation of hypertext, hypermedia, graphics and computer audio programs allows not only the effective use of information technology in the education system, but also the organization of non-traditional lessons on science.

When analyzing the process of teaching on the basis of computer technology in higher education institutions of developed countries and in the leading educational institutions of the republic, several directions can be seen [5]. One of these is the use of a computer model. This direction allows the objects of the taught disciplines to express information that cannot be shown in a natural way. This, in turn, makes it possible to determine the nature of the original, to observe its internal and external properties and the process of development.

Today, computer modeling technology is available, the purpose of which is to understand the nature around us, the events that take place in it, and changes in society, to accelerate and adopt the process of understanding through modern methods. Mastering computer modeling technology requires a good knowledge of computer systems (as an intermediary device) and the ability to use modeling technologies in it.

The use of programming languages in computers has made a serious breakthrough in mathematical modeling. Different views of the process models (graphics, diagrams, animations, animations, etc.) studied on high-powered Pentium processor computers created in the late twentieth century can be created on a computer monitor. It is possible to move the model on the screen (for example, a picture sketch) at different levels (in the plane, in space).

Based on these ideas, it is possible to create a computer simulation model of processes that can not be observed in the natural environment in the field of physics "Quantum Electronics" and organize lessons based on it.

Quantum electronics is such a branch of physics that teaches the formation of forced radiation in quantum systems that are thermodynamically unbalanced, and the amplifiers and generators that operate on that basis .

Quantum generators are basically divided into two, lasers and masers.

Quantum generators and amplifiers are called masers, which correspond to the radio frequency of electromagnetic radiation, and lasers, which correspond to the frequency of light [8].

There is no fundamental difference between lasers and masers, this difference disappears with the transition from the light wave range to the radio wave range.

A laser is a monochromatic coherent light source with a high degree of light focus. The word "laser" itself is made up of the initials of English phrases that mean "intensification of light due to forced radiation".

Quantum generators and centimeter-range electromagnetic wave amplifiers are called masers. The term "maser" is derived from the capital letters of English words and means "the intensification of microwaves (ie electromagnetic waves in the range of centimeters) as a result of forced radiation" [9].

### RESULTS.

There are processes in quantum electronics that, if explained in a simple way (showing a picture or drawing on a board), may not give students a clear idea. For example,

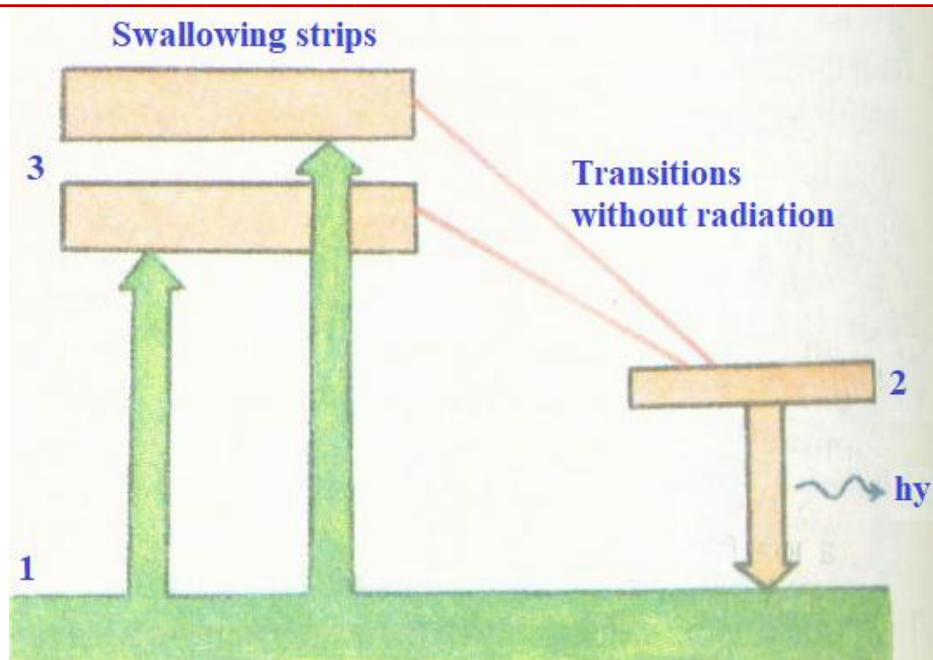


Figure 1. A schematic representation of the environment in which the energy levels are inverted.

