

AUGMENTED REALITY IN THE DEVELOPMENT OF TECHNOLOGICAL COMPETENCE OF PRIMARY SCHOOLCHILDREN

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Abstract

Technological competence of a primary schoolchildren is an integrative set of personal qualities of a child who is able to use game technologies, including those based on augmented reality, for successful studies, effective interaction with the world and in solving real life situations. The aim of the study is to substantiate and experimentally test the most effective conditions for the development of primary schoolchildren' technological competence through play activities. The hypothesis of the study: the development of primary school students' technological competence will be effective if the following conditions are implemented: maps of technological competence of each subject are developed; programs of gaming activities based on augmented reality are developed; the description of mechanisms of transformation of school spaces in the interactive environment is offered; increase of information competence of teachers in the field of use of technology of the augmented reality is organized. The study used the following methods: the study of legal documents, psychological, pedagogical and methodological literature on the problem; survey; conversation; interview; questionnaire (including using augmented reality); testing; expert evaluation; observation; modeling; pedagogical experiment; generalization of best practices on the problem.

Keywords: technological competence; gaming activities; mobile devices; augmented reality; educational space.

1. INTRODUCTION

Technological and personal preparation of a person for professional activity in any field in the future becomes one of the most important tasks of educational institutions in modern conditions of informatization of society. The use of information technologies for the development and practical solution of the problem of the development of specialist's competence in the field of future professional activity is becoming relevant (Kondratenko E.V., Biryukova N.A. et al., 2017). One of the main tasks of primary education is the development of school students' skills to use information technologies, including mobile devices, navigate the information society, and be able to quickly make independent decisions based on the information

received. It is necessary to identify the most effective means of development the technological competence of students. The technological competence of primary school children is an integrative set of personal qualities of a child who can apply game technologies, including augmented reality, for successful study, effective interaction with the outside world and in solving real life problems.

The main components of the technological competence of primary schoolchildren are: the ability together with the teacher to search, analyze, select, process and transmit the necessary information using information technologies; the ability to apply information technologies for learning, for the development of literacy, self-improvement and creativity in educational and gaming activities. Studies of the problem of using information technologies in education in recent years have been actively conducted both in Russia and abroad (Yachina N.P., Petrova T.N. et al.(2016). As a result, there are studies on the problems of using virtual and augmented reality technologies in the educational process (D.K. Boyko, M.E. Vayndorf-Sysoeva, N.V. Grigoryeva, A.V. Grinshkun, N.N. Zilberman, A.F. Ivanko, T.V. Kornienko, S.A. Prokopov, M.B. Fain, E.I. Shakirzyanova, A. Kukulska-Hulme, V. Midoro, P. Milgram, M. Sairio, J. Traxler). In these works, the advantages of using augmented and virtual reality tools in education are analyzed, and training tasks related to their application are also offered.

At the same time, the practical issues of introducing augmented reality into the games and educational activities of primary school students are still not studied. Augmented reality is a technology for superimposing digital objects - text, graphics, audio, video, hypertext - on real-world objects in order to complement them informationally (Kornienko T.V., Potapov A.A., 2018). The need to use augmented reality technology in the process of schoolchildren's gaming activities is justified by two main reasons. Firstly, the use of augmented reality can significantly increase the effectiveness of educational and cognitive activities. It has a number of unique advantages: increasing visibility, increasing the degree of integration of information technology in the educational process. Secondly, the technology of augmented reality penetrates into all spheres of professional activities of any specialist and begins to enter into everyday life. Students will be better prepared for life and work in the information society due to the mastery of augmented reality by visual means (*Building the space...*).

2. MATERIALS AND METHODS

The purpose of the study was the justification and experimental verification of pedagogical conditions for the development of technological competence of primary school students by means augmented reality technology.

Research hypothesis: the development of technological competence of primary school students will be more effective if the following pedagogical conditions are implemented: maps of technological competence of school subjects are developed; game activity programs based on the augmented reality have been developed; a description of the mechanisms for transforming school spaces into an interactive environment is proposed; an the informational competence of teachers in the use of augmented reality technology is improved (Kornienko, T.V., Potapov A.A., 2018).

