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Influence of Augmented Reality on Motivation to Study, in the Process of Training Future Teachers of Chemistry

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Abstract

The relevance of the study of this problem is due to the fact that there are trends towards digitalization of everything that surrounds us in most countries. In this regard, this article is aimed at studying the problem of the quality of education in the context of approaches to increase motivation in the preparation of chemistry teachers and the role in motivation of modern technologies.
The leading methods in the study of this problem are theoretical methods, analysis and synthesis of the subject of research based on the study of literature on augmented reality and motivation. As for empirical methods, the focus group method was used.
The article revealed that augmented reality is currently a breakthrough technology in the delivery of educational content and contributes to a more effective assimilation of both theoretical educational material and the development of practical skills. The results of the focus group showed that future teachers are ready to use augmented reality technology in their work, but at the same time they note a number of shortcomings. The materials presented in the article convincingly prove the positive impact of augmented reality on the quality of education.

Keywords: focus group, augmented reality, Android, iOS, Vuforia, education, improving the quality of education, motivation in learning, chemistry teachers.

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Introduction

The world is undergoing global changes in education, which introduce new characteristics into it: continuity, ubiquity, human orientation, over objectivity. In most countries, there is a tendency to digitalize everything that surrounds us. The change in education is aimed at creating a smart environment where almost any object, whether it is a book or an installation for conducting experiments, can be represented in a network or virtual space. However, these trends cannot be compared with what the school currently has. At best, these are static images of posters and filmstrips that do not allow students to fully master the topic (Shibaev, 2016).

In the 21st century, the generation of “visuals” cannot be encouraged to study with obsolete technologies. To motivate a modern child to study, it is necessary that the technologies in the educational process correspond to the general development of information technologies in the world.

Purpose and objectives of the study

The purpose of the study is to reveal the relevance of using augmented reality as an element of motivation in the educational process.

Literature review

People spend more and more time with smartphones. These mobile gadgets have almost crowded out cameras, players, navigators. Now they are replacing laptops and PCs (personal computers) from our lives. Classic computers have been losing popularity with users since 2011. Quarterly desktop sales fall by a few percent. Yes, and laptops are slowly but surely leaving our lives. Laptops, although they outperformed PC sales, are inferior in popularity to smartphones by almost ten times. The production of phones is growing rapidly: if in the same 2011, gadget sales amounted to 494 million units, then in 2018 the number tripled, to almost one and a half billion devices. The fact that mobile phones are more popular today than laptops and desktops is also indicated by usage statistics. For example, for Internet surfing, people already use gadgets more often than classic PCs. According to a study by Counterpoint, every fourth user spends more than 7 hours per day on a smartphone. In 2017, 63% of people viewed websites from mobile devices (Chepur, 2018).

IDC believes that the smartphone will gradually turn into the “main gadget” of a person, while computers and tablets will become “auxiliary devices”. The growth in smartphone sales, according to IDC forecast, will occur mainly due to emerging markets in China, India and Brazil. He will contribute to the reduction in

the price of gadgets. If in 2013 the share of smartphones, tablets and laptops in the price range of up to $ 200 and $ 200 - 500 was approximately at the same level – 32–34%, then by 2018 the share of gadgets cheaper than $ 200 was already more than 43% of the total number sold devices (IDC: smartphones are crowding out computers, 2014).

Table 1 shows the percentage use of Android and iOS in different countries of the world, prepared by Bloomberg. It follows that the most popular OS in the world are Android and iOS.

Table 1. Percentage of use of the Android OS and iOS in different countries of the world, prepared by Bloomberg (Ovide, 2019)

OC	Russia	USA	Japan	China	Sweden
iOS	26%	53%	70%	24%	54%
Android	73%	46%	30%	72%	46%

The leader in using iOS is Japan, and the leader in using Android is China.

Modern tendencies

The modern education system focuses on learning on the basis of simulations of reality and cognitive technologies, conflicts with what the school has today. In the XXI century, only by inducing, and not "forcing" a child to active educational activity, it is possible to form his systemic thinking.

Augmented reality is a technology for overlaying information in the form of text, graphics, audio, and other virtual objects on real objects in real time (Yakovlev & Pustov, 2013).