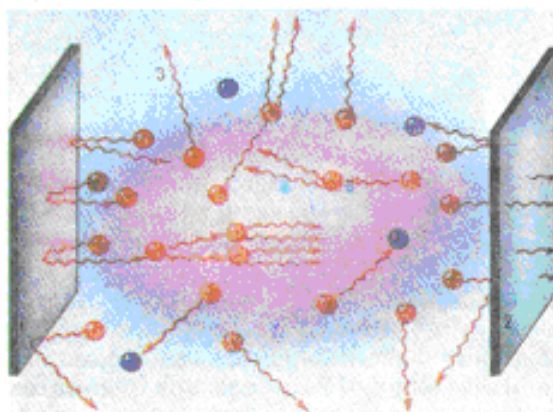


Figure 2. Spontaneously formed photons; their directions of propagation are perpendicular to the plane of the mirrors, forming a lava of photons that deviate from the medium.

If a computer simulation model of these processes is created and the process is explained on the basis of this model, it will be easier for students to understand and imagine these processes, and the knowledge gained through hearing and sight will be remembered for a long time. A computer simulation model of the processes described in all three images above has been created.

### CONCLUSION.

In short, computer simulation models make it possible to use data in a way that is consciously consistent (consistent) with each other. This allows for the presentation of knowledge in a variety of forms using modern teaching methods. At the same time, teaching on the basis of computer simulation model not only masters the learning materials, but also increases the desire of students who are not well mastered to acquire new knowledge. Teaching using a computer simulation model became the basis for increasing the activity of students, the quality of their learning.

### REFERENCES.

1. Lutfillaev, M. Integration of information technologies in improving the educational process in higher education (on the example of computer science and natural sciences): Dis. doct. ped. science. -Tashkent: UzDPITI, 2006. -212 p.
2. Dyachenko, S. The use of the integrated symbolic system of Mathematis in the study of the course of hanging mathematics at the university: Dis. ... sand. ped. science. - Oryol, 2000 .-- 164 p.
3. Gulomov, S., Abdullaev, A. Virtual stand for imitation of functions of educational masters and laboratory installations. -Tashkent: MVISSO, 2002. -23 p.
4. Pulotov, A. Methods of forecasting and using the level of knowledge of students (on the example of teaching the subject "Computer Science and Information Technology"). Dis. ... cand. ped. science. -Tashkent: TDPU, 2006. -139 p.

5. Bidaybekov, Y., Grinshkun, V. Computer modeling and computational experiment in pedagogical research. <http://www.bitpro.ru/ITO/2000/II1/14.html>
6. Fayziev, M. Methodology of formation of knowledge and skills of students on the basis of computer simulation model (on the example of the subject "Informatics and Information Technologies"). Dis. ... cand. ped. science. -Tashkent: TDPU, 2008. –137 p.
7. Ganiev, F., Indiaminov, N. Some problems of modern pedagogical technology. Methodical manual. Part 1. Samarkand: SamSU, 2004. –104 p.
8. Tursunov, A., Tukhlibaev, O. Introduction to quantum electronics. Tashkent, Teacher, 1992, -170 p.
9. Abdurazzokov, A., Nazirov, E. Young Physicist Encyclopedic Dictionary Uzbek Soviet Encyclopedia General Editor, Tashkent, Teacher, 1989, 168-172, 186-187 p.
10. Shadiev, R., Shadiev, N., Fayziev, M., Halubitskaya, Y. Improving Student Learning Satisfaction in Lectures in English as a Medium of Instruction with Speech-Enabled Language Translation Application. Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics), 2020, 12555 LNCS, p . 576–581. [https://doi.org/10.1007/978-3-030-63885-6\\_62](https://doi.org/10.1007/978-3-030-63885-6_62).
11. Shadiev, R., Shadiev, N., & Fayziev, M. (2018, August). Exploring influence of cultural constructs and social network on cross-cultural learning. In *International Conference on Innovative Technologies and Learning* (pp. 345–350). Cham, Switzerland: Springer. <https://edusummit2019.fse.ulaval.ca/sites/edusummit2019.fse.ulaval.ca/files/TWG11-ActionAgenda.pdf>