The basic elements of augmented reality used in primary school are: the creation and use of QR codes as hyperlinks for mobile devices (for example, the QR Code Reader application); creation of additional layers of images that connect a regular picture with a video (the HP Reveal application makes pictures "come to life"); the use of interactive 3D-coloring for educational purposes (for example, the Quiver application, where the teacher can independently add subject content to game content); creation and conduct of online surveys (the Plickers application can be used to update knowledge, consolidate the material studied, check the level of mastering the learning information without using special equipment).

The study was implemented in secondary school No. 17 of St. Petersburg (Russia). A total of 243 people took part in the study. Of these: 180 primary school students, 18 teachers, 45 parents of students. At the first stage of the study, three levels of technological competence of students were identified:

a) 51.9% of students have low level of technological competence. They have minimal technological information and the initial level of its application. They do not know about augmented reality, do not know how to use QR codes and do not know how to store and transmit information using mobile devices during gaming activities;

b) in the group with a moderate level of technological competence, 35.2% of students were. They have a basic level of technological knowledge and a low level of its application. They can analyze the results of gaming activities, but do not show sufficient initiative in their practical application. They also show free, but not always effective use of mobile devices in gaming practice;

c) 12.9% of students belonged to a group with a high level of technological competence. For these students, judgments are logically structured, they substantiate their point of view, analyze the results of gaming and educational activities, show creativity and initiative when working with mobile devices and augmented reality.

It was concluded that the level of technological competence in more than half of primary schoolchildren is insufficiently formed. This fact suggests the need for further research to test the effectiveness of the proposed set of pedagogical conditions. To this end, a training program "Organization of the game activities of primary schoolchildren using augmented reality" was developed to form the technological competence of students.

To work with augmented reality, we used ready-made software products designed to work with mobile devices. For example, "QR Code Reader" for creating and reading QR codes; "HP Reveal" for overlaying video, photos, and hypertext information on graphic objects; "Quiver" for creating and working with interactive 3D-coloring; Plickers for organizing surveys with instant feedback; "Walla Me" for creating educational quests with augmented reality; sports simulators "Ball inAR" and "Kick Ball (AR Soccer)" and others. We used these applications to change the school space in an interactive environment: classrooms, recreation, and information stands (Programs of gaming activities, 2019). To organize this work with students, teachers first passed a distance course developed by the authors on the use of augmented reality in education.

3. RESULTS

The results that we obtained showed that:

- a) A low level of technological competence remained among 37.1% of students;
- b) In the group with a moderate level of technological competence, there were 44.8% of students;
- c) 18.1% of students began to belong to a group with a high level of technological competence.

This result shows that there was a reliable increase of students with moderate and high levels of technological competence. The analysis and comparison of the results before and after the experiment confirmed the effectiveness of the pedagogical conditions that we identified for the development of the technological competence of primary school children in the process of using augmented reality technologies. In the course of the study the following pedagogical conditions were implemented by means of gaming technology of augmented reality, which proved to be effective: maps of technological competence were developed (for children of preschool and primary school age as subjects of the educational process); programs of gaming activities based on the use of augmented reality technology have been developed; the process of reorganizing the school space into an interactive environment is described; organized an increase in the informational competence of teachers in the use of augmented reality technology. The implementation of the developed pedagogical conditions led to a serious changes in the indicators of the technological competence of primary schoolchildren: the number of students with a high level increased by 5.2%, and the average level increased by 9.6%. This indicates the effectiveness of the pedagogical conditions that we have identified.

4. CONCLUSION

The results of this study do not claim to fully cover the entire problem. In the future, it is possible to continue research in the field of the development of information competence in the teachers (Kondratenko E.V., Biryukova N.A. et al., 2018); identifying the features of the digital educational environment in online educational organizations; substantiation of the laws governing the development of information competence of students of different specializations in educational activities; developing educational digital content with augmented reality for high school students. Work at school No. 17 of St. Petersburg on the design of gaming activities with the goal of developing students' technological competence will continue through the development of the open online platform "Learn! Play! Supplement! (Online platform, 2019) and the federal network "Supplement!". The main content will be didactic games with elements of augmented reality and materials for distance education of teachers on the use of augmented reality in education.

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