The technology of augmented reality as a motivational factor for EFL future soil scientists in learning foreign language terminology of chemical elements

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Abstract. Currently augmented reality technology, as one of innovative tools, is rapidly penetrating the process of mastering a foreign language, helping to diversify and optimize the learning process for a new generation of students. The use of augmented reality technology in the foreign language educational process helps to increase motivation of students to study a foreign language at a university. The purpose of the study is to examine and analyze the impact of augmented reality technology on future soil specialists' motivation in the process of learning English as a foreign language. To achieve the goal of the study, a comprehensive research methodology was chosen: theoretical analysis of scientific, pedagogical and methodological literature on the topic of research, pedagogical observation, survey, interview, analysis of the research results. Along with traditional methods, the elements of augmented reality were introduced in the process of teaching a foreign language to first-year students of non-linguistic specialties in order to identify the effectiveness of the influence of the technology on students' motivation in learning English as a foreign language. The authors conclude that the technology of augmented reality has a didactic potential in the study of a foreign language in general and in the study of foreign language terminology of chemical elements in particular.

1 Introduction

The Russian education system has undergone major changes in recent years due to the introduction of digital technologies. The total digitalization of social processes and people's lives is changing the way we perceive the world, the way we think and process information. The clip thinking of the younger generation makes traditional educational models change as well. Young people who grew up in an environment with a high information flow find it

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difficult to perceive texts without dynamic illustrations. There is a decrease in interest in the subject and motivation for learning [1].

As part of teaching a foreign language, the problems of motivation were considered in the scientific works of such domestic and foreign researchers as A.A. Alkhazishvili, N.I. Gez, P.B. Gurvich, I.A. Zimnyaya, A.A. Leontiev, V.L. Skalkina, E.I. Passov, N.M. Simonova, E.P. Shubina, R.D. Gonzales, R. Gardner, W. Lambert, M. Rost, M. Tanaka, Á. Di Serio, M.B. Ibáñez, C.D. Kloos, R.B. Nevisi, A. Farhani, M. Liu, W.L. Quint Oga-Baldwin, G.R. Kiany, B. Mahdavy, R.G. Samar, H. Mohammadi, E. Namaziandost, M. Wallace, P. Leong, et al. Modern living conditions are changing the approach to learning. There is a need, along with traditional methods and forms of education, to use digital educational technologies to improve the quality of education and optimize the learning process. Augmented reality (AR) technology has recently become one of the effective digitalization tools, which allows diversifying the educational process for the modern generation of students. When teaching a foreign language, it is always very important to create a natural and entertaining educational environment that can help increase the motivation of students, arouse their interest and encourage them to learn a foreign language. Learning activities and educational environment should be created in such a way as to attract the attention of students, give them confidence in learning a foreign language and, conversely, limit negative emotions such as anxiety and fear [2]. It is AR technology that today, rapidly penetrating into foreign language education, can become one of the effective tools for increasing the level of motivation for learning activities and involvement in the educational process. However, the potential of AR technology is still little studied, and the number of research on the impact of AR technology on students' motivation to learn a foreign language is not so large.

The relevance of this research lies in the fact that the use of AR technology in a foreign language educational process helps to increase the motivation of students to study a foreign language at a university.

The purpose of the research is to examine and analyze the impact of the use of AR technology in teaching a foreign language on students' motivation to study such discipline as English.

2 Main part

The modern educational environment dictates new conditions for the presentation of theoretical and practical knowledge in teaching students in higher educational institutions. AR technology satisfies these conditions. The idea of AR technology is relatively simple: it recognizes a given image of the real world and superimposes a virtual world object on this image. At the same time, it allows everyone to carry out interesting projects [3]. The purpose of such technologies in education is to strengthen the intellectual abilities of students in the information society, to individualize and intensify the learning process and improve its quality [4, 5]. Using the possibilities of AR in foreign language classrooms gives a unique opportunity to visually reproduce difficult or almost impossible processes by means of the real world and makes the learning process fascinating and understandable [6]. AR can add expressive animation to the static pages of textbooks, newspapers, magazines, geographical maps, etc. and it turns reading and translation into an exciting game and an interesting adventure together with the heroes of famous works, while seriously and thoroughly practicing professional vocabulary [7].

