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The Functional Model of Using Visualization and Digitalization for Media Literacy Development in Media Education Process

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Abstract

Speaking about the media component in organization of education, we consider such a branch of modern science of mass media and mass communication as media education. In the paper the functional model of using visualization and digitalization in modern media education is considered. Visual cognition concept in “media education” is introduced. Visual cognition covers many aspects such as object recognition, attention and search, word recognition and reading, eye movement control and active vision, short-term and long-term memory for long-term memory and visual imagery development. Cognition refers to how an individual acquires and processes information, those who veer toward a visual cognitive style prefer to process visual information rather than verbal information. Several strategies when processing visual data are considered in the study. The phenomenon of media literacy is highlighted in modern media. Visualization is studied as a tool for “packaging” education with media potential. The main attention is paid to visual messages potential in the media. Based on the analysis of different approaches to education, the effectiveness of this potential is assessed in terms of increasing media competence of the student audience, including future journalists, producers, filmmakers and designers who will be taught to create modern print and online media.

Keywords: media cognition, visual cognition, media competence, data visualization, data digitalization, media literacy, digital technology.

1. Introduction

The 21st century is revealed to the observer’s view as an era of endless “explosions and cataclysms” – radical changes in scientific fields and existing scientific worldviews reassessment. It is not surprising that the formation of science is accompanied by numerous conceptual disasters: the seemingly unshakable postulates collapse; many new theories are born, some of which disappear as suddenly as they appear; the conceptual apparatus is rapidly changing, while the introduced new concepts (media education, media literacy, digital competence, cognitive constructs, mental representation, emotional intelligence, visualization etc.) blow up the imagination with their metaphorical ambiguity.

“Media competency is the result, as anticipated, of the convergence of the audio-visual concepts, communication media competency, digital competency, visual cognition, informational competency, and audiovisual competency, among others all” (Buckingham, 2007). Modern times are often described as the era of media application in communication, journalism, education and in

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other spheres of life. Undoubtedly, media play a crucial role in today's information society. However, in public opinion, this influence is often described in categories of negative semantics (manipulation, virtualization of reality, avoiding real life problems, substitution of journalism for propaganda, etc.). Therefore there is an urgent necessity to clarify modern media functions and their role in society, the principles of work, and different spheres of application, advantages and disadvantages. That is why the main goal of our study is to compile a functional model of media education aimed at reaching media competence first and media literacy afterwards. This education process is greatly contributed to by modern popular trends in education, such as data visualization and data technologies. Discussing challenges put forward by modern media, on the one hand, will debunk dangerous myths that have developed around the so-called "media democracy", on the other hand, it will help to neutralize the destructive and harmful influences that can be revealed in the field of mass media.

There are many reasons for such a cognitive approach, as in the media there has been a shift from the verbal comprehension to the visual one. In modern society, the bombardment of visual aids, such as television images, commercials, billboards, posters, computer icons, cell phone smiley pictures, has such an effect that people are becoming less susceptible to the printed word; students can not focus on the text for a long time if there are no pictures, diagrams, graphs or charts in it. An alarming from the point of view of education is the recent need for media literacy – the ability to analyze, critically interpret and absorb information created and presented using various types of media, the need for such literacy is soaking in the modern information society. It is noted that in recent years there has been a real revolution in science, associated with an interest in the study of visual culture (Mitchell, 1995). This concerns education in the first place and brings to life the need to create auxiliary visual support and visual organization of information for the purpose of media education. This is all about the specifics of the "visual society". Visual reality appears as an information construct, subject to "reading" and interpretation to the same extent as the text lends itself to these procedures. Both "reading" and interpretation of visual information constructs need to be explained and instructed to students, if we want them to comprehend the meaning of them.

Like many other phenomena in the world media should become the subject of education, should be taught and learned in order to reveal their positive semantics. That's where media education and visualization have become inseparable. Thus in our experimental model we use such major blocks as: media, media literacy, media competence, digital competence, education, culture and visualization. Media literacy deals with the culture and lifestyle of students. They enjoy thinking and talking about what is going on in the media. For teachers, it is an opportunity to make students examine how they are influencing and being influenced by popular culture presented by media.

