https://doi.org/10.36719/2789-6919/41/49-52

Aygun Sultanova
Nakhchivan State University
Doctor of Philosophy in Physics
https://orcid.org/0009-0006-7406-6055
aygunsultanova60@gmail.com

Teaching of Physics and Multimedia Technologies

Abstract

Multimedia tools of physics teaching school physics course has wide possibilities for intensification. The use of multimedia in teaching physics makes the study of the subject more interesting and attractive for students.

The main goal of using multimedia in teaching physics is to provide students with deep knowledge and by giving skills, it is to ensure high professional competence in teachers around the following issues. Computer modeling is one of the effective teaching methods for problem-solving in physics. This method is considered a means of developing the mental and creative abilities of students by integrating the didactic possibilities of problem-solving training. Writing and animating information in a multimedia format on a computer is performed with the help of special hardware and software tools. A computer should have minimum tools to be multimedia. Voice information is recorded on multimedia computers using technical devices such as dictaphone and microphone.

Multimedia is a very useful and productive educational technology, it increases motivation by providing interactivity, flexible integration of various visual information, taking into account the individual characteristics of learners. Interactivity is the most important advantage of multimedia over other means of presenting information.

Specifically, the article provides objective and justified answers to methodological questions, when, where and how multimedia can be used in physics teaching.

Keywords*: multimedia, interactivity, information, animation, didactic*

Aygün Sultanova
Naxçıvan Dövlət Universiteti
fizika üzrə fəlsəfə doktoru
https://orcid.org/0009-0006-7406-6055
aygunsultanova60@gmail.com

Fizikanın tədrisi və multimedia texnologiyaları

Xülasə

Fizikadan multimedia vasitələri məktəb fizika kursunun tədrisinin intensivləşdirməsində geniş imkanlara malikdir. Fizikanın tədrisində multimediadan istifadə fənnin öyrənilməsini şagirdlər üçün daha maraqlı və cəlbedici edir.

Fizikanın tədrisində multimediadan istifadədə əsas məqsəd şagirdlərə dərin bilik və bacarıqlar verməklə aşağıdakı məsələlər ətrafında müəllimlərdə yüksək peşəkarlıq kompetensiyasını təmin etməkdir. Fizikadan məsələ həllində səmərəli təlim metodlarından biri də kompyuter modelləşdirməsidir. Bu metod məsələ həlli təliminin didaktik imkanlarını inteqrasiya etməklə şagirdlərin əqli və yaradıcılıq qabiliyyətlərini inkişaf etdirən vasitə hesab edilir. Kompyuterdə multimedia, formatda informasiyanın yazılması və canlandırılması xüsusi aparat və proqram vasitələrinin köməyi ilə yerinə yetirilir. Kompyuter multimedialı olması üçün minimum vasitələrə malik olmalıdır. Multimedialı kompyuterlərdə səsli informasiyaların yazılışı, diktafon və mikrofon kimi texniki vasitələrlə həyata keçirilir.

Multimedia çox faydalı və məhsuldar təhsil texnologiyası olub, interaktivliyi, müxtəlif əyani informasiyaların çevik inteqrasiyasını təmin etməklə, öyrənənlərin fərdi xüsusiyyətlərini nəzərə alaraq motivasiyanı yüksəldir. İnteraktivlik informasiyanın təqdim edilməsində istifadə olunan başqa vasitələrə nəzərən multimedianın ən əhəmiyyətli üstünlüyüdür.

Məqalədə konkret olaraq, metodoloji suallara obyektiv və əsaslandırılmış cavablar, multimediadan fizika tədrisində nə vaxt, harada və necə istifadə oluna biləcəyi haqqında məlumat verilir.

Açar sözlər: *multimedia, interaktivlik, informasiya, animasiya, didaktik*

Introduction

It has been found that the application of multimedia in teaching physics has significantly increased the quality of students' knowledge in all categories compared to the traditional teaching method, as well as maintained the quality of knowledge in the application category (Cubrilo, 2014).

Physics includes various complex concepts, which creates difficulties for both teachers to teach and students to understand the clarity of the subject. Many researchers have discussed this problem in order to adopt an appropriate approach to teaching physics. Therefore, the study reviews research articles focused on multimedia for improving the knowledge delivery system of physics, published in indexes in various standard databases.

Research

The study conducts a literature review based on a five-stage methodology, which consists of the following:

1. Collection of research articles from the database;
2. Inclusion and exclusion norms of the research article;
3. Review of the processed research articles;
4. Analysis of the research articles to extract information;
5. Drawing conclusions from the information extracted to obtain directions for future research (Cubrilo, 2014).

The article contributes to the review of research articles on the use of multimedia in improving methodologies involved in teaching and learning physics. The main idea of this study is to extract research gaps related to the use of multimedia in the existing knowledge delivery system of the physics field in order to provide future research directions. In addition, bibliometric analysis consists of the co-occurrence of keywords, citations using VOS viewer software.

Content analysis is followed to analyze the research method and multimedia tool used.

The result of the study shows that most of the existing works found are based on quasi-experimental design or qualitative design. The result of the study also highlights the different topics of the accepted articles and research gaps related to the use of multimedia in the knowledge delivery system of the physics field.

The use of multimedia technologies in teaching physics in secondary schools is new, relevant and significant. The article presents the main methodological opportunities for use of multimedia technologies in the teaching process of physics in secondary schools.

Multimedia technologies are innovative educational resources. The use of multimedia technologies complements, expands and diversifies traditional methods and means of teaching physics. Their application is aimed at increasing the effectiveness of teaching physics in secondary schools.