In the age of digitalization AR technology is one of the most important tools to increase the level of motivation to study various disciplines, especially to study a foreign language at a university. Currently students do not have enough traditional means and methods of teaching a foreign language. Boring printed textbooks do not allow diversifying the

learning process and arousing interest in the subject being studied. Handouts, work with video and audio materials increase interest in the discipline, but are also ineffective at the current stage of social development. Thus, motivation to study disciplines is reduced. The generation of students who have been using gadgets since childhood do not want and cannot study in the old way. The issue of increasing the level of motivation to master foreign language competence has been actively raised among scientists in recent years. Accordingly, it makes sense to use smartphones, tablets and AR technology in a classroom to interest students, involve them in the learning process and motivate them to learn a foreign language.

Today, both foreign [8-19] and domestic scientists [20-25] are engaged in the problem of studying the motivational sphere. Currently there are various interpretations of the concept of motivation as a psychological and pedagogical phenomenon. We agree with G.N. Khamedova, who understands learning motivation as a process mediated by internal and external factors, encouraging students to study in order to achieve educational goals [20]. Managing the motivation for learning a foreign language is one of the central problems of teaching methods in higher education. A foreign language as a subject has a number of specific features, one of which is the acquisition of a foreign language by teaching the ability to communicate in a foreign language. The teacher is faced with the task of creating an environment of foreign language speech communication in the process of language learning, bringing it as close as possible to natural conditions [21].

According to E.A. Kabanova, in order to form a positive sustainable motivation for learning activities, it is necessary to take into account the following factors:

- content of the educational material;
- organization of educational activities;
- collective forms of learning activity [22].

The content of teaching appears to students primarily in the form of information that they receive from the teacher and from educational literature. Therefore, when giving educational material (for example, a topic for discussion), it is necessary to take into account the needs and knowledge that a student of this age has. In addition, the material should be sufficiently illustrated, have a motivating force that contributes to the awakening of interest in learning. It is in this case that the ability to use AR elements can bring an invaluable contribution to the educational process.

The organization of educational activities plays an important role in the learning process. It is necessary to clearly formulate the tasks assigned to the student in order to avoid misunderstanding and subsequently the fear of failure. The use of mobile applications with AR elements will help organize classroom and independent work of students in an interesting and high-quality way.

As for the collective (group) form of activity, it creates better motivation than individual one. The group form “draws” even passive, poorly motivated students into active work, since they cannot refuse to do their part of the work without being condemned by their groupmates. In addition, subconsciously there is a setting for competition, a desire to be no worse than others. From this, we can conclude that it is necessary to select educational material and ways of working with it, taking into account the factors that affect cognitive motivation. And then it will be possible to increase the level of cognitive motivation of all groups of students: with positive and negative learning motives.

R.B. Nevisi and A. Farhani notice that educators should be more cautious in choosing the right instructional materials and pedagogical tools. To decrease demotivation, teachers are recommended to pay due attention to the proper selection and adoption of teaching methodology and their manner that can boost learners’ motivation [19].

Z.I. Konnova and G.V. Semenova emphasize that the educational process currently requires searching and mastering of new motivational tools for foreign language education [26].

It is AR technology that can become one of such motivational tools. The use of AR technology in the process of forming the foreign language competence of students of a non-linguistic university enriches the visual and contextual teaching of a foreign language and improves the content of foreign language teaching; effectively complements traditional teaching methods and tools; increases interest in the process of foreign language learning among generation Z, who have been accustomed to the constant use of electronic devices since childhood [27]. This technology also provides students with quick access to various authentic educational resources and programs inside a classroom and outside it. Due to its advantages, it is acceptable, interesting and easy for students. Learning a foreign language with the help of gadgets, which allow including AR elements, brings pleasure from the process of learning new things and gives students emotional satisfaction. The current generation has become accustomed to smartphones and tablets, so this feature should be taken into account in teaching.