Modern society is characterized by large volumes of information offered by media that people process in order to support progress and sustainable development in science and society. The bulk of information is evolving so fast that a person is no longer able to perceive actual data about the world around and to process all this information using traditional methods. The basis of the 'image of the world' today is not only concepts and semantic fields, but also visual images, schemes and prototypes created by media. People in many cases tend to trust visual information more than other forms of sensory information (Sinnott et al., 2007). The reason why visual information convinces people more can be explained by the role of vision in forming the basis of the biological and socio-cultural existence of people and their past experience (Arcavi, 2003). Therefore, visual information and visualization are part of human life and are valued by people. Visualization is also used in many fields of science as its rational part (Farmaki, Paschos, 2007). Information provided by other areas of human activity can also be expressed in a visual representation that can facilitate the process of understanding. For example, the use of graphical presentations (diagrams, charts, graphs, cognitive maps, mental cards) can help to arrange simply and directly presented educational material difficult to comprehend into schemata (Tappenden, 2005). In a more general expression, all kinds of connections of the studied object can be perceived easier and faster due to visualization. Visual presentations convey information systematically and using interesting and effective methods. Visualization serves an important purpose, such as facilitating learning and teaching. Visually presented information can be apprehended and interpreted, like any verbal text in print. Modern students do not pay attention to boring, hard-to-reach printed texts; rather, their attention will be drawn to colored structural information models and diagrams, cognitive maps and mental schemes, videos or PowerPoint presentations. When comparing different teaching technologies, we can conclude that visual presentation is more effective because of a structured and

systematized form that makes it easy to teach and learn. Such structures are stored in long-term memory, easily accessible and quickly updated if necessary, which contributes to the storage of more information per unit of time and faster and more detailed reproduction of the stored material. “Visualization in training is based on the special properties of mental images as objects of knowledge, expresses the degree of accessibility and clarity of these images for a student. It is based on one of the most important principles of learning – the principle of clarity” (Makarova, 2016).

Visual cognition covers many aspects, such as face recognition, memorizing scenes and objects, attention and search, words recognition, eye movement control and active vision, short-term and long-term visual memory and visual images storage. This kind of cognition relates to the cognitive process (the way a person acquires and processes information), and those who turn to the visual cognitive style prefer to process visual information rather than verbal, acoustic or tactile. There are several strategies that can be used while processing visual information.

Cognition means mental processes, such as sensation, perception; representation, imagination and memory, speech and reflection can also be attributed there. Visual cognition refers to how the brain responds to visual stimuli; in other words, a subjective process, when vision through an objective process becomes an object, word or memory. Before cognition takes place, sensory input must occur - visual. For example, the eye sees a series of lines, shapes, and colors. Only when this information has reached the brain and has been processed, a rounded pottery clay vase or a marble sculpture appears in the inner eye. From the point of view of an outside observer this process may seem extremely simple, but it is not. Visualization involves creation of real or unrealistic images in the imagination and memory. This usually refers to visual images, but may relate to sounds, movements, tactile sensations, taste and smell, whatever is perceived by human senses or arises in human imagination. As any human activity, visualization should be taught and learned.

The answer to such developmental challenges was the birth of an independent scientific discipline and a set of pedagogical and media practices, called media education, the result of which, ideally, should lead to the higher level of media literacy of media consumers or media competence development increase.

Today, media literacy education is developing intensively in many countries, its problems and issues being studied by a number of scientists (Aleksandrov, Levitskaya, 2018; Berger, McDougall, 2013, Cheung, 2009; Fedorov, 2019; Fedorov, Levitskaya, 2018; Förster, Rohn, 2015; Kačínová, 2018; Petranová et al., 2017; Seliverstova, 2016). Media issues in philosophy of media were developed by V.V. Savchuk (Savchuk, 2007), N.N. Sosna (Sosna, 2011), P.M. Stepanova (Stepanova, 2016) and others. An important contribution to the theoretical understanding and creation of history of media was made by D. Bulatov (Bulatov, 2012), D.V. Galkin (Galkin, 2004), K.E. Razlogov (Razlogov, 2011).

