

Digital visual modelling of educational virtual media

Konstantin Ivshin ^{1*}, and Ekaterina Kudelina ¹

¹ Udmurt State University, Universitetskaya st., 1/1, 426034, Izhevsk, Russia

Abstract. The modern educational process exists in an interactive information world. Modelling educational virtual media for mass involvement of learners in the process of formation of relevant competences. Digital visual art approaches form a holistic visual image of a virtual medium to actualize the subject of learning for learners. Examples of the implementation of the approaches in the creation of virtual media by Boxglass (Izhevsk) in educational institutions are described.

1 Introduction

Digital technologies provide an opportunity to build the educational process in the context of the global information world [1]. To realise these objectives, a massive introduction of virtual media into the learning process is necessary to develop the creative abilities of learners [2]. The learner's interest and enthusiasm also depend directly on the design of learning tools. "A 'boring' design or lack of design can be repulsive, while an original striking appearance can attract and capture attention. For example, for teenage students the appearance of the object they choose to use plays a decisive role [3]. To create educational virtual media, digital visual art approaches are actualised to form a vivid and recognisable artistic image. The holistic visual image of a virtual medium helps to interest and engage the learner and increase the effectiveness of education.

Modern digital tools for the learning process (from circles to classes to vocational education and training) include Virtual reality technologies; Augmented Reality Applications; Cardboard glasses; Educational website; Tools for video conferencing and remote collaboration of students; e-textbook; Tablet; Interactive whiteboard and projector; display walls; personal computer.

To date, cardboards are more relevant for use in the educational process for the development of creative abilities of students and the formation of their original visual image, by means of digital art.

The convenience of this learning tool lies in its ease of use, transport, compactness (takes up little space in a backpack) and low cost.

Cardboards allow you to fully immerse yourself in VR without leaving the classroom, without using expensive equipment. The eye-catching design of the glasses will attract attention. It will also be of interest that you need to apply your ingenuity and design approach when assembling them.

* Corresponding author: vshic@mail.ru

2 Materials and methods

Design modelling of educational virtual media involves cross-disciplinary competencies, which require specialized approaches at different stages of product formation (Fig. 1).

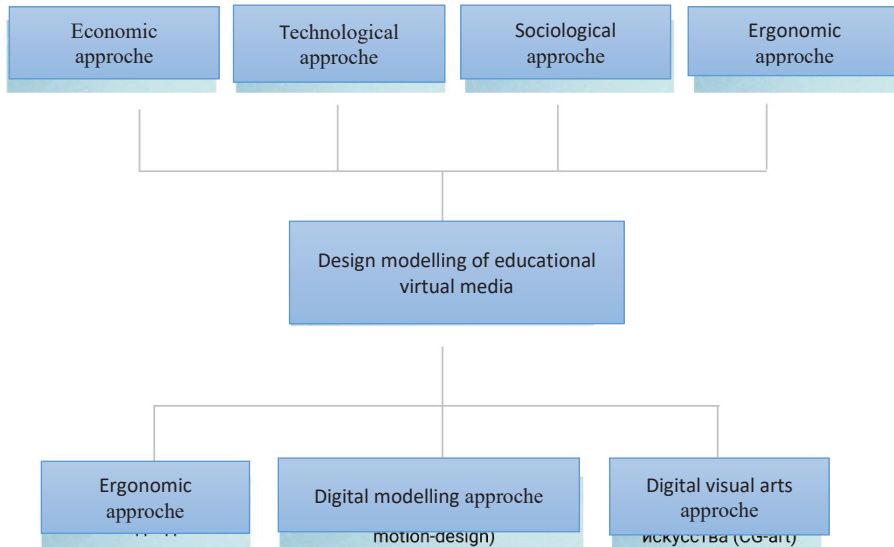


Fig. 1. Specialized approaches in project modelling of educational virtual tools.

A digital visual arts approach for educational virtual media:

1) Legend and story formation. The legend and the story are formed based on the author's objectives. Within the thematic space, he/she forms the ideas that could form the basis of the legend. The clearest, most interesting, most logical idea becomes the legend, the story of the art.

2) formation of the character, the hero. In the process of creating the legend, the author can introduce a hero to the story who would complement the concept, make it more coherent. The hero can be a link in the space of the created art. He can appear on different media or (if we are talking about a digital application), be a guide for the user, accompany him in the digital space.

3) the formation of the context. The context is a set of parameters, elements that surround the concept, supplement it, specify it.