Rupert Forsyth and Paul Lewis found Campus Interactive, UK's first specialized augmented reality agency for universities, colleges, and schools. With the help of augmented reality, a medical training program called SimMan, created on the basis of the University of Sheffield, was implemented, which was used at training sessions for nurses in Sheffield (Augmented reality – new experience and opportunities in the field of education, 2014).

Vuforia Chalk by PTC Inc. made a revolution in the use of AR to implement the educational process on-line. The teacher can draw digital annotations on the screen of a mobile phone or on the desktop, which

exactly correspond to three-dimensional physical objects, which allows the teacher to demonstrate the sequence of operations step by step (PTC Inc., n.d.).

In Europe, testing was done during lessons using 3D content and regular 2D content. 100% of the teachers participating in the survey noted the following: the percentage of mastering the material for groups with 3D was about 86% and discipline increased, while in groups with 2D it barely reached 52%. It has also been found that 3D motivates children to study, stimulates the development of speech and facial expressions in children, and improves the assimilation of material (Augmented Reality in Education: Interview with EligoVision, 2013).

The first in Russia specialized center “Augmented Reality” was opened at Moscow Lyceum No. 1575, where augmented reality is used in the lessons of biology and science, chemistry, physics, history, astronomy (Virtual reality engulfed Moscow schoolchildren, 2015).

Methodology

The problem of research. The work examines the problems of improving the quality of education, in the context of the training of chemistry teachers and the introduction of modern high technologies in the educational process, the causes of problems and ways to solve them.

Research methods: theoretical methods, analysis and synthesis of the subject of research based on the study of literature on augmented reality and motivation. As empirical methods, the focus group method was used.

Subject of research: the use of augmented reality in learning.

Results

We have developed the AR application for mobile devices "AR Neft" pic. 1. The program is an educational environment in which students have the opportunity to learn the real technological equipment of the oil industry using a 3D object, recreated using marker technology of augmented reality, using a mobile device based on Android. The program provides the following functions: visualization of technological equipment of the oil industry using marker technology of augmented reality. The program can be used in universities, as a training simulator for advanced training of workers in the oil industry, as well as in laboratory, practical and lecture classes, for the student to work independently in studying a training course in technological equipment for the oil industry, as well as in chemistry classes at school.