Media literacy education regroups the pedagogical approaches and educational initiatives designed to foster the media literacy of individuals. Media education concerns the learning processes and the means to reach that goal. Media literacy concerns the outcomes and objectives of media education but not only: in a broader sense, it's an issue related to social life and culture. «But because today people use so many different types of expression and communication in daily life, the concept of literacy is beginning to be defined as the ability to share meaning through symbol systems in order to fully participate in society» (Hobbs, 2010). We can simply put media education as a process, while media literacy is being its outcome, and digital competence, data visualization are teaching aids.

Data visualization in recent years has gained fame and popularity in a wide variety of fields (Kirk, 2012). The development of many new interactive visualization tools has accompanied growing interest in data visualization, allowing users from a wide range of backgrounds to interactively visualize and share data using digital technologies. In fact, interactive visualizations have the potential to improve user intelligence and enrich teaching process supported by visualizations.

Albert Einstein was known as a visual thinker, but not very many people have really read how he described the idea: “What, in fact, is thinking? When snapshots of memory appear at the reception of sensory impressions, this is not yet “thinking”. And when such images form sequences, each of which causes another, it is also not “thinking”. When, however, a certain picture appears in many sequences, it is precisely thanks to such a return that it becomes the organizing element for such sequences, since it combines sequences that are not related to one another. Such an element

becomes a tool, a concept. I think that the transition from free association or “dreaming” to thinking is characterized by the more or less outstanding role of “conception” (Dukas et al., 1979).

The image is often subjective in nature as a result of the student’s intellectual activity, therefore it does not always objectively reflect the surrounding world, but is a holistic integrated reflection of reality, in which the main categories are space, movement, color, shape, texture, sounds, etc. Visualization is a holistic approach to the world, not divided into separate details, concepts and ideas, but images created through visual operations and the imagination of the perceiver, his previous experience and background knowledge, which is why they are easily understood and remembered for a long time. Visual images do not have to be detailed graphic images (drawings, sculptures or photographs), more often they are abstract schemes, prototypes, frames, diagrams, graphs, charts, cognitive and mental maps. In addition, visualization is associated with the emotional sphere of a person: to remember visual images must be positive; not only perception of real objects in real world around, but also creative thinking becomes a positive experience in individual’s emotional sphere. Visualization and digitalization of data are not simply the modern trends, but first of all, useful tools to develop certain skills and competences in education. And as those can be applied for students’ comprehension development and long-term memory ensuring in media education as well as in any other type of education, we have included data visualization and digitalization in our model

2. Materials and methods

Research materials: visualization in education, development of infographics in education, students’ long-term memory developed by presenting teaching materials via media, using media presentation to explain topics difficult for comprehension. Infographics is a portmanteau word made of morphemes ‘info’ and ‘graphics’ blended in one word. are graphic of information, data or knowledge intended to present information quickly and clearly. We use this blending to indicate information, data or knowledge visual images for explicit representation promoting comprehension and memorizing due to inborn human ability to see patterns, trends and memorize images better than words and sentences.

Research object is teaching students using infographics first to develop comprehension, then to ensure long-term memory to memorize large volumes of data, and finally to retrieve and to apply in practice large chunks of information when necessary.

The study uses basic methods of cognition: the problem-solution, situational, schema and comparative methods. The assessment approach is applied to the media literacy education problem. Comparative method defines the difference in international media literacy situations, approaches to media education and media literacy in different countries. A schema method shows holistic approach to media literacy teaching, describing its past, present and future.

The main research methods are modeling of education process using infographics in media education to provide understanding, memorizing and information retrieval when needed.

3. Discussion

As the result of study, a functional model of using visualization and digitalization for media literacy development in media education process was compiled. With visualization at hand it is easy to introduce several components of media education process in their interaction and interdependence. The blocks represent major concepts in education process, such as media education as the process, media competency and media literacy as this process’ results, while visual cognition, data visualization, data digitalization and digital technologies being the tools used to achieve set goals.

In this part of the article we would like to consider several components of the functional model (Figure 1) using media education as main teaching process, media competency and media literacy as major results of this process, visualization and digitalization as main tools in order to ensure information visual perception, comprehension, memorizing and practical application when needed, all arranged in a simple hierarchical multi-level structure.

