

# State and Prospects of Digitalization in the Field of Formation of Students’ Healthy and Safe Lifestyles

Yugova E.A.\* Gafner V.V. Blinov D.I.

*Ural State Pedagogical University, Yekaterinburg, Russian Federation*

*\*Corresponding author. Email: eayugova@mail.ru*

## ABSTRACT

The article considers the need to organize a digital educational environment in the field of forming a healthy and safe lifestyle for students, based on the psycho-physiological features of the development of modern children and adolescents. It accentuates the problem of deficit of credible medical research related to future health prognosis of participants in the digitization process, and insufficient financing of the educational environment for the introduction of supplementary digital educational tools in the work of teachers. Barriers to the digital transformation of education are highlighted. The review and systematization of currently used digital learning technologies in the field of life safety is carried out. Effectively applied digital teaching methods are proposed for use in general education organizations at the lessons of “Fundamentals of life safety”. The possibilities of using VR-simulators in the field of first-aid skills formation, safe behavior on the roads, during a fire and in other dangerous situations.

**Keywords:** *digitalization of education, life safety, fundamentals of life safety, virtual reality, digital learning technologies*

## 1. INTRODUCTION

Those born at the beginning of the 21st century, the so-called “Generation Z”, have been developing in an environment different from that of their parents’ since their birth. The most dramatic changes have occurred in the field of technology, primarily digital technology. Not only has the nature of work and leisure changed, but also the nature of education. The list of professions that are in demand in the near future is changing. So, according to the forecasts of specialists who developed the atlas of new specialties, after a while, new professions will be in demand on the market, such as the developer of educational trajectories, a tutor or an architect of virtual reality. But regardless of the future profession, knowledge about how to stay healthy, the ability to act in a dangerous situation, and first-aid skills will always be relevant. In this regard, in educational institutions at all stages of education, it is necessary to take into account the ongoing technological changes and use their opportunities to improve the effectiveness of training students in the field of forming healthy and safe lifestyles .

One of the requirements of the Federal state educational standards of general education [10, 11] is to build the educational process taking into account the individual, age, psychological, physiological characteristics and health status of students. Observing these requirements, it is necessary to take into account psycho-physiological patterns based on the correspondence of age-related psycho-physiological features of the individual to the possibilities of information perception when organizing a

digital educational environment. The modern teenager constantly uses digital devices (game consoles, smart phones, computers, music players) throughout the day, thus ensuring an uninterrupted audio and video flow of information. Accordingly, to stimulate such psycho-physiological parameters as memory, attention, consciousness, thinking, perception of students who are actively developing during adolescence, it is necessary to search and apply such methods, techniques and tools of problem-based learning that activate intellectual activity in ways familiar to theirs [19]. Accordingly, a number of authors note that a tool for creating educational materials for the digital educational environment, a developed teaching methodology (taking into account hygiene standards), and a trained teacher who is able to apply new digital learning technologies are necessary [5, 8, 12].

## 2. METHODS OF RESEARCH

These are the Federal state educational standards [10, 11], the basic provisions laid down in the national project “Education” in terms of digital development of education, as well as the concept of teaching the subject “Fundamentals of life safety” [concept]. The paper analyzes the experience of using various available timely and effective types of digital technologies in teaching disciplines aimed at forming a safe and healthy lifestyle.

### 3. THE RESULTS OF THE STUDY

Analyzing the current situation, we note that for a number of objective reasons (insufficient funding, poor training of qualified specialists, lack of reliable medical research concerning the health forecasts of users of digital technologies, etc.), there is no widespread introduction of such supplementary training tools [2, 4, 6].

Using the emerging opportunities of the digital educational environment, the classroom can be transformed for the purposes of a particular class, for the needs of students [9, 14, 18]. The tendency to develop a classroom leads to the fact that such a room in many cases turns into a set of screens and digital services (as an example, we can consider online education, elements of which are widely used in the educational environment).

One of the most promising options for including digital technologies in the educational process in the field of forming a healthy and safe lifestyle for students is the use of virtual and augmented reality technologies. Unfortunately, these technologies are still too expensive to be used everywhere, but it is already clear that they have great potential in the field of education. Experts have proven the effectiveness of using VR-technologies in training [20, 21, 22, 25]. Reality simulators allow us to take a step forward in the visibility and interactivity of training manuals, help make it possible and safe to practice in areas such as first aid and training skills in emergency situations.