4) modelling the composition. Selection of colours and shapes suitable for the expression of the context. Modelling the holistic compositional image of the context.

5) Artistic stylisation. Stylisation is an approach that helps move from the legend, the story, to the development of their digital graphic accompaniment in the product.

6) Modelling the subject matter content. The subject content is formed by the author according to the storyline of the art.

Development of digital graphic support for learners. An example of implementation of virtual media project modelling into the educational process for schools and higher educational institutions in Izhevsk is Boxglass Education development - a set for educational institutions, which allows introducing augmented reality (AR) into educational programmes approved by the Ministry of Education (Fig. 2).

This solution implies the introduction of augmented reality elements, lasting 3-5 minutes, into a standard educational programme. This format allows for a clear illustration and reinforcement of the material. The main advantages include:

1) visibility and high level of involvement.

2) safety and accessibility (working with a smartphone).

3) compliance with the objectives of the national project "Education" and the regional project "Modern School".

The case includes: 15 smartphones with pre-installed software, ready to be used in educational institutions; 15 Boxglass Cardboard virtual reality glasses; charger (charging 15 smartphones from 1 outlet and possibility of remote use of the box due to the built-in battery); branded case for easy storage and transportation.

3 Results and Discussion

In 2021, Boxglass turned to students at the Udmurt State University Department of Design to develop the design for this kit. In the process of working on the artistic image, the students came up with three concepts (Fig. 3).

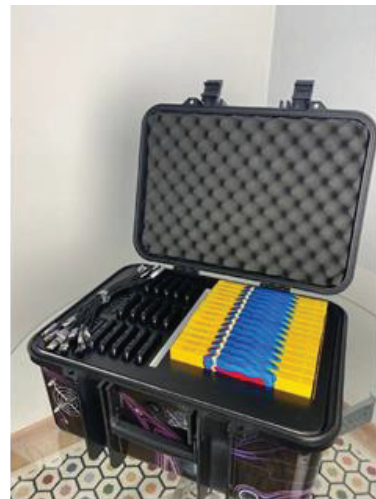


Fig. 2. Boxglas Education: a set for educational institutions from Boxglass (Izhevsk).



Fig. 3. Seeking ideas for developing an educational case study Boxglass Education 2021.

The first concept is the legend of Pandora's Box. "Pandora's Box", which is the source of sorrow and distress, and to open Pandora's Box is to do something that will lead to sad and irreversible consequences. The concept behind this design was that to understand the essence and grasp the granite of science, obstacles must be overcome, and only then will the true "good" be revealed. The enigmatic plot involved illustrative graphics that would be located on a box, goggles and cardboards, as well as in an augmented reality (AR) mobile app.

The second concept had to do with Aladdin's lamp and the genie. Rub the lamp and a new reality emerges. Augmented reality, like the lamp, gives the impression of the presence of

magic in real life. Legend: that first sense of being immersed in a viara, when reality changes slightly and makes you dizzy. Each time is like a first, allowing students to immerse themselves in tasks, challenges and stories with the anticipation and expectation of something new. "Jinn" comes from the Arabic word "janna", which means "hidden". Thus, jinn are invisible to humans and their magical image conceals many secrets.

The third concept is Atlantis, a highly developed civilization of antiquity. Many legends say that Atlantis was a highly developed country with a lot of different knowledge. And many people longed to get their hands on it, even after the civilization had disappeared under the sea. Box by design represents the legacy of Atlantis - a treasure trove of knowledge that many sought. The graphics were intended to be a cool color scheme, to convey a mysterious atmosphere and a mythical story. The idea was to invent a heroine for the concept - Atlantis, a girl with long wavy hair who looked like the cold waters where this mysterious island-state is located.

A third concept was chosen by the team for implementation. Three illustrations were developed for further use in the media (Fig. 4).