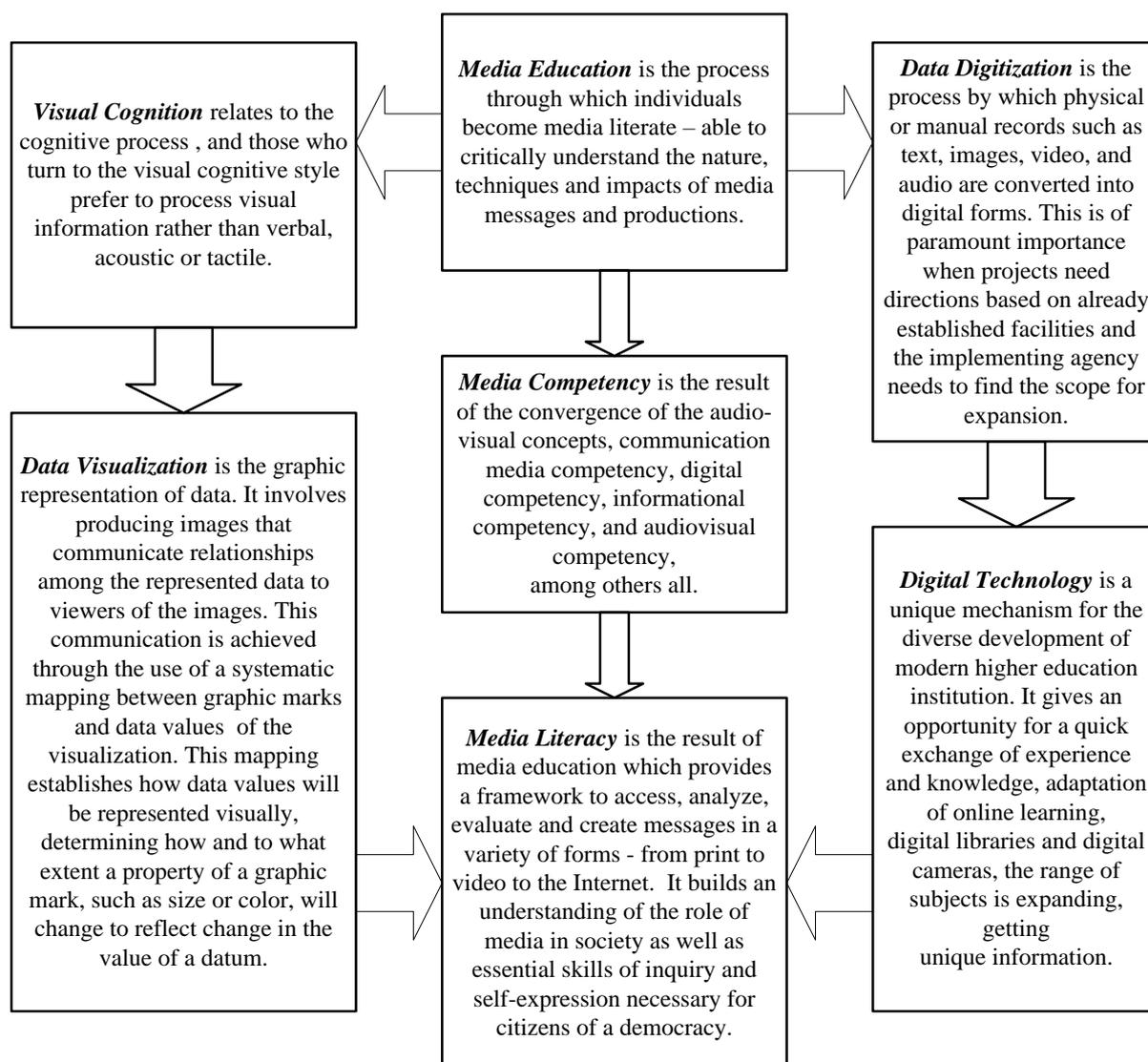


Fig 1. The functional model of media literacy development

Not included in the model, but not less important in media education goals achievement is infographics as a form of graphic and communication design. One of the obvious “gaps” in media education seems to be an underestimation of the media educational potential of the media themselves, which, through the realization of media aesthetic potential, can be a powerful resource for the formation of media competency. This is especially true of the so-called ‘new media’ and the manifestations of visual perception. Underestimated from the point of view of past media educational efforts, the phenomenon of infographics, which is the form of graphic and communication design today, is most widely used in the media sphere. Infographics can not only organize large chunks of information, but also more clearly show the objects and facts in time and space, as well as predict different trends and interaction.

