

Conference Paper

Visualization and Digitalization: Between Tradition and Innovation in Modern Education

Natalia Simbirtseva

Ural State Pedagogical University, Ekaterinburg, Russia

Abstract

This article considers visualization as a special way in which the individual represents information in the conditions of post-literacy and actualizes technological means from the digital environment. Along with the traditional understanding of literacy (visual, media and information), this study suggests that a new one should be developed dealing with the creation of texts of various modalities. In connection with this, tasks aimed at developing critical thinking skills focused on understanding and comprehending the mechanisms and content of the conveyed information in actual socio-cultural practices are gaining particular relevance. When combining tradition and innovation in education, visualization is becoming an increasingly common practice teaching method. Media literacy as a set of competencies which allow a person to acquire information, create high quality content and distribute it in various forms using modern technologies, becoming a part of a large public dialogue. The possibility of representation of data, both visual and visualized, with the help of technologies contributes not only to the inclusion of the student in the media context of the present, but also to the professional formation of his personality.

Keywords: visualization; digitalization; visual literacy; information literacy; media literacy; traditions and innovations in education

Corresponding Author:

Natalia Simbirtseva
Simbirtseva.nat@yandex.ru

Received: Month 2020

Accepted: Month 2020

Published: 28 September 2020

Publishing services provided by
Knowledge E

© Natalia Simbirtseva. This article is distributed under the terms of the [Creative Commons Attribution License](#), which permits unrestricted use and redistribution provided that the original author and source are credited.

Selection and Peer-review under the responsibility of the Convention-2019 Conference Committee.

1. Introduction

The challenges of the information age are aimed at rethinking the complex and multi-dimensional reality, including virtual, and building communication technologies in the social environment, as well as shaping of mechanisms of adaptation of the individual in a rapidly changing world. The power of visual images has acquired a special significance in the social cognition of reality. Under the influence of the exaggerated visualization, the mentality of the 21st century man has changed. "Grasping" reality in images and their immediate imprinting has become a common practice in the field of Digital Art (digital painting, photography, vector graphics and animation, photo manipulation, animation design, etc.). Skills of visualization of images with the help of technical means and gadgets have become an obligatory element of today's communication.

 OPEN ACCESS

Education as the sphere of intersection of traditions and innovations actively reacts to the changes taking place in the culture of the XXI century. The principles of working with multilayered and polysemantic information are important for all subjects of education, as they are associated with the development of cognitive and creative thinking of the individual. The ability to reflect the surrounding reality in all its diversity, in its "fluidity" [1] and variability in historical and cultural context, the ability to actualize meanings in images and express them in them in languages understandable to contemporaries (verbal, auditory, and visual), making the statement integral – these are the result achievable through continuous personal interaction and mastering various practices. Today, the principles of traditional and open education are implemented with the help of technical means and technologies, in particular digital ones. The accessible educational environment is based on information and computer technologies and follows the principles of humanization and openness to the world, society and man. The open format expands the possibilities of knowledge transmission regardless of cultural background and location of the learners, which makes this area of education an important tool for the formation of social relations and the image of society as a whole [2]. In fact, the challenge posed by the man-made environment, has become a space to search for answers and key solutions.

2. Data and Methods

The empirical method of selection and systematization of the data connected with studying the issues of *visualization* and *digitalization* in modern education was applied in this research. Based on foreign and domestic literature analysis, the methodology of instrumental interdisciplinarity combining methods and tools of natural and social and human sciences is suggested.

3. Data Analysis

One of the current trends in modern education is blended learning (traditional and online), which focuses on the use of technological devices and tools in the process of solving simple, short-term tasks. For example, R. Mora notes that technologies in teaching practices allow, firstly, considering contextual realities, and secondly, help students to be included in them and, thirdly, to experience a sense of the importance of their own position and involvement in the XXI century cultural realities. As a teaching tool the author suggests digital multimodal texts (video essays) and their creation in the

learning process both independently and jointly with the teacher. According to R. Mora, such interaction enriches the content of pedagogy and promotes integration of theory and practice in education [3].