In addition to the above mentioned, the use of the described technologies will allow to apply the personalization of training, implementing an individual approach to pedagogy much more actively and with greater effect. As the most justified when used in the educational process, we note multimedia, which makes it possible to use text, graphics, video and animation in the interactive mode and thereby expands the scope of computer technology in the educational process.

### 4. DISCUSSION

The use of electronic technologies in life safety classes opens up wide opportunities for the teacher, in particular, the implementation of fundamentally new forms and methods of training with the use of modeling tools for phenomena and processes that can make a significant contribution to the formation of a culture of life safety, as well as improve the effectiveness of training and education.

The use of multimedia in the educational process provides in turn an increase in the informative capacity of the content of the training session, it:

- reduces time, enables to acquire more knowledge;
- develops skills and abilities through individualization of training and development of independent work skills;
- focuses on learning the most complex topics and concepts;
- enables to improve the selection of tasks and exercises, making them more visual and interesting;

- contributes to the implementation of educational and developmental functions of training.

Currently, in Russia in the field of life safety, there is a fairly large pool of e-learning resources for different age categories that can be used both offline and online. First of all, this concerns the topics of first aid to the victim, as well as the formation of safe behavior:

- on roads (country road, road signs, young cyclist, safe yard, safe route, reflective elements, pedestrian crossing, etc.);
- in case of fire (using a fire extinguisher, evacuation from the building, calling the rescue service);
- in case of dangerous and emergency situations of natural and man-made nature.

The analysis of electronic educational publications and online information resources shows that they represent a wide range of different objects that can be effectively used in the design of lessons on life and health safety [2, 6, 18]. Traditionally these items include:

1. Audio materials;
2. Videos;
3. Photographs (digital);
4. Computer testing.

These technologies are actively used in electronic (digital) schools, for example, "Russian electronic school", "Moscow electronic school", "Mobile electronic education", etc. These projects are an online educational space that provides equal access to educational services for all categories of children, including children with disabilities. However, the possibilities of e-schools, in fact, that are of distance education, in the field of teaching safe behavior in life and in emergency situations have limitations in the field of skills development. It is advisable to combine the use of electronic materials together with real practical classes in the presence of a teacher.

One of the most common ways to use modern technologies in the study of life safety is the use of projectors. This technology allows students to demonstrate various presentations or educational films on a particular section at any stage of educational activity. Ease of use explains why teachers use computers and multimedia projection equipment primarily as an aid to illustrating educational material.

Interactive whiteboards are an alternative to projectors. The main additional feature is the use of methodological material "here and now", changing the content, making corrections, both by the teacher and students.

A type of "screen technology" can be considered the use of an anatomical 3D table, which, in fact, is a large touch screen that has the size of an adult. During operation, the screen shows the human body, and the sensor allows to perform various manipulations on it. The touch table also makes it possible to study not only the functional systems of the body, but also individual human organs. Such knowledge will be in demand not only when providing first aid, but also for the formation of students' healthy lifestyle.

On December 24, 2018, the board of the Ministry of education of the Russian Federation approved the concept

of teaching the subject “Fundamentals of life safety”. The concept states that the development of an educational subject should ensure “the development of practice-oriented competencies that meet the age characteristics and needs of students, through the use of interactive training systems that can simulate various real situations of everyday life” [7]. To do this, the classroom should be equipped with “visual and technical training tools, including interactive 3D models and simulator systems that can simulate various dangerous situations, for practicing appropriate practical techniques and actions” [7].

The latest digital technologies, which have only recently been used in the educational process, allow to significantly expand the list of the above mentioned digital technologies in use and include:

1. Training software (computer and multimedia training programs);
2. Electronic textbooks;
3. Electronic shooting gallery;
4. Web-quests [13];
5. Virtual tours [15];
6. Virtual classrooms for life safety classes[1].

The concept of teaching a subject implies the introduction of modern forms of e-learning in the teaching of Fundamentals of life safety, but it should be understood that their use is not an end in itself, they are not able to completely replace the practical actions of students, and replace the teacher [7].

When teaching practical knowledge in the field of life and health safety, specialized computer programs and applications for electronic devices that allow a more in-depth study of the structure of the human body have proved to be positive. An example of one of these training programs is the interactive virtual atlas of human anatomy in 3D format by ArtekSA - ArtekSA Virtual Anatomy (“Virtual anatomy”). The 3D atlas of human anatomy uses technologies for displaying three-dimensional graphics. Students can view the location of any organ, vessel or nerve in a three-dimensional projection, trace the direction of nerves or vessels, the location of branches and final branches; trace its direction and relation to neighboring organs; layer-by-layer removal of tissues enables to view deeper layers of muscles, see where they are attached. When changing the settings, you can simultaneously consider the gender differences in the topography of human organs.