The need for a systematic study of infographics’ media educational potential as one of the most dynamically developing and promising tools for processing, ‘packaging’ and broadcasting media information by modern media is also due to such a phenomenon as media aesthetics – a phenomenon that developed in the era of visual revolution. Although not studied in full, this media phenomenon is being of a certain interest to researchers. “However, the role of aesthetics in achieving media power is not enough studied. An analysis of the relationship between media policies and the aesthetic regime will allow define as your own specifics of media policies aimed at self-vision and self-justification, as well as new horizons of aesthetics. Aesthetics have its own politics. The acute question is posed about the area that is not given to aesthetics, which it cannot impose on a network of categories, which again testifies to the lack of bridges of extra-aesthetic experience. And vice versa,

that whatever is considered aesthetic, loses the mode of relevance, becoming the normative regime of art or a legitimate page in the history of culture” (Savchuk, 2018).

The goals of media education are focused on students gaining knowledge about communications and media skills: information search, processing, storing and retrieving, training in information perception and comprehension, critical thinking development, ability to understand the hidden meaning of the image or other messages. It is also important to learn how to resist media’s manipulation of the individual’s consciousness, how to adequately understand media texts, to use different means of communication for creative expression of one’s thoughts and ideas. Especially important is the focus on new information technologies use, such as multimedia informational opportunities and the Internet endless resources. Media education is facing new types of problems associated with information systems operation and hypertext learning environments. Media education should create students’ systems of information interpretation and organization to achieve independence from the media, make them active participants in communication processes in modern society.

It is generally recognized that visual images are remembered faster than verbal texts, and human memory stores them much better. Visualization is evidence and persuasiveness. Therefore, the human brain processes visual images as priority ones (clear and precise). Visualization “improves understanding, memorizing and decision making, as it uses forms that are clear and easy to perceive, making data accessible and attractive” (Shevchenko, 2015).

Finally, “the interpretation of complex data becomes possible after its visualization, through visualization the information becomes more meaningful, emotional, detailed and fixed hard in the memory” (Shakirov, Safiullina, 2015). It is emphasized that “the human brain loves visual content; by using visualization data are made easier to understand and compare” (Lengler, 2007). Visual images are faster to remember and stored in memory for a longer time. Educational activity in modern school systems is largely based on values, carried by concepts, ideas, laws, words, but there is no appeal to students’ emotional and creative spheres. The incentive for introducing visualization into education is the desire to move away from explanatory pedagogy to a constructively new approach to teaching, which involves student and the teacher’s active interaction within psychologically comfortable and safe educational environment. Just as logic is based on verbal thinking, so intuition is based on visual thinking. Visual thinking is no less important than the verbal one; moreover, both components of thinking are stronger in unity and interaction.

Rudolf Arnheim offers a possible basis for such visualization in his book “Visual Thinking” (Arnheim, 1980). He explains how visualization becomes an integral part of thought and understanding. He uses examples where awareness processes, structures, and objects often precede or even constitute visibility. This visualization of the inner mind is created through observation and analysis of physical objects or effects, which Arnheim calls ‘models of forces’, which the observer inevitably interprets based on prior knowledge of the world and past experiences. What future keeps in store for us is complete digitalization in all spheres and especially in education. In the world, where mobile penetration increasing by a billion per year with over 200 million connected to the internet, the potential to digitally educate the masses seems very rich.

In the past years there has been a considerable rise in Digital and Virtual Classrooms at different levels of learning. With evolution of technologies such as cloud, data centers and virtualization there is a huge potential for technology to be integrated with the media education. Advantages can be seen from all points of view. Students consider it as a flexible option allowing them to use individual learning trajectories, to study at personal time and pace. Teachers find it convenient to prepare their learning plans well aided by technology. Teaching becomes more of (Edutainment education+entertainment) than hard work, a smoother experience with a perfect combination of personalized assignment packages having a blend of animations, gamification and elaborate audio-visual effects. The usefulness of the digital technology in society and culture is increasing, while these technologies grow and multiply. Visual cognition refers to the way the brain responds to visual stimuli; in other words, the subjective process where the seeing becomes, through an objective process, an object, word or memory. Before cognition can take place, there must be some sort of sensory input —a visual one (Croft, Nevill, 2019).