3 Materials and methods

To achieve the goal of the study, a comprehensive research methodology was chosen: theoretical analysis of scientific, pedagogical and methodological literature on the topic of research, pedagogical observation, survey, interview, analysis of the research results. For the survey, we used the methodology of T.D. Dubovitskaya, which consists of 20 judgments and suggested answers.

Since most applications with AR elements are in English, first-year students of the Natural Science Institute of Tula State University studying English as a foreign language (EFL) were involved in the pedagogical experiment to identify the effectiveness of the influence of AR technology on the motivation of students to learn a foreign language. Experimental work was carried out in the 2021-2022 academic year and 68 students studying in the specialties 04.03.01 “Chemistry”, 06.03.01 “Biology”, 19.03.01 “Biotechnology” took part in the experiment. Future soil specialists were divided into 4 subgroups: control group № 1 (CGr 1), control group № 2 (CGr 2), experimental group № 1 (EGr 1), and experimental group № 2 (EGr 2).

4 Results and discussion

At *the ascertaining stage* of the experiment, using the methods of survey and interview, we carried out the diagnosis of the initial level of formation of the students’ motivation in the control and experimental groups for EFL learning. The methodology of T.D. Dubovitskaya was chosen for the survey since there are not enough studies in domestic pedagogy that apply this methodology for determining the level of non-linguistic university students’ motivation to learn a foreign language using AR technology.

For the interview, 7 students were randomly selected from each group. The interviews showed that the majority of students are poorly motivated to learn a foreign language. Many of them think that studying only with textbooks and grammar references is boring and outdated. Paper handouts also no longer attract students in the modern learning process. We noticed that during the interview, each student was holding a smartphone in his hands. Accordingly, we concluded that learning with gadgets is more interesting and easier. The students confirmed our findings in the interview.

As a result of the survey, according to the methodology of T.D. Dubovitskaya, at the beginning of the experiment it was revealed that the indicators of the level of formation of the students' motivation in the experimental and control groups for EFL learning are approximately equal (high – 9.6-11.1% of students, medium – 34.6-35.3% of students, low – 53.7-55.1% of students). The results are presented in the diagram (Figure 1).

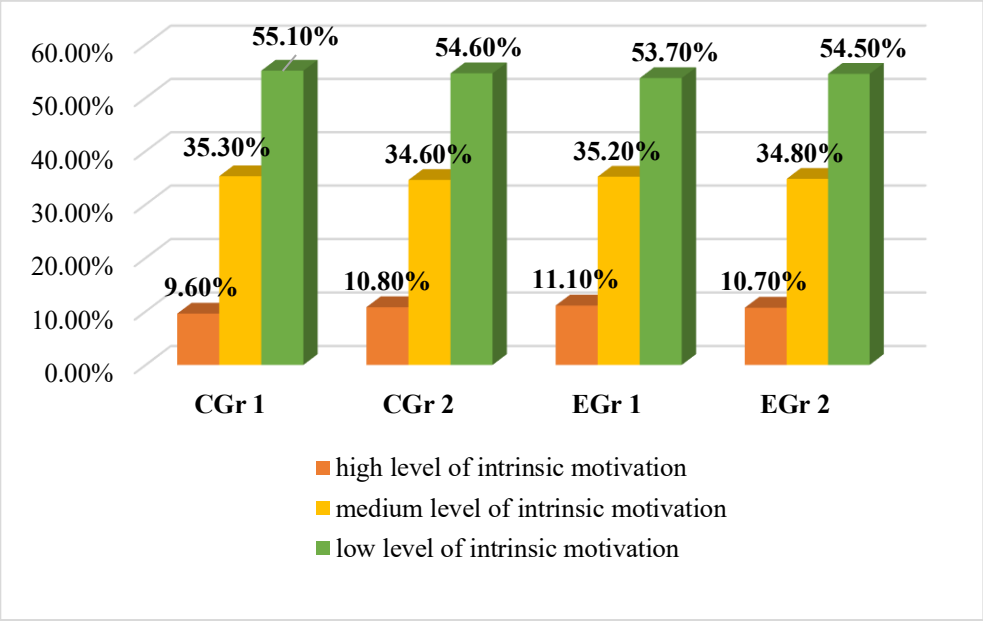

Fig. 1. Indicators of the level of formation of motivation of the students of the experimental and control groups for EFL learning at the beginning of the experiment.