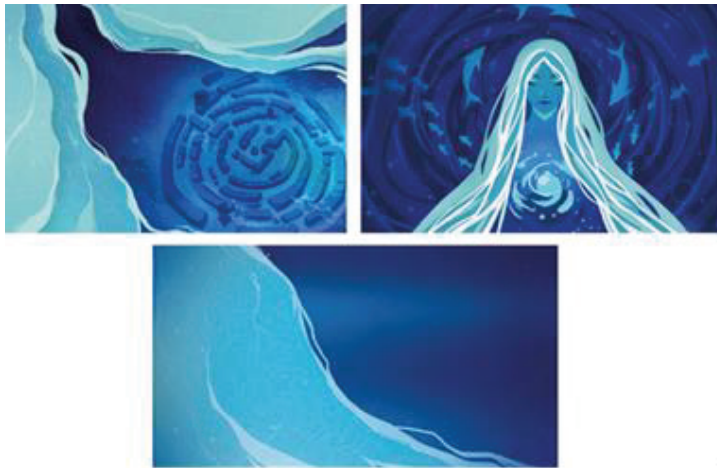


Fig. 4. Illustrative graphics for Boxglass Education 2021 (The authors are Burkhanova V.M., Demjanjuk A.V., 3rd year students of the Department of Design, Udmurt State University. Supervisor: Ivshin K.S.).

The formation of the case study legend for educational institutions began with a search for a creative source. As a result of brainstorming, the creative source was an ancient highly developed civilization - Atlantis. According to the legend the inhabitants of Atlantis possessed vast knowledge, high intelligence, mental development, and the country itself was considered economically advanced and progressive. Such a creative source formed the basis of the legendary design for the educational case, where the box with mobile devices, as conceived by the authors, represents the treasure of the mysterious lost Atlantis.

The character formation in this project is a girl named Atlantis, who presents a mysterious, secretive image. Her hair develops like the current of the ocean waters where the world of Atlantean knowledge lies deep at the bottom. Atlantis was chosen to be placed on the box (CG-art) as a kind of guide to the world of knowledge, movement, and development.

Shaping the context. Once the legend and hero were defined, the colors were decided in a cool palette (white, blue, and blue). To complete the concept of a highly developed civilization, we made a CG-art in the form of a sea current in the depths of which you can see the ruins of a sunken civilization (both ruins, but at the same time, they represent the outlines of the logo of the company Boxglass). We also chose textures that immerse us in an atmosphere of coldness and the ocean - the texture of water and ice.

Composition shaping. The compositions for the CG-art were made dynamic, integral, and eye-catching. The illustration with the heroine Atlantis was placed on cardboard glasses and packaging (Fig. 5). In the foreground is the heroine Atlantis and the ancient civilization.



Fig. 5. CG-art visualization, front and back of cardboards and packaging.

Image. In shaping the image, the authors sought to create an atmosphere of mystery and mystery, and to convey the idea of Atlantis. The aim was to create an image that would attract attention and capture interest.

Content. In the case, it was necessary to think over the design of the box, the cardboards, as well as the design of the application. CG-art was designed for the box, as well as a designation on one side - an instruction on how to use it. The same CG-art was used on the cardboards and their box as on the box (with the main character). Another CG-art was designed for the inside of the glasses and the inside of the packaging. A CG-art (which was described above, figure 6) was developed for the box, as well as a label on one of the sides - the instructions for use (Fig. 7).



Fig. 6. Boxglass case visualisation - Atlantic box.



Fig. 7. Infographic on how to use the Atlantic Box briefcase.

A splash screen, interfaces, class icons (in the form of Roman numerals, like in ancient civilizations), and class icons have been designed for the application (Fig. 8).