Visual memory is the process of recalling information a person has seen. This type of memory is often considered different than other types of memory, such as the ability to recall facts or pieces of music. Different people have various degrees of aptitude for this type of memory, and it is

believed to be possible to improve it with practice. Many people believe that this type of memory is important for learning and that deficiencies in visual memory can be related to specific learning disorders like dyslexia or autism. In Temple Grandin's books 'Thinking in Pictures' (Grandin, 2013) and 'The Autistic Brain', she uses the language expertly to explain how visual thinking works. "Words refer to cascades of images, as visual and linguistic systems interact" (Grandin 2006). T. Grandin, autistic herself, has become a University professor and an award-winning writer, whose books explain how to develop visual thinking and to achieve success in learning notwithstanding mental handicaps.

The process of recalling visual information is not as straightforward as many people believe. For example, visual memory can be affected by age, alcohol, or lack of sleep. When a person's brain takes in visual information, it is not stored as a single image or set of images. Information about what the brain sees is stored, but certain areas may be more easily recalled and certain information may be altered in storage. Additionally, memories that are not purely visual may be more vivid or easier to recall, and memories that are not primarily visual may still have image components.

Images are described as some systems, as a result of processing of which certain mental constructs appear in the internal plane of consciousness, they can be of various degrees of generalization: from detailed figurative paintings to diagrams, graphs, maps or abstract schemata. Saying that an image is something special and a word is something generalizing is wrong, words can fix a separate, particular, and images can rise to high degrees of generalization. Until now, the imagery played an auxiliary role in the training system, however, today the requirements of modernity are such that we need to bring visual images "from shadow to light" and give them a second life and a primary role.

Coming back to the problem of media definition let us dwell a little more on the thoughts that are most promising in connection with the technology-oriented and digitalized education. So, modern media (computers and other electronic devices) turn out to become "means of expression", not standing on a par with textbooks, pictures, image and even a movie camera, but heading forward to more progressive and more effective methods of teaching.

4. Results

The definition of media as a container for other kinds of media is described in the framework of the so-called functional model. Media not only allows you to more sharply feel your own self in its pages, but also offer ways to expand the very ability of feeling and sensing, and with it a new level of involvement in the world, its development and knowledge.

The human psyche does not form a specific image, but the perception of the world, created by the perception and imagination of the subject, as a rule, it includes personal meanings, other people, the spatial environment and the time sequence of events. The image of the world is also determined by the nature of the actions during which the original image is supplemented, modified until it satisfies the practical needs of a person. The subject, as a rule, seeks an emotionally positive action to model the world in its semantic perspective and integrity. Semantic integrity is an ideal environment, a mental space in which all peculiarities of the world are sketched out from a certain view point and thus acquire a very definite meaning. The picture of the world is a system of generalized views on the surrounding world and the place of the individual in it, the relationship of the individual to the world, as well as what the individual can learn from this general picture of the world (beliefs, socio-political, moral and aesthetic ideals, principles by which material and spiritual events are evaluated).

Visual reality is presented in education as an information structure, which should be apt to "reading" as much as any verbal (written) text and can be comprehended and translated in the same way. Visual reality has long ceased to be perceived as a subordinate operand that complements the verbal text; thinking and imagination clash to serve semantic purposes. For teaching and learning, visual images have undeniable uniqueness of cognitive power and the multi-level structure encoded in it. Having compared various ways of information presentation, we have been made the conclusion about effectiveness and efficiency of visual teaching and learning methods because they contribute to holistic, more structured and systematized data that a student confronts thus facilitating understanding and memorizing. A graphical representation helps the structure and sequence of information to be visualized and understood. In addition, it has already been proven that visualized learning stimulates student's motivation. With an increase in motivational inspiration to study, critical and creative thinking becomes flexible, avoiding

stereotypical patterns, dogmatic thinking and trivial routine. Images, ideas and concepts are combined in a sense; contribute to the formation of logical thinking.