During *the formative stage* of the experiment, twice a semester we determined the level of formation of the students' motivation for EFL learning by conducting interviews and pedagogical observation.

The experimental work was carried out during the entire course of study, that is during 2 semesters, as follows: in the control groups traditional methods and teaching aids were used in EFL classrooms. In the experimental groups, along with traditional methods and teaching aids, AR technology was used in EFL classrooms. The students of the experimental and control groups studied chemical terminology, vocabulary of various topics and directions, read texts on regional studies and their specialty, watched videos and had discussions in English. The students of all the groups involved in the experiment mastered the same amount of material in the same number of classroom hours. During traditional classes, the students of the experimental groups were asked to switch to smartphones for a while and download the Mondly, AR VR Molecules Editor, Chemistry AR applications, AR Notecards, and other applications. Chemistry AR applications allowed the students to visualize and interact with the spatial structure of a molecule using a marker object in their hands. Using HP Reveal, a free app, they could create AR Notecards to study organic chemistry mechanisms or virtual demonstrations of how to use laboratory instruments. With "AR VR Molecules Editor" application the students could design single, double, and triple bond molecules and make cyclic models (Figure 2).

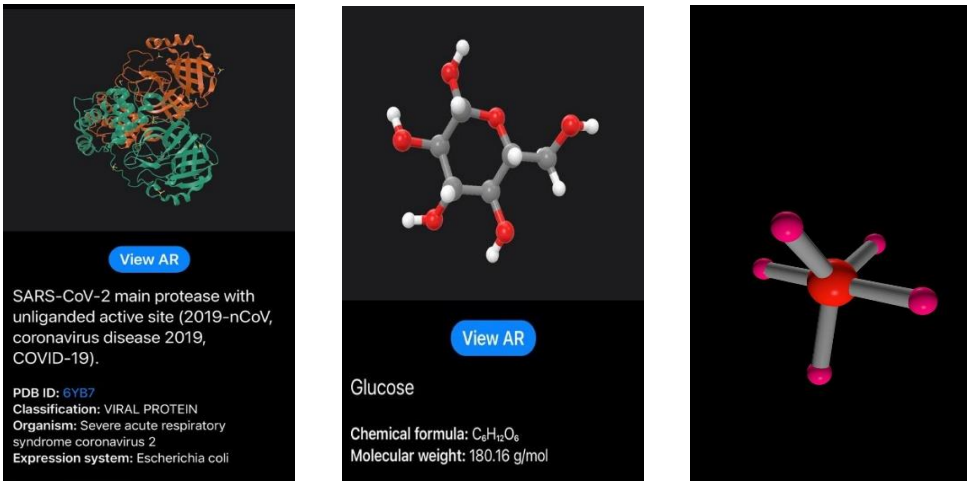

Fig. 2. Working with Chemistry AR applications, Authors' photos.

By pointing the camera of a mobile device at a chemical formula printed on a piece of paper, the student was able to observe and study a 3D representation of the corresponding molecule in AR.

At this stage of the experiment, the teacher constantly conducted pedagogical observation in the control and experimental groups. When students switched to applications for working with AR, they became animated, their faces showed interest, curiosity, and a desire to study. During the use of AR applications for learning English, the involvement in EFL learning process was maximum.

At *the final stage* of the experiment, after EFL learning with AR technology in the experimental groups and after EFL learning with traditional methods and techniques in the control groups, using the methods of survey and interview, we again diagnosed the level of formation of the students' motivation for EFL learning in the control and experimental groups.

The interview was held with students of the experimental groups in order to determine the role of using AR applications in foreign language classrooms at a university for increasing the level of motivation. The vast majority of the participants of the experiment noted that due to the visibility, information completeness and interactivity of AR applications, academic performance and understanding of the material improve, foreign language competence forms faster, the degree of involvement in the learning process and interest in studying the subject increases, and the level of communication between students increases. Accordingly, the level of motivation for learning increases.