The digital humanitarian pedagogy is oriented towards the developing platforms for reading and also towards institutional spaces in which the principles of the integrated and cross-disciplinary education are implemented. A. Borsuk and B. Bouse argue that the advantage of text media consists in the combination of old and new forms, as well as various educational modalities [4]. R. Davis indicates that "digital projects, networks, communities and resources provide students with ample opportunities to transfer their learning" [5]. As such, there are global educational platforms for online learning (access to lectures, quickly updated information, organization of online discussions, etc.) and artificial agents as equal participants in the educational process (augmented reality glasses, gaming technologies, online games, etc.).

Communication and communicative environments are layered on top of each other, forming an information environment where technological and content components require the learner to dive into the material and understand, and then demonstrate representation skills available to him. In this sense, visualization is advantageous and optimal, as it is used by natural sciences and humanities for replication, popularization and representation of data.

It can be presented as

- visual aids,
- actions as practices with multiplicity (experiments),
- process of translating the verbal language into the language of images,
- visual image, designed for a particular type of reading (e.g., digital art),
- multimodal text that combines video, sound, pictures, etc.

In all cases, visualization provides a special type of literacy which developed in the post-literacy conditions [6] the situation in terms of Postgraduate [7]. The authors of the monograph "Communication trends in the post-literacy era: multilingualism and multiculturalism" define literacy as a complex system of capabilities of a cultural subject to read all texts generated by culture, i.e. to perceive, decode and interpret them. This broad and universal interpretation of literacy is a new and productive culturological key to the description of the whole system of modern and postmodern culture [8]. A new type of literacy, emerging in the digital environment, is necessary for modern man along with traditional literacy. The practice of reading texts, both linguistic and multimodal, requires

special training of students and competent interpretation. This is important for research creativity and for further activities related to the transfer of information from the subject to the subject. The semantic reduction of the information presented in the images and subsequent explication of the inherent meanings is a bidirectional process of reading multimodal texts that requires the skills of visual, media, and information literacy.

Reading skills as a traditional way of acquiring information remain in demand and important in the process of mastering reality. This is the basis necessary for the subsequent practice of perception and interpretation of texts of various modifications. Certainly, the practice of reading multimodal texts contributes to the development of cognitive thinking skills and the "restoration" of a holistic image of reality, which subsequently affects the quality of education and professional development of the individual. Visualization is a variant of the representation of text created with the help of modern technologies and subject to decoding. If it is used as a means of learning, it certainly affects the organization and content of the educational process. As noted by V. E. Steinberg and N. N. Manko, "methods and means of visual representation of knowledge must be improved in order to align the levels of intellectual and professional activity in education [9]. P. Fyfe, describing the possibilities of digital humanitarian pedagogy, approves the expediency of training based on the projects that require a meaningful approach at all stages of their implementation, the manifestation of cognitive thinking skills and visualization, not only within the educational community, but also outside it. According to the author's logic, it promotes further personal and professional development [10].

In the history of foreign and domestic pedagogy, visualization was traditionally understood as a means of presentation and illustration which accompanied verbal texts. Such type of visualization is defined by S. Segenchuk (Segenchuk, *Static Visualizations*) [11] as static. The author defines the dynamic type of visualization as the process elements of which can change over time, and this demonstrates to the students the ideas of the existence of numerous variants of the process itself, the complexity of the phenomenon and different viewpoints on it. Simulation applied generally in natural sciences acts as an example: engines models, liquid mixtures, and so on. At the same time students can interact with such visualization, either directly participating in it during its performance or modeling simulation independently (Segenchuk, *Dynamic Visualization*) [12]. With that understanding of visualization, it is important that the action itself is considered as the practice "I see vs I act", in which the subject is directly involved.

4. Results

In the course of education, a significant role is played by the technique of step-by-step mastering of the ways and means of representation of visualized information, both in traditional communicative practices and personal interaction, and in the digital environment. It can be mentioned that innovative visualization practices are based on the long-standing traditions which shouldn't be neglected. Students' acquisition of such traditions is one of the stages for search of the productive and creative solution in the visual sphere. Here are some examples:

- creating mental maps and memory cards while working with information;
- a way of "folding" (reduction) the text to visual images or notions presented as a scheme;
- drawing up graphs and charts;
- developing visual thinking, for example, on the basis of the "Image and Thought" technology [13], etc.