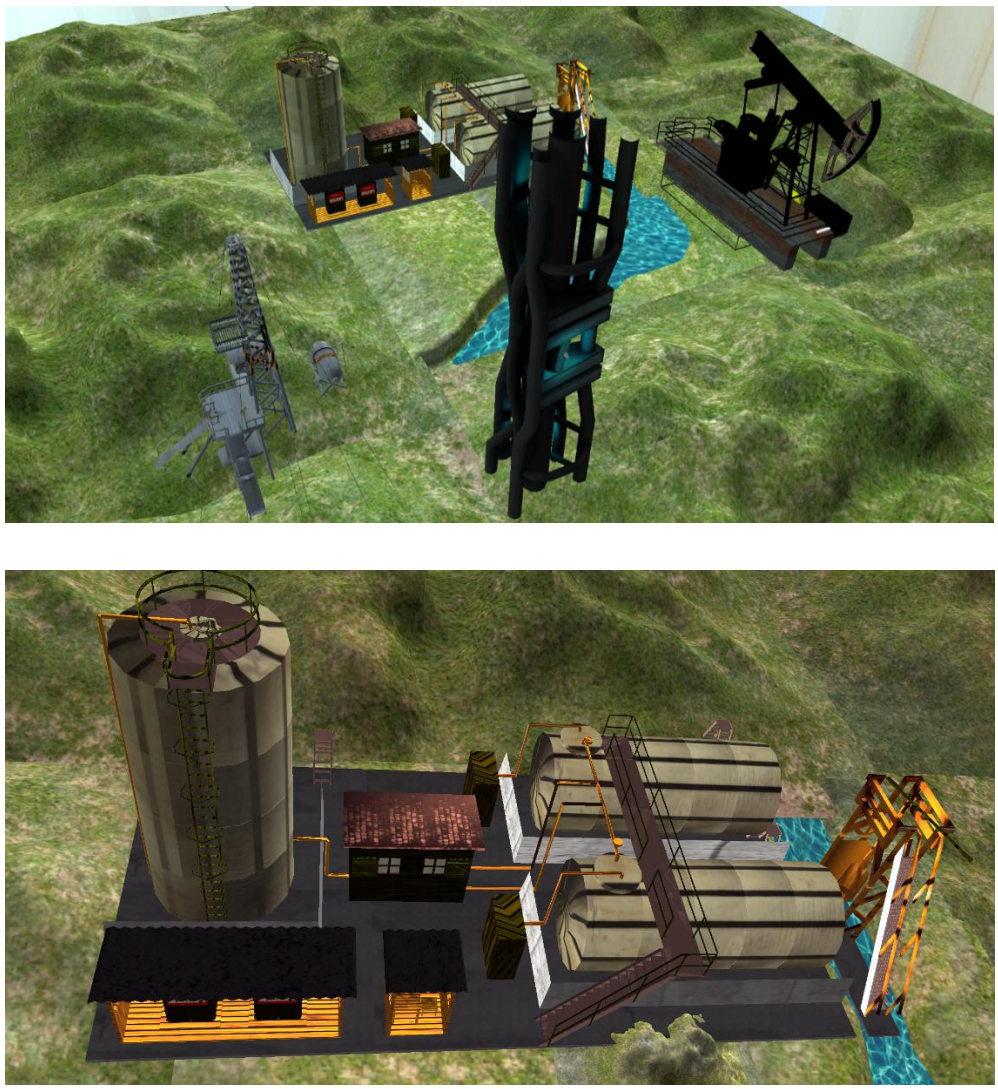

Figure. 1. Application for mobile devices "AR Neft" with augmented reality

In order to obtain information on the attitude of future chemistry teachers to the use of new AR technologies in the educational process, a focus group was held among students of the 3rd year of teacher education “Biology with an additional specialty in chemistry” and “Biology with an additional specialty in English”.

Tasks:

1. To study the attitude of respondents to the use of augmented reality in education.

2. Find out the opinion of respondents about an application that can be used in teaching chemistry.

3. Formulate proposals for the application of the Elements 4D application in chemistry classes.

The object of the study are students in the age category from 20 to 21 years.

The subject of focus is groups - applications of augmented reality.

The hypothesis was not put forward so as not to predetermine the understanding of the topic under study.

Focus - the group was held in the type of "challenging".

In the course of planning focus groups, projective techniques were used that were supposed to help circumvent the respondents' psychological barrier. In particular, tasks were applied using the constructive method and to complete the task.

During the focus group, the following were established.

Respondents did not know about the topic under study. After a brief explanation of the essence of augmented reality, respondents were asked to define augmented reality. All respondents unambiguously (100%) gave the correct definition, the answers differed only in wording. The most vivid answer was given by one of the participants in the focus group:

Augmented reality is the reconstruction of reality with elements that we cannot actually do when using special tools.

To the question in which areas augmented reality can be used, respondents gave very interesting answers. 60% of respondents said that augmented reality can be used in IT programming, mechanics, construction and education. 10% suggested that in tourism. 30% believe in medicine.

To the question regarding the problems of using augmented reality, respondents gave a definite answer (100%) – there are not enough funds for introducing augmented reality into the sphere of education. Also, respondents expressed the idea that the mainstream population has little knowledge about extended reality:

The risks of using augmented reality in the field of education were also noted. When asked how augmented reality will affect the quality of education, respondents were divided into two halves. The negative side noted the lack of tactile perception of many ongoing experiments, and the positive side – "you can show that in reality it is impossible to do."

The next question in the focus group was related to the age at which augmented reality could be applied. Age categories were different: 45% – from the elementary grades, since now is the age of technical means, and children are much better versed in technical means than adults; 30% – from secondary – increased interest in studying new material and from 25% – senior classes – visibility will help to memorize material for preparation for the exam.

According to the majority of respondents (70%), more advanced information should appear in the manuals. 20% believe that the structure of the lesson should change, and 10% believe that the development of practical and laboratory work using augmented reality should appear. “These methodological manuals should change at intervals of 2 to 3 years,” 80% of respondents gave such an answer, and 20% replied that every 5 years.

To the statement – “There is an opinion that the use of augmented reality in teaching is not advisable, that it will distract students and not contribute to the study of the curriculum” 70% answered that they agree with this statement, and 30% of the participants do not agree, as they consider that "in the lesson there should be a principle of visualization, and in the courtyard of the age of computer technology."

At the stage of basic questions, the Elements 4D application was shown. Questions concerning this application and its application in training were discussed.