In our opinion, “all the knowledge obtained in the life safety lessons is necessary in order to make the optimal decision for a particular situation” [3]. In this sense, one of the most promising types of digital educational technologies that form the students’ decision-making skills is a VR-simulator. In addition, they allow you to show processes and phenomena that cannot be observed in nature, as well as to form skills whose manifestation is difficult to track, check and demonstrate clearly, the so called Soft skills - “flexible” or “gentle” skills. In the field of life safety, skills that cannot be brought to automatism include:

- responsibility for one’s life;
- formation of safe behavior models in dangerous and emergency situations;
- stress resistance in dangerous and emergency situations;
- awareness of emotions in dangerous and emergency situations;
- forecasting and analysis of dangerous and emergency situations;
- decision-making in dangerous and emergency situations;
- psychological preparation for dangerous and emergency situations.

Virtual reality technologies are already successfully used in the educational process. We have studied the possibilities of virtual reality in teaching safe behavior in dangerous situations, identifying and changing risky behavior [22, 25]. The effectiveness of classes on forming safe behavior using virtual reality has been experimentally proved [20, 21].

Most often, virtual reality is used to teach children fire safety skills [24], to identify and mend risky behavior of child pedestrians [22, 25]. The key point is that the student receives the necessary practical skills to act in dangerous and emergency situations, without endangering their lives and health.

It should be noted that virtual reality usually does not have sensory feedback from a real dangerous situation in life, such as a fire, which prevents the sense of realism of such experiences. Recent developments in this area include the use of a multi-sensory virtual environment for training evacuation in case of a fire [23]. The fire escape simulator is designed to provide not only audio-visual feedback, but also real-time heat and smell simulation.

The first projects for the introduction of virtual reality in the educational process of life safety classes appeared several years ago. At the end of 2019, the project “VR-Fundamentals of life safety” was demonstrated in Dzerzhinsk as part of the training project “Team of growth 2019”. Various situations are simulated for the lessons. The topic covers road accidents, terrorist threats, and natural and man-made emergencies. The children are divided into teams: while some are busy with simulators, the others are studying theory. The age of the children participating in this program is 13-14. It is planned to include all schools in Dzerzhinsk in the project in the near future. Similar virtual reality projects on Fundamentals of life safety are being developed by other specialists-enthusiasts, for example, in the town of Zhukovsky (Moscow region). At the moment, several scenarios have been developed: a fire, a terrorist attack, or the emission of chemicals. In order to maximize distribution, the developers plan to place the program in the public domain. Schools will only need to purchase VR-glasses. Virtual simulators enable to create a pattern of behavior in a dangerous situation in the mind, the reaction of students becomes adequate, predictable, and the chances of survival increase.

## 5. CONCLUSION

Considering the sufficient amount of modern digital learning technologies created and being created, their introduction into the educational space, qualitative transformation of the education system is inevitable. But as it was noted, their introduction into the educational space is quite slow. The most common - online education (e-learning environments, etc.) is most often used in higher education institutions and general education institutions in large cities with millions of students. And even there, you can see the duplication of electronic and paper documentation.

The creation of digital technologies in education urgently needs not only to be implemented through acquisition in schools and other educational institutions, but also through instruction. One instruction for use is clearly not enough. Virtual reality projects and technologies associated with them are isolated cases of use not only because of the high cost, but also because of the lack of methodological support for their practical application in the educational process. Such training tools should be

properly integrated into the lesson or other training session, which in turn will improve the practical skills of students. However, putting on virtual reality glasses as just a game tool and viewing exciting images will not ensure the full learning acquisition. For the full implementation of digital technologies in education, it is necessary to provide competent methodological assistance, develop a set of methods, instructions for teachers (many of them do not have skills in this area), complexes of drawn educational tasks and algorithms aimed at analyzing what they see.

At the same time, one of real professional tasks of a modern teacher is to develop their digital skills. Accordingly, there is a need for both professional development courses for already working teachers, as well as the need to train future teachers in pedagogical universities in a new way, especially in those areas of training that will further form life and health safety skills of the younger generation.

## REFERENCES

[1] Borisov, S. S. (2012), "Using the MOODLE environment in teaching the fundamentals of life safety" ["Ispolzovaniye sredy MOODLE v obuchenii osnovam bezopasnosti zhiznedeyatel'nosti"], *Vestnik Rossiyskogo universiteta družby narodov. Ser.: Informatization of education*, No. 1, pp. 78-83.