As a result of resurvey, according to the methodology of T.D. Dubovitskaya, at the end of the experiment, it turned out that the level of future soil specialists' motivation to learn English and foreign language terminology of chemical elements increased both in the experimental and control groups. However, the performance in the experimental groups was significantly higher. The findings are given in the diagram (Figure 3).

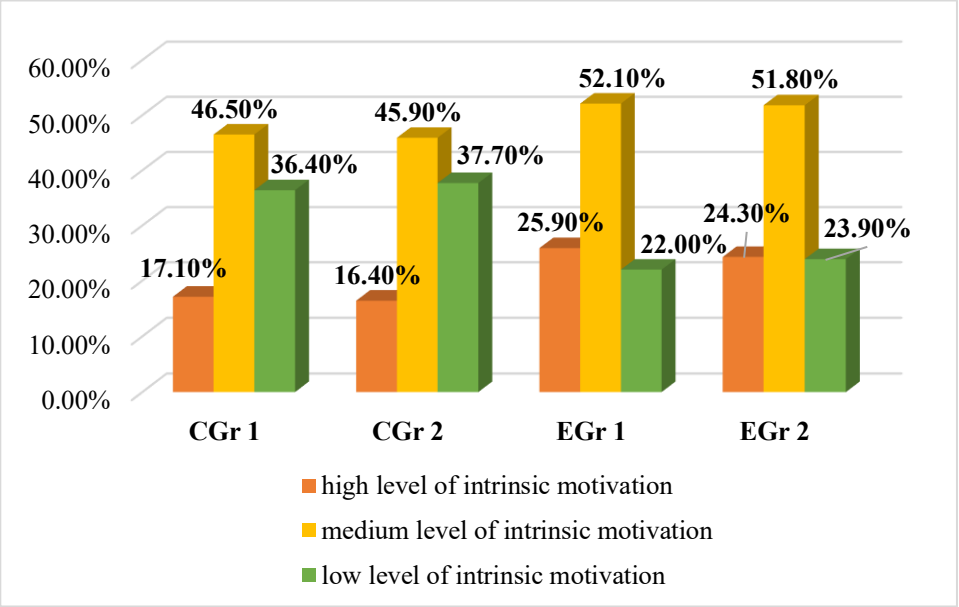

Fig. 3. Indicators of the level of formation of motivation of the students of the experimental and control groups for EFL learning at the end of the experiment.

Comparing and evaluating the indicators of the level of formation of the students' motivation for EFL learning at the beginning and at the end of the experiment in the control and experimental groups, we can conclude that, according to the criterion of effectiveness of pedagogical monitoring of the level of future specialists' motivation for learning a foreign language, in case of using AR technology in EFL learning we receive a positive dynamics, namely, an increase in the level of formation of motivation of students in the experimental groups.

In our opinion, AR is one of the best pedagogical tools for presenting educational material today. The use of AR technology in EFL learning allows university students not only to enrich English vocabulary but also to move 3D objects, to create collectively various models in accordance with the profile of the specialty. These aspects motivate university students to study in EFL classrooms more profoundly and effectively.

5 Conclusions

AR technology undoubtedly has a huge didactic potential in the study of a foreign language by university students. Based on the results of the research, we can conclude that using it as a tool to increase the level of motivation to study the subject, the student has the opportunity to learn a foreign language more effectively and in a familiar atmosphere. Mobile applications with AR elements breaks the monotony of the learning process. The experiment made it possible to understand that AR technology is penetrating the foreign language educational process, pushing traditional technologies aside and taking its own place. Thanks to the use of gadgets familiar to modern students, their interest in the discipline and their involvement in the educational process increase while the process of obtaining knowledge simplifies. Visualization of objects, gamification of the learning process, individualization and interactivity of the process of mastering knowledge help to increase the level of university students' motivation for learning a foreign language. The results obtained in the course of experimental work can be important for increasing the

level of motivation for learning a foreign language, intensifying and optimizing the learning process through the use of AR technology along with traditional means and methods.

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