Visual thinking consists of visual operations and allows using a person's ability to see and understand images, and then analyze the data obtained. Accordingly, the task of visualization is the conversion of huge amounts of information into graphic images accessible to human perception when they are connected by one meaning (infographics). This is how visualization is associated with metacognition, which is "stored knowledge about oneself and others as cognitive agents, about tasks, about actions or strategies, and about how all this affects the results of any intellectual behavior" (Flavell, 1985).

Visualization is also a way of exchanging information, which is an alternative way to oral and written communication that prevailed in the past. Currently, there is a "copying of the cultural environment", in which human evolution fully reflected and expressed in written texts, receive audiovisual expression thanks to the media education and digital technologies. Compared to common verbal communication, visualization is a psychologically easier and more capacious, socially more accessible and voluminous, but a less unidirectional and stable form of knowledge structuring. "Teaching experience should provide fair, authentic learning opportunities. Today, more and more students are looking for alternative ways to accomplish tasks, often using innovative technologies, which can provide a real context for learning and the formation of deeper conceptual thinking. ... The use of visualization must maintain consciousness in learning" (Schaffer, 2017). These visualization features form its socio-cultural peculiarities and cognitive functions.

In visualization's communicative function, it is quickly becoming the leading medium of mass communication, suggesting the associated social and regulatory responsibilities. Throughout the world, in various fields of activity, a gradual transition from the verbal component to the visual one takes place: visual images have such an effect that people become lazy to read texts in regular print; but rely on images more than on verbal texts. This once again confirms that visualization haunts humans in life, study and work activities.

With the methodically competent use of visualization methods, students can not only plan their educational process, evaluate results and monitor progress in learning, but also move to higher levels of cognitive activity, mastering subject content. In the process of introducing visualization methods into training, it is necessary to take into account the psychological characteristics of the activity of cognitive mechanisms. Metacognitive experiences are conscious cognitive or emotional experiences that occur during training and apply to any aspect of it.

When visualizing educational content and ways of understanding and memorizing it, it is necessary to take into account various characteristics of a person, types of cognitive abilities of a student, various types of leading sensory moments and, undoubtedly, the ability to be metacognitive regarding their learning. Visual teaching methods, based on the psychological characteristics of the trainees, can solve various development problems: the development of observation, visual memory, creative thinking, creativity, awareness, etc.

The process of thinking using visualization of metacognitive strategies in learning can also be enhanced by expanding the activated types of thinking. (Abakumova et al., 2006) Along with abstract-logical, information visualization allows including mechanisms of visually effective, imaginative, associative thinking, and enhancing the activity of imagination (reproductive and creative).

5. Conclusion

In this study, it is tried to determine the level of the effect of visualization and digitalization on media literacy development achievement by following the above mentioned steps and by using the functional model offered.

Degree of development marked problems due to the multilayered nature of the affected aspects, their interdisciplinarity. Necessary disciplinary contexts include both philosophical and aesthetic tradition, modern theories of science and technology, the theory and methodology of modern education, particular aspects of media art and media education. The purpose of this study is reviewing the resources with regard to the effects of visualization, digitalization and cognitive science in media education. In this context, findings of individual studies are combined by meta-analysis and put together as a text. Using the functional model of using visualization and digitalization for media literacy development in media education process will help further research

and practical application in media education development. Thus, the effect regarding the ways of using visualization in gaining media competence and media literacy can be calculated and a general assessment will be made. A study of the aesthetic side of media education and compiling theory of education using new technologies engaged in teaching and learning are among them. But this might become the topic of some other study.

In conditions of dramatic transformations of the media environment due to technological “breakthroughs” (creation of the Internet, emergence of portable gadgets, wireless communications, digitalization of content, etc.), infographics acquire additional previously unknown importance that make it an even more effective way of transmitting information. The combination of the Internet communication properties (multimedia, hypertext, interactivity) with a verbal product (written text, audio and video content) also changes the media consumer’s demands, who is constantly heading toward multitasking, increasing activity in arrangement of information, visibility, dominance of game activities (gamification), etc. In this context, new requirements about the visual content of media education – infographics – are being made, it should not only be exciting, but also informative, visual, aesthetically attractive, multi-channel (affecting media consumer through hearing, sight, imagination etc.), and digitalized.

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