

## **APPLICATION OF QR CODE TECHNOLOGY IN EDUCATION**

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### **ABSTRACT**

*The article shows the effectiveness of the use of mobile devices in the classroom, the use of QR code and a set of 3D molecule designers, the possibility of using 3D technology in chemistry lessons, the advantages of using 3D technology.*

**Keywords:** *education, QR code, 3D designer, molecule, platform, globalization, applications, interactive.*

### **АННОТАЦИЯ**

*В статье показана эффективность использования мобильных устройств в классе, использование QR-кода и набора 3D-конструкторов молекул, возможность использования 3D-технологий на уроках химии, преимущества использования 3D-технологий.*

**Ключевые слова:** *образование, QR-код, 3D-конструктор, молекула, платформа, глобализация, приложения, интерактив.*

### **INTRODUCTION**

Information and communication technologies are gradually penetrating into all spheres of education. Information globalization of the modern world, technology development and availability of technical means, development of mobile applications, programs and interactive educational platforms, creating programs aimed at informatization of education contribute to this.

For a substantiation of efficiency and rationality of application of mobile devices at lessons, we have carried out the analysis of interactive methods with and without application of mobile devices with application of a set of QR-code and the 3D designer of molecules, with specially set criteria. The appliance of mobile devices together with 3D technologies at chemistry classes can be a productive variant of activation of cognitive activity of students. Currently, cell phones are a distraction for students in the classroom due to inappropriate use of the device. We suggest using mobile devices as a guide to information. The use of 3D technology in teaching will make the lessons interesting, cognitive, digital, visual-volume. 3D-technology will allow "immerse" the student in the topic of the studied lesson, makes it possible to

visually explain the topic of the lesson to the students, for example, in chemistry lessons this technology will allow to visually study the structure of molecules, crystal lattices, etc.

Advantages of using 3D technology:

- Equips teachers with high-quality teaching materials, thus saving time explaining difficult concepts.

- Allows to visualize a difficult to understand school topic, fragment of a lesson - understanding of the material.

- Allows to systematize knowledge easily

- Allows you to learn more material - it improves your grades. Despite the positive aspects of this technology, it is worth paying attention to the negative aspects:

Requires the ability and knowledge of the teacher to use 3D-technology

- Requires equipment (interactive whiteboard, mobile devices, tablets)

- Programs for creating 3D models with good functionality may have to be paid for.

- Students who have access to 3D-technology, models have the opportunity to study in detail both the external and internal characteristics of certain models.

- There are various programs for creating 3D models: chemcraft, reactor 2.1, molecular editor 3D, xtaldraw, Avogadro, molview. We have reviewed the platform for creating 3D models of molecules which can be productively applied at the lessons of chemistry when studying the structure of substances: <http://molview.org/> - this platform makes it easy to build 3D model of molecule structure, the "builder" will need to know how these molecules are located in space and correctly position them on the platform. The appliance of 3D technologies together with QR codes will increase the productivity and availability of the digital material. The QR code is a direct successor of the bar code. A bar code is graphic information, applied to the surface, marking or packaging of products, representing the possibility of its reading by technical means - a sequence of black and white stripes, or other geometric shapes. But the capabilities of barcodes are limited. A linear code can hold a small amount of information. Due to the small amount of information encoded, Japanese specialists have expanded the possibilities of this technology, then two-dimensional (matrix) codes appear, QR-code is the environment of which.

Positive sides of appliance of QR-code technology:

1. The volume of encoded information increases several tens of times.

2. information is encoded and not duplicated by symbols understandable to humans

Several variants of execution

4. Different Internet resources and sources write that it is impossible to call this technology something absolutely new, as the technology is close to the usual bar code. However, the QR code is a kind of "window", a link between the real and the virtual world. The availability of this technology is the possibility of reading a QR code from any smartphone or tablet, the process of reading takes a couple of seconds. The reading of these codes can be divided into passive and active reading. The main difference of the QR code is the change of roles of an "object-subject". Usually there is a passive reading, i.e. they are read in buses, metro, stores (at the cash desk), cultural mass places (Human - passive participant). Considering a person as an active reader of codes, it is possible to give an example of a person reading a QR-code from a billboard, from advertising, on a certain resource, i.e. there is a need, a motive, followed by an independent action.

## **DISCUSSION AND RESULTS**

This technology is a new way of interaction and automation of many processes in different spheres of people, including everyday life. The most interesting and unexpected appliance of this technology can be considered as education.

Applying QR code technology in education. This technology acts as a new way and form of broadcasting, transferring of the content of the material, which forms students' competences. Effective formation of competences becomes possible only in case a subject of education himself wants to get knowledge, to perform certain actions for this purpose (intrinsic motivation).

Today, computer technology is well developed and rapidly continuing to evolve, but not always new technologies can interact with the school. The use of IT technology in schools primarily requires some teacher training, as well as a considerable financial investment. Unfortunately, the common conclusion is that phones in the classroom distract from learning activities. In the near future, even now it is difficult to do without computer devices - it is necessary to involve pupils in educational cognitive activity with the help of their smart phones. QR code is one of the interesting interactive means of learning. The appliance of QR code can help teachers and educators in the lesson and extracurricular activity. For educational purposes this technology has a number of advantages as pupils work with information every day - they use their phones, tablets during break time, at home, in their leisure time.

Key opportunities in the educational process:

The use of QR-code with links to various educational portals, multimedia sources, resources that will help the student to solve the task. In organizing activities. Posters with QR code, information block, comments, at extracurricular activities (quests, quizzes, etc.). Using QR-code in the handouts at the lessons in the form of comments, video links, 3D models, etc. Include in controlling and measuring material. Project activities, creation of a collection of links, information block, etc. There are many options for creating QR codes. Below are some of them

1. QR Code Generator (<http://qrcoder.ru/>)

2. Kerem Erkan. QR Code and 2D code generator. (<https://keremerkan.net/qr-code-and-2d-code-generator/>)

Tec-it. (<https://qrcode.tec-it.com/ru>)

4. Visualead (<https://www.visualead.com/qr-code-generator>)

5. Creambe (<http://creambee.ru>)

There are also many options, programs, applications to decrypt (read) QR-codes: Application for Android phones, IOS, QR-code Reader.

1. Various online services, a program in which it will be possible to download the image QR-code.

2. By encoding a link to the 3D chemical model in the QR code, we can make the material accessible, also there is an opportunity to combine these technologies into a reference book of additional material on chemistry, which will help the pupils to learn the school material on chemistry.

To create the 3D molecules guide on chemistry, the adobe InDesign platform was used for the guide's layout, the creambe platform was used for

QR-code creation(<http://creambee.ru>),platformMolView (<http://molview.org/>), for construction of three-dimensional molecules, Paint Tool Sai, adobe photoshop - was used for creation of illustrations.

## **CONCLUSION**

The results of the experimental work gave the information that computer technologies have already entered the educational process as a whole and they are used in practice, also pupils and teachers consider the necessity of using interactive computer technologies, exactly the technology of QR codes with 3D constructor can make chemistry teaching productive and interesting. Our development proved to be effective and in demand among the students. This technology faces the problem of technical equipment of the chemistry room and students themselves, the prohibition of using mobile devices at the lessons in the school educational institutions.

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