Modern techniques are focused on the development of visual and cognitive thinking in the mixed-aged groups. In their fragmentary action they represent only a stage necessary for the development of universal competences. Systematicity allowing for overcoming the modern man's eclectic thinking and worldview is needed. Not a refusal from traditional practices of working with visuality, but transformation of the methods allowing integrating the digital technologies experience into the sphere of humanitarian knowledge is the cornerstone of digital pedagogy.

Let us agree with A.N. Ioffe who suggested understanding visualization in education as "a way of acquiring and generalization of knowledge through the visual image of a concept, an event, a process, a phenomenon, a fact based on associative thinking and systematic structuring of the information in the visual form" [14]. Transforming information from the text format into a graphic image is not an alternative to the verbal approach in education, but it improves teaching efficiency in their synergetic combination.

In this context, visual literacy and the skills of its realization by means of representing texts and the results of their reading in visual images is important. Visual literacy was defined by R. Braden and J. Hortin as "the ability to understand (to read) and to use (to write) images and also to think and study in terms of images" [15]. The competence formed at such level characterizes professional approach to the analysis and interpretation of visual imagery. R. Buurma emphasizes that the changes caused by digital technologies dictate the tasks for teachers, and one of these is training

students in reading [16]. Interpretation as a variant of reading of multimodal texts represents the universal mechanism of different semiotics systems decoding. In this case, the experience of the reflexive attitude towards reality and the experience of its representation is important.

Formation of visual literacy is a specific problem of modern humanitarian pedagogy, consisting in the necessity of developing critical thinking skills focused on understanding and comprehension of the mechanisms and contents of the information, conveyed in the actual socio-cultural practices which are important in the course of visual experience acquisition.

The innovative component is demonstrated as a result of the creative solution and manifestation of visual literacy skills, which we define not only as a way of intelligent and creative reading and interpretation of the information perceived in the 21st century videocracy conditions, but also as a special level of a competent, professional approach to the phenomena of sociocultural reality. Systematized, intelligent and representative research (not only scientific, but also personally significant), characterized with technological effectiveness of conveyance (including media in the broadest aspect), becomes the "product" and result of visual literacy skills realized in the digital environment.

Let us agree with A. McGrail [11] that training in reading has the potential of disciplinary openness with placing the emphases on joint practice of the reality cognition and critical judgment of information. Digital technologies in many respects facilitate humanists' activity, but at the same time oblige them. In particular, they are required to have literacy skills and own technologies of data representation in the media environment.

In this context media and information literacy become of special importance. **Media literacy** is a set of competences allowing the individual to master information resources, to create qualitative content and distribute it in various forms by means of modern technologies, becoming a part of a big social dialogue.

In 2018, C. d'Ignacio and R. Bkhargava argue (we cannot but agree with them) that "it is necessary to do a great job on specification and standardization of the information literacy definition, especially in connection with the changes in technological achievements and practice of visual communication". How should information literacy look like for nontechnical students who will stop being engaged in data studying, but will need to communicate with data in their professional life? <...> the best way forward is students' involvement in practical creative activities, which promotes strengthening of their potential. Without such practices, any efforts in terms of working with beginners will be focused on the acquisition of the software skills allowing them to achieve their goals. It ...is the program for those who are engaged in digital humanitarian space

and have the experience and working practice connected with this problem” [17]. In other words, **information literacy** is the mastery of information and computer and communication technologies, providing perception, interpretation and conveyance of information according to those forms and practices which are relevant for creative and/or professional self-realization of the individual in the 21st century culture.

5. Discussion and Conclusion

The combination of visualization and digitalization in modern education becomes, according to the experts, more and more active and demanded phenomenon. Representation of information in visual images with the help of technical means and communication technologies incorporates into the pedagogical process, enriching it and endowing it with new opportunities. In particular, it saves time when studying the material, activates various channels of information perception, promotes acquisition of competences demanded in the real life and immersion in the actual practices of experience and information conveyance, as well as forms a dialogue with the subjects of education regardless of the place and time. Along with the opportunities listed above, a personally significant need in developing skills of different type of literacy (visual, media and information) increases.

Actually, the process of reading itself acquires the nature of a multimodal practice which is based on the cardinal principles of text work: coding and decoding meanings with the help of technological means requires a competent approach.