- The positive sides of this application are:
- Colorfulness (30% of respondents);
- Visibility (40% of respondents);
- Assistant in learning English (30% of respondents).

The following signs noted the negative sides of this application:

- “The principles of work are not understood” (10% of respondents);
- The application is in English (40% of respondents);
- 50% of respondents did not catch the negative sides.

When asked what topics can be studied using the augmented reality application, all respondents unambiguously answered about the use of the application in the study of chemical elements and chemical reactions of organic and inorganic compounds.

Augmented reality can be applied at the following stages of the lesson: actualization, study of new material and consolidation. All respondents (100%) showed that augmented reality can be applied at the stage of studying new material.

All participants of the focus group to the question “Are you interested in using augmented reality?” answered positively. The following points were noted about the prospects of use:

- Use in many subjects, such as physics, chemistry, biology. For example, the cycle of things in nature.

- Augmented reality technology will not be accepted in the field of education, as teachers of the old school are very difficult to perceive innovations.

- Augmented reality technology will be used in class, extracurricular and extra-class classes.

In the final stage, clarifying additional questions were asked, such as: “From what sources do you prefer to receive information about the technologies used in the field of education?” and “Under what circumstances did you learn about augmented reality?” The following data were obtained on these two issues: in most cases, respondents receive information from the Internet and mass media.

90% of respondents learned about the details of augmented reality when conducting a focus group.

Having made a detailed analysis of the Fox group, we can conclude that Russian students are little aware of this topic.

Discussions

The technology of augmented reality must unconditionally find its place in the educational system, both in high school and in higher education, but there remain problems that need to be addressed. One of them is how to find a reasonable combination of traditional teaching methods and modern technologies, while not destroying the good, we have a hundred today, while introducing technologies that make learning more visual, interactive, fun and productive.

Augmented reality technology has been intensively used in education for several years. Abroad, there are dozens of development companies that create ready-made educational applications using augmented reality and encourage other teachers to accept their interactive textbooks in the learning process.

For example, in New Zealand, Australia, Japan, and Korea, augmented reality technologies for learning are developing at a very fast pace, which is much faster than in Europe and Russia, the latter lagging behind the

Europe in this regard. We treat augmented reality, as well as everything new, with some caution (EligoVision: complementing reality, 2010).

Augmented reality allows you to create and work with incredible educational projects in scenarios that are physically not realistic to realize in real life.

With its help, you can pick up a tiny atom or, conversely, our planet. It helps the concept of abstract concepts, for example, geometric three-dimensional forms, make complex chemical experiments visual, dangerous experiments in 3D graphics at chemistry or physics classes, entertaining travels at geography, as well as reconstruct historical battles right on the table, unique experiments at biology classes will become significantly more exciting and interesting and will be remembered for a long time.

Conclusion

In our opinion, the introduction of mobile applications in chemistry classes is currently very relevant. They are accessible to a wide number of people, including the school age group.

Using the capabilities of modern information technology in a modern school contributes to:

• Motivation of cognitive activity in students.

• Individualization of training.

• Professional growth of the teacher, the quality of self-education, mastery of advanced teaching technologies.

• Novelty, originality, expediency of ways to achieve results.

Thus, the use of mobile applications as an element of the educational environment of a modern school: develops the cognitive abilities of students (attention, imagination, memory, logical thinking), improves the perception of the world, fosters independence, and allows the diagnosis of learning material.

The use of mobile learning tools in a modern school allows you to create a creative positive-emotional atmosphere in the lesson. The use of beautiful and vivid graphics, a fairy-tale shell in training programs with the effect of novelty (different fairy-tale shells for playing with the same educational purpose allow maintaining the student’s constant interest), leads students to look forward to mobile lessons, which increases learning motivation.

Augmented reality technology is an extremely important tool for the development of individuality and creativity of a person's personality in a post-industrial meritocratic IT society; it has great prospects in the new generation education system.

Augmented reality is a breakthrough technology in the delivery of educational content and contributes to a more effective assimilation of both theoretical educational material and the development of practical skills.

The results of the focus group showed that future teachers are ready to use AR technology in their work, but at the same time they note a lack of their own knowledge for the development of such applications and a lack of awareness in this matter.

The results of the study can be used in the preparation of future chemistry teachers, with the aim of improving the quality of their education and meeting its world level.

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