Continuous search for new, unconventional methods and means of teaching physics. In 1988, the European Commission, which dealt with the problems of implementation and the use of new technologies, multimedia technologies aimed at creating a product that "contains a set of images, texts and information, accompanied by sound, video, animation, other visual effects (simulations), as well as an interactive interface and other control mechanisms" (Kalpachka, 2022).

The most characteristic feature of multimedia technologies is their interactivity. Multimedia technologies have applications in various fields of human activity. They are most often used in the

education of students. They are widely used in studying various school subjects. The use of multimedia technologies is relevant in the teaching of physics in secondary schools.

In teaching physics in secondary schools, multimedia technologies can be used in various ways. Physics lessons use multimedia technologies in solving physics problems, summarizing, laboratory tasks for testing and evaluating students, learning achievements, extracurricular activities of students, conducting electronic education (synchronous and asynchronous), etc.

Multimedia programs are didactic programs. Products representing computer models reproduce the real conditions for conducting physics experiments, physical objects, phenomena or processes. They represent a qualitatively new type, since they allow you to recreate physics. Visualization of events or processes through computer animation, sound, text, graphics, diagrams, numerical values, etc. allows for active intervention in the course of events or processes, changing the parameters and conditions, conducting experiments and obtaining specific results (Kalpachka, 2022).

Multimedia programs can be used in various ways. Physics lessons, students' activities in extracurricular classes, conducting e-learning, etc. They can also be used when updating, presenting, and are more widely used in the consolidation of the content of training in physics, checking and evaluating the achievements of students' learning, in independent learning, taking into account the application of their physical knowledge.

In the teaching process, physics, multimedia programs can be used for the following: describing the content of training; conducting computer (virtual) interactive; physical experiments (demonstration and laboratory, quantitative and qualitative); creating problem situations and solving learning; introducing new physical concepts, quantities and units of measurement; studying and revealing causal relationships; studying and establishing functional relationships between physical quantities; formulating physical laws; solving various types of physical problems (quantitative, graphical, qualitative, experimental), etc. Multimedia physics teaching programs allow for direct observation of physical experiments. Multimedia computer presentations for teaching and learning physics are modern learning tools that provide innovative opportunities (Kalpachka, 2021). They are usually created using software. They can include various objects in the form of a series of slides: text, dynamic and static images, sound, etc. They are also a convenient methodological tool (Ismayilov, Abdullayev, 2006). For a structured presentation of a certain learning, the content or a certain amount of information is presented in a way that is appropriate and understandable to students.

The hardware and software used to create and run multimedia programs is known as multimedia technology (Ismayilov, Musayeva, 2012).

Multimedia technology has some features such as integration, diversity and interactivity, which allow people to convey information and ideas with digital and printed elements. Digital and printed elements in this context refer to multimedia-based programs or tools used to convey information to people for a better understanding of concepts.

Indeed, various aspects of human endeavors, especially the education sector, are being transformed by the advent of Information and Communication Technologies (ICT). ICT refers to the use of hardware and software for the purpose of collecting, processing, storing, presenting and sharing information, mainly in digital forms (Sultanova, 2022).

Multimedia technology is an important aspect of ICT that deals with how information can be represented and presented digitally using various media such as text, audio, video, among others. It refers to the combination of several technologies that provide information in the best possible formats, packages and sizes.

However, when used in the classroom or for educational purposes, the design quality and complexity of the multimedia application must be high enough to integrate different elements of cognitive processes to achieve the best possible imitation of the teacher.

Conclusion

1. The development of science and technology leads to changes in physics teaching in secondary schools. Educational resources with real-world applications of multimedia technologies are innovative in physics teaching in secondary schools.

2. Teaching physics in secondary schools shows that multimedia technologies can be used in various physics lessons, electronic education of students in extracurricular activities (synchronous and asynchronous), etc.

3. Multimedia technologies can solve many problems of physics teaching in an innovative way.

4. Multimedia or digital learning resources help learners to get along well with mental images by using various media elements that support the processing of information. Information consisting of content and sometimes learning activities is presented using a combination of text, images, video and audio with digital learning resources. Studies conducted on the use of multimedia for learning have shown that learners who combine images and words achieve more positive results than those who use only words.

5. Diversification and traditional enrichment of teaching methods and tools leads to the use of multimedia technologies.

6. Teachers support students' multimedia technologies, rationalize and improve their creative learning activities. The use of multimedia technologies is a key factor in improving secondary school physics teaching, as a possible methodological option, increasing its efficiency.

Reference

1. Cubrilo, D.R. (2014). On the application of multimedia and its impact on teaching physics in secondary school. *Technical school, Kikinda*. P.339-363.
2. Ismayilov, I.N., Abdullayev, C.S. (2006). *Technical means of training and new information technologies. Methodology of their use in teaching (based on physics materials)*. Education.
3. Ismayilov, I.N. (2012). *Modern technologies of physics teaching in secondary schools*. Science.
4. Ismayilov, I.N., Musayeva, G.M. (2012). The place and role of computer models in the system of general education physical models. ICT in education. *Scientific and methodological journal*, No. 1.
5. Ismayilov, I.N. (2013). The role of multimedia technology in teacher competence. ICT in Education. *Scientific-Methodological Journal*. No. 2, pp. 49-565.
6. Sultanova, A.H. (2022). On the possibilities of using multimedia technology in teaching physics. *Scientific Works*. No. 2. 67.
7. Kalpachka, G., Kalpachki, V. (2022). Multimedia technologies in physics teaching. *Bulgarian Chemical Communications*, Volume 54, Special Issue B1 (pp. 111-115).
8. Kalpachka, G. (2021). Modern educational technologies in physics teaching. *Blagoevgrad, University Publishing House "Neofit Rilski"*, p. 128.

Received: 24.11.2024
Submitted for review: 12.12.2024
Approved: 10.01.2025
Published: 28.01.2025