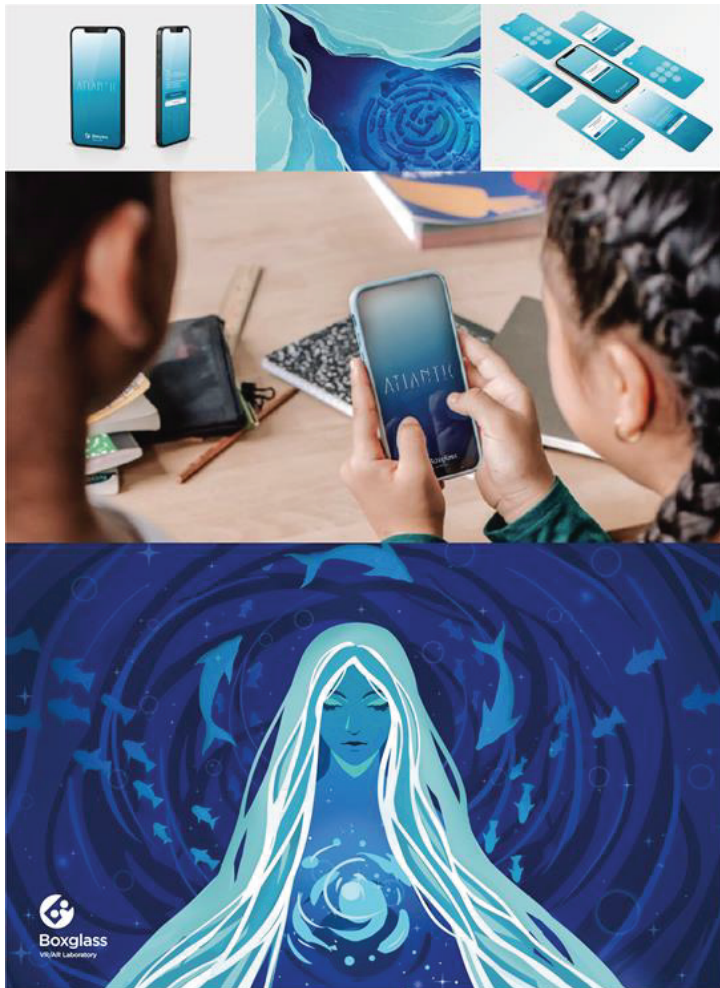


Fig. 8. Atlantic Box digital app.

Atlantic app development. This project involved the design of an app (software) for the Boxglass Education kit. Objective: to form a design concept for the app, to develop a design that is understandable for schoolchildren, at the same time harmonious within the concept, interesting to use, visually comfortable and modern. The tasks faced during the development

process: 1) to analyze the basic principles of interface design; 2) to analyze the initial application Boxglass Education and its design (UX / UI); 3) to analyze existing reference applications on the subject (educational); 4) propose a design option, which will correspond to a complete concept of the project; 5) work on the visual design (development of background variation, a selection of colour palettes, buttons, font design); 6) testing the application in Figma (transitions between screens, from the launch of the application).

Initial application. When developing the application, the company set a goal to make a modern and technologically advanced product for use in schools. The design was not developed separately and thoroughly. The design of the software was made to be suitable and understandable for the use and implementation in the educational programmes of the schools (Fig. 9).

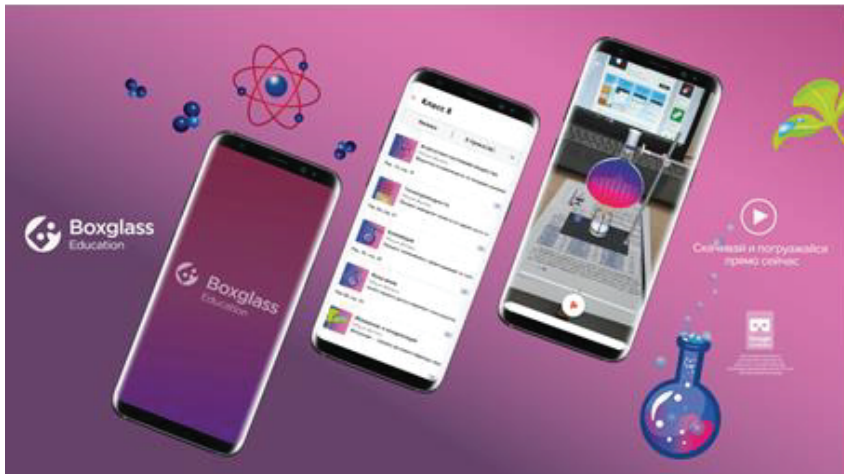


Fig. 9. The original design of the Boxglass Education app, developed by the company.

Atlantic application for schools (Figure 10). The name of the Atlantic Box set concept that the students formed in the app is simplified into a shorter version of Atlantis. The name translates to Atlantis. A font was developed as part of the concept. The font is in the form of hieroglyphs, angular. Numerals in the appendix in connection with the concept were suggested to use Roman numerals since Atlantis is with myths. The colour scheme is white, blue, blue. Backgrounds for the app were also developed: monochrome variations and the texture of cracks in the ice. The design of the icons was determined to be minimalistic in order to support the design of the app and not to overload the space. The purpose of the icons is to indicate subjects (maths, physics, Russian, etc.). The colour scheme is kept cool: white and blue.

Arrangement of information on screens. It was proposed to place information on screens where there is text on a monochrome background for the most convenient reading. Sequence of appearance of the screens. Scenario of the interaction between the student and the application. This stage was developed together with the Boxglass team. The following interaction scenario was created:

- 1) the student launches the app.
- 2) selects the desired section (physics, biology, etc.).
- 3) selects the topic.
- 4) the student points the smartphone camera at the image in the student.
- 5) the app plays the AR clip according to the image.
- 6) interacts with the clip (pauses, examines background information for the clip).
- 7) proceeds to the list of clips.