[2] Gamidova, D. M. (2019), "Digitalization of education: problems and prospects of a new format of training" ["Tsifrovizatsiya obrazovaniya: problemy i perspektivy novogo formata obucheniya"], *Voprosy pedagogiki*, No. 6-1, pp. 28-31.

[3] Gafner, V. V. (2013), "The subject "Fundamentals of life safety" in the light of the second-generation Federal state educational standards of general education" ["Predmet "Osnovy bezopasnosti zhiznedeyatel'nosti" v svete FGOS obshchego obrazovaniya vtorogo pokoleniya"], *Vestnik "Nauchnyy tsentr bezopasnosti zhiznedeyatel'nosti detey"*, No. 4 (18), pp. 32-38.

[4] Yershova, I. V. (2019), "Digitalization of education: pro & contra" ["Tsifrovizatsiya obrazovaniya: pro & contra"], *Predprinimatelskoye pravo*, No. 3, pp. 61-68.

[5] Zhelonkina, Yu. N. (2019), "Socio-psychological features of primary school children in the context of digitalization of society and education" ["Sotsialno-

psihologicheskiye osobennosti mladshih shkolnikov v kontekste tsifrovizatsii obschestva i obrazovaniya"], *Informatsiya i obrazovaniye: granitsy kommunikatsiy*, No. 11 (19), pp. 194-196.

[6] Kolykhmatov, V. I. (2018), "Development of the system of continuous pedagogical education in the conditions of digitalization of education" ["Razvitiye sistemy nepreryvnogo pedagogicheskogo obrazovaniya v usloviyakh tsifrovizatsii obrazovaniya"], *Chelovek i obrazovaniye*, No. 4 (57), pp. 118-121.

[7] Document bank of the Ministry of education of the Russian Federation (2018), "Concept of teaching the subject "Fundamentals of life safety" in educational organizations of the Russian Federation implementing basic general education programs" [Bank dokumentov Ministerstva prosvescheniya RF (2018), "Kontseptsiya prepodavaniya uchebnogo predmeta "Osnovy bezopasnosti zhiznedeyatel'nosti" v obrazovatelnykh organizatsiyah Rossiyskoy Federatsii, realizuyuschih osnovniye obscheobrazovatelniye programmy"], available at: <https://docs.edu.gov.ru/document/bac5f1cd420a477b847e931322e90762> (in Russian).

[8] Kochergin, D. G., Zhernov, E. E. (2019) "Experience of digitalization of higher education in the USA" ["Opyt tsifrovizatsii vyshego obrazovaniya v SShA"], *Professionalnoye obrazovaniye v Rossii i za rubezhom*, No 2 (34), pp. 12-23.