Funding

This research was made possible by the support of the Russian Foundation for Basic Research, grant No. 17-29-09136\19 «Polylingualism in the era of post-literacy: philosophical and cultural studies and methodological and pedagogical development of a multilingual education model».

References

- [1] Bauman, Z. (2008). *Tekuchaya sovremennost*. Asochakova: SPb.
- [2] Simbirtseva, N. A. and Shul'ga, N. S. (2017). Polikul'turnoe obrazovanie kak napravlenie deyatelnosti otkrytogo universiteta. *Pedagogicheskoe obrazovanie v Rossii*, vol. 8, pp. 6-12.

- [3] Mora, R. A. (2019). Multimodal Texts and Tools in Preservice Methods Courses: From Consumption to Design. *Blended Language Learning: International Perspectives on Innovative Practice*, vol. 3, pp. 359-388.
- [4] Borsuk, A. and Bouse, B. (2013). *Between Page and Screen*. Los Angeles: Siglio.
- [5] Davis, R. F. (2017). Pedagogy and Learning in a Digital Ecosystem. In R. Bass and J. L. Moore, (Eds.), *Understanding Writing Transfer: Implications for Transformative Student Learning in Higher Education*. Sterling: Stylus Publishing, LLC, p. 36.
- [6] Kress, G. (2005). Gains and Losses: New forms of Text, Knowledge, and Learning. *Computers and Composition*, vol. 22, pp. 5–22.
- [7] McGrail, A. B. (2016). The ‘Whole Game’: Digital Humanities at Community Colleges. In M. K. Gold and L. Klein (Eds.), *Debates in the Digital Humanities*. Minneapolis: University of Minnesota, pp. 5-22. Retrieved from <http://dhdebates.gc.cuny.edu/debates/text/53>.
- [8] Guzikovoj, M. O. and Gudovoj, M. Y. (Ed.) (2017). *Kommunikatsionnye trendy v ehpokhu postgramotnosti: polilingvizm i polikul'turnost': monografiya*. Ekaterinburg: Izd-vo Ural. un-ta.
- [9] Stejnberg, V. E. and Man'ko, N. N. (2017). Vizual'nye didakticheskie regulyativy logiko-smyslovogo tipa. *Obrazovanie i nauka. The Education and Science Journal*, vol. 19, issue 9, pp. 3-31.
- [10] Fyfe, P. (2018). Reading, Making, and Metacognition: Teaching Digital Humanities for Transfer. *Digital Humanities Quarterly*, vol. 12.2 (2018). Retrieved from: <http://digitalhumanities.org/dhq/vol/12/2/000394/000394.html>
- [11] Segenchuk, S. (1997). Static Visualizations. *The Role of Visualization in Education* Retrieved from <https://web.cs.wpi.edu/~matt/courses/cs563/talks/education/IEindex.html>.
- [12] Segenchuk, S. (1997). Dynamic Visualization. *The Role of Visualization in Education*. Retrieved from <https://web.cs.wpi.edu/~matt/courses/cs563/talks/education/IEindex.html>.
- [13] Vanyushkina, L. M. and Kopylov, L. Y. (1997). Obraz i mysl': na puti k programme. In *Muzej i shkola v obrazovatel'nom prostranstve*, vol. 2, pp. 53-54: SPb: Sb. Statej.
- [14] Ioffe, A. N. (2012). Vizualizatsiya v istorii i obshhestvoznanii – sposoby i podkhody. *Prepodavanie istorii v shkole*, vol. 10, p. 3.
- [15] Braden, R. A. and Hortin, J. A. (1982). Identifying the Theoretical Foundations of Visual Literacy. *Journal of Visual Verbal Language*, 1982, vol. 2, pp. 37-42.
- [16] Buurma, R. S. (2015). “Reading.” In Digital Pedagogy. In R. F. Davis, et al. (Eds.), *Humanities: Concepts, Models, and Experiments*. New York: Modern Language

Association. Retrieved from <https://digitalpedagogy.mla.hcommons.org/keywords/reading/>.

- [17] D'Ignazio, C. and Bhargava, R. (2018). Creative Data Literacy: A Constructionist Approach to Teaching Information Visualization. *Digital Humanities Quarterly*, vol. 12(4), pp. 1-36. Retrieved from <https://hdl.handle.net/1721.1/123473>.