Fig. 10. Annex Atlantic.

Higher education institutions. Medusa VR. The design thinking of undergraduate students is shaped by their immersion in design creativity [21]. Designers and design trainees are constantly developing solutions, so they need to develop their creative vision and approach. [22]. The students of the UdSU Department of Design were asked to develop a solution for the design of cardboard glasses to be used by students in schools and other educational institutions. As a result of the research described above, the authors concluded: to arouse students' interest, a suitable design (exterior design) of the cardboard glasses is needed, which can help to immerse them in the learning process with interest.

Choosing a theme for the graphic support. In the process of developing the idea for the cardboard, the authors proposed three concepts - three plots of graphic development (Fig. 11).



Fig. 11. Seeking ideas for the design of the Boxglass 2020 cardboard glasses.

In the first concept, the hero is American basketball player Coby Bryant, who played in the National Basketball Association for twenty consecutive seasons with the Los Angeles Lakers. The idea is about striving forward, moving and achieving goals. The second concept is based on a space theme and the hero, Gorgon. Medusa snakes figuratively are portals to other worlds, and she is the guardian of something mysterious and enigmatic. The snakes look into the eyes of those who look into them and are bewitched by their gaze and lured into a different reality. The third concept is based on cyberpunk themes, with a focus on modern technology, or more precisely, novelty and accuracy.

The relevance of the choice of graphic theme. The company specializes in creating augmented and virtual reality applications, creating 360 video and simulators for people with disabilities and professional athletes [20]. The company has a tradition - every year, the team updates the design of the glasses, improving the ergonomic side, as well as developing a new and more interesting appearance. Every so often, a new idea comes up in the design, but there is also something that has remained the same over the years in the layout, which has in a way become their "thing" (Fig. 12).



Fig. 12. Boxglass eyewear for 2016, 2017 and 2019.

The theme of space, planets, something mysterious and unusual will always remain on the glasses. The use of the image of eyes on the front of the glasses is also retained.

In 2020, students of the UdsU Department of Design tried to develop the design of glasses. The developed design concept retained the space theme, the atmosphere of the unexplored and mystical. The main character in the story is the Gorgon Jellyfish, a mythical character with eyes that turn everyone who looks through them into stone. It sounds frightening. This is the interesting thing about a different reality - something new, unusual and emotionally evocative can appear in it. In this concept you can see a combination of the cosmic, the unusual, the mysterious, but at the same time there is also something that surrounds us - the stars, the sky, and the darkness of night.

The graphics for the concept is designed in the graphic editor SAI and then printed on cardboard glasses using special printing equipment.

Everyone who picks up the glasses will experience mystery, mystery, room for imagination and a foreboding sense of what's to come when they put them on and run the VR/AR app on their phone (Fig. 13, 14).

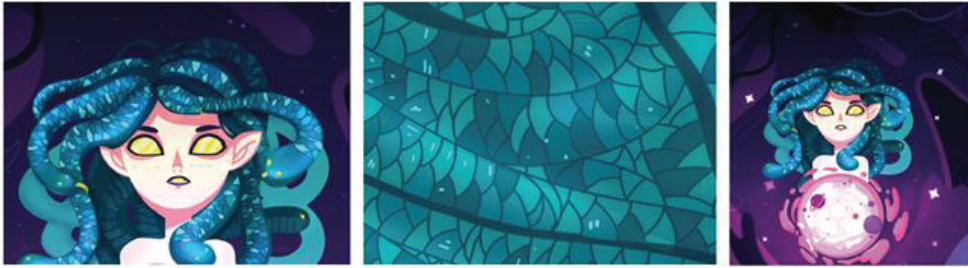


Fig. 13. Illustration "Medusa VR". (Illustration by Burkhanova V.M., 3rd-year student of the Department of Design Udmurt State University. Supervisor: Ivshin K.S.).



Fig. 14. Illustration "Medusa VR". (Illustration by Burkhanova V.M., 3rd-year student of the Department of Design Udmurt State University. Supervisor: Ivshin K.S.).

4 Conclusion

A virtual educational tool with meaningful graphic support will engage learners, open up space for their imagination, and help learners immerse themselves in the visual reality of the discipline's knowledge world. Modern interactive learning tools make the educational process communicative, visual, engaging, motivating and comprehensible. Digital art embedded in educational activities allows information to be presented in an imaginative way for learners. Simulation of a graphic image of a virtual educational tool increases visibility and simplicity of perception of information, which makes the educational process more comfortable and thus more effective for the student and the teacher. The use of graphic design tools on a product like goggles-cardboards increases students' interest and enthusiasm in the discipline they are studying.