- [9] Petrova, N. P. (2019), "Digitalization and digital technologies of education" ["Tsifrovizatsiya i tsifroviye tehnologii obrazovaniya"], *Mir nauki, kultury, obrazovaniya*, No. 5, pp. 353-356.
- [10] "On approval and introduction of the Federal state educational standard of basic general education": order of the Ministry of education and science of the Russian Federation dated December 17, 2010 No. 1897 ["Ob utverzhdenii i vvedenii v deystviye federalnogo gosudarstvennogo obrazovatel'nogo standarta osnovnogo obshchego obrazovaniya"], ot 17 dekabrya 2010 g., available at: <http://base.garant.ru/55170507>.
- [11] "On approval and introduction of the Federal state educational standard of secondary (complete) general education": order of the Ministry of education and science of the Russian Federation dated May 17, 2012 No. 413 ["Ob utverzhdenii i vvedenii v deystviye federalnogo gosudarstvennogo obrazovatel'nogo standarta srednego (polnogo) obshchego obrazovaniya"], ot 17 maya 2012 g., available at: <http://base.garant.ru/70188902>.
- [12] Safuanov, R. M., Lekhmus, M. Yu., Kolganov, E. A. (2019), "Digitalization of the education system" ["Tsifrovizatsiya sistemy obrazovaniya"], *Vestnik UGNTU. Nauka, obrazovaniye, ekonomika. Ser.: Economics*, No. (2) (28), pp. 116-121.
- [13] Soboleva, E. V., Nesterov, D. S. (2019), "Modern pedagogical technologies of digital school for ensuring life safety", *Materials of the all-Russian scientific and practical conference "Personality in culture and education: psychological support, development, socialization"* ["Sovremenniye pedagogicheskiye tehnologii tsifrovoy shkoly dlya obespecheniya bezopasnosti zhiznedeyatel'nosti"], *Lichnost' v culture i obrazovanii: psihologicheskoye soprovozhdeniye, razvitiye, sotsializatsiya*, Southern Federal University, Rostov-on-Don, No. 7, pp. 514-521.
- [14] Timofeeva, V. Yu., Shapoval, V. N. (2019), "New approaches in management within the framework of digitalization of education" ["Noviye podhody v upravlenii v ramkah tsifrovizatsii obrazovaniya"], *Sotsialno-gumanitarniye tehnologii*, No. 2 (10), pp. 53-58.
- [15] Khludnev N. Yu. "Peculiarities of organization and carrying out virtual tours within the course of life safety for 7th grade" ["Osobennosti organizatsii i provedeniya virtualnykh ekskursiy po kursu OBZh v 7 klasse"], *Molodoy ucheniy*. 2017. No. 11-2 (145). pp. 114-115.
- [16] Chagin, D. P. (2010), "Using electronic learning tools with 3D modeling capabilities in the course of life safety fundamentals" ["Ispolzovaniye elektronnykh sredstv obucheniya s vozmozhnostyami 3D-modelirovaniya v kurse osnov bezopasnosti zhiznedeyatel'nosti"], *Chelovek i obrazovaniye*, No. 3(24), pp. 74-78.
- [17] Chagin, D. P. (2011), "Computer modeling as an innovative technological resource in the study of the school course "Fundamentals of life safety" ["Kompyuternoye modelirovaniye kak innovatsionniy tehnologicheskiy resurs pri izuchenii shkol'nogo kursa "Osnovy bezopasnosti zhiznedeyatel'nosti"]], *Nauka i shkola*, No. 3, pp. 36-40.
- [18] Shevchenko, N. I. (2018), "Interactive methods as a condition for interactive education" ["Interaktivniye metody kak usloviye interaktivnogo obrazovaniya"], *Interaktivnoye obrazovaniye*, No. 1-2, pp. 15-22.
- [19] Yugova, E. A. (2016), *Theoretical and methodological foundations for the formation of meaning-forming constructs of a healthy lifestyle of students of a pedagogical university: Author's thesis* [Teoretiko-metodologicheskkiye osnovaniya formirovaniya smysloobrazuyuschih konstruktov zdorovogo obraza zhizni studentov pedagogicheskogo vuza: avtoref. dis. dok. ped. nauk], Yekaterinburg, Russian State Prof.-Ped. Un-ty., 21p.
- [20] Deb, S., Carruth, D.W., Sween, R., Strawderman, L., Garrison, T.M. (2017), "Efficacy of virtual reality in pedestrian safety research", *Applied Ergonomics*, Volume 65, pp. 449-460, DOI: <https://doi.org/10.1016/j.apergo.2017.03.007>.
- [21] Joan McComas, Morag MacKay, Jayne Pivik (2002), "Effectiveness of Virtual Reality for Teaching Pedestrian Safety", *CyberPsychology & Behavior*, Jun. pp. 185-190, DOI: <https://doi.org/10.1089/109493102760147150>.
- [22] Luo, H., Yang, T.T., Kwon, S.J., Zuo, M.Z., Li, W.H., Choi I. (2020), "Using virtual reality to identify and modify risky pedestrian behaviors amongst Chinese children", *Traffic Injury Prevention*, Volume 21, Issue 1, pp. 108-113, DOI: <https://doi.org/10.1080/15389588.2019.1694667>.
- [23] Nilsson, T., Roper, T., Shaw, E., Lawson, G., Cobb, S. V. G., Meng-Ko H., Miller, D., Khan, J. (2019), "Multisensory Virtual Environment for Fire Evacuation Training", *CHI EA '19: Extended Abstracts of the 2019 CHI Conference on Human*

Factors in Computing Systems, pp. 1-4, DOI:  
<https://doi.org/10.1145/3290607.3313283>.

[24] Smith, S., Ericson, E. (2009), “Using immersive game-based virtual reality to teach fire-safety skills to children”, *Virtual Reality* 13, pp. 87-99, DOI:  
<https://doi.org/10.1007/s10055-009-0113-6>.

[25] Thomson, J. A., Tolmie, A. K., Foot, H. C., Whelan, K. M., Sarvary, P., & Morrison, S. (2005), “Influence of Virtual Reality Training on the Roadside Crossing Judgments of Child Pedestrians”, *Journal of Experimental Psychology: Applied*, 11(3), pp. 175–186, DOI: <https://doi.org/10.1037/1076-898X.11.3.175>.