References

1. Alabuzhev S.V. Positive self-consciousness and self-perception as factors in the development of a healthy personality in adolescents // Prevention of substance use in the educational environment: Proc. of the Republican Interdepartmental Scientific-Practical Conference. Conf. Conf. Izhevsk, 2001. Pp. 13-16.
2. Knyazeva G.V. Application of multimedia technologies in educational institutions // Bulletin of Volga University named after V.N. Tatischev. Series: Science and education. 2020. Pp. 10-11.
3. Nurtdinova L. R., Gureev M. V., Krutskaya S. V. Principles of designing virtual environments in the educational space and psychological features of their perception by students // Vestnik of Samara State Technical University. Series: Psychological and Pedagogical Sciences. 2018. Pp. 123-130.

4. Modern means of teaching and technical equipment of classrooms in a modern school [Electronic resource]. Mode of access: <https://topref.ru/referat/123308.html>
5. Virtual reality in education or virtual education [Electronic resource]. Access mode: <https://hdr360.ru/o-kompanii/virtualnoe-obrazovanie>
6. Augmented reality technologies in education [Electronic resource]. Access mode: <http://kvantorium37.ru/texnologii-dopolnennoj-realnosti-v-sfere-obrazovaniya>
7. Augmented reality in education [Electronic resource]. Access mode: <http://tofar.ru/dopolnennaya-realnost-v-obrazovanii.php>
8. Cardboard [Electronic resource]. Access mode: <https://myslang.ru/slovo/kardbord>
9. Choose your cardboard [Electronic resource]. Access mode: https://arvr.google.com/intl/ru_ru/cardboard/get-cardboard/
10. Education 4.0: how new edtech trends are creating the school of the future [Electronic resource]. Access mode: <https://hightech.fm/2020/04/08/education-4-0>
11. Educational Web-sites as a mean of professional self-realization [Electronic resource]. Access mode: <https://griban.ru/blog/53-obrazovatelnye-vebsajty-kak-sredstvo-professionalnoj-samorealizacii.html>
12. The notion of educational web-site and web-quest [Electronic resource]. Access mode: https://knowledge.allbest.ru/programming/3c0b65635a2ad68a5d53b89521316c26_0.html#text
13. Beloglazova L.V., Bondareva O.V. Bulletin of Peoples' Friendship University of Russia. Series: Informatization of Education. 2015. Pp. 36.
14. Kraineva S.V., Shefer O.R., Lebedeva T.N. Bulletin of the South Ural State University of Humanities and Education. 2019. Pp. 107.
15. Chudinskiy R.M. Vestnik of Tambov University. Series: Humanities. 2009. Pp. 124.
16. Novikova, E.V. Technologies of civil safety. 2004. Pp. 93-96.
17. Kiseleva E.S., Priyatkina N.Y. Modern means of education // Shujskiy State Pedagogical University. 2011. Pp. 1-2.
18. Suleymanova G.F., Cherednikova M.V. South Ural State University of Humanities and Pedagogy. 2018. Pp. 9-13.
19. Programming languages [Electronic resource]. Access mode: <https://life-prog.ru/>
20. Graphical information models. Variety of graphic information models [Electronic resource]. Mode of access: <https://videouroki.net/video/5-grafichieskie-informatsionnyie-modieli-mnoghoobraziie-ghrafichieskikh-informatsionnykh-modieliei.html>
21. Baeva E.I. Graphical modeling as a semantic technique in the educational process // North Caucasian Psychological Bulletin. 2014. Pp. 22-25.
22. Digital Art [Electronic resource]. Access mode: <https://sites.google.com/site/digtechbasic/cifrovye-tehnologii-v-nauke>
23. Digital Art and its Future in the City on the Neva [Electronic resource]. Access mode: <https://gorod-plus.tv/navi/1008.html>
24. Cardboards with company style [Electronic resource]. Access mode: <http://upakovka-holding.ru/homepage/articles/55-cardboards.html>
25. Ivshin K.S., Ponomarev E., Rusakova T., Miroshnikova D., Golubeva O. 12th International Conference of Education, Research and Innovation ICERI 2019 Proceedings. Valencia, 2019. Pp. 10869-10877.