Visualization in the Context of Motivation Development Within the Framework of Corporate Training

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Abstract

The current stage of socio-economic development is characterized by the use of information and digital technologies in all spheres of human activity. The processes of production, exchange and consumption of goods, including knowledge and information, have changed. Intellectualization and digitalization of production systems are the main trends of economic development, which are supported in many countries. The functioning space of any organization is now increasingly facing difficulties in processing a large amount of data and new information to maintain competitiveness at the proper level. Employees' cognitive skills are also being transformed. According to our surveys, it is more difficult for employees to focus and keep their attention on all incoming information, process and analyze large amounts of data, present compressed data in reports so as to briefly and quickly explain the essence. Also, employees tend to experience stress because they do not have time to master new skills necessary for work. This is especially felt by representatives of creative professions (designers), as well as marketers, programmers, etc. Moreover, the modern volume of data should not just be perceived by employees, but analyzed, understood and used in work. All this leads to an increase in the volume of corporate training, which is not always of high quality and often includes traditional forms in the form of lectures, seminars. In the current situation, it is necessary to apply new approaches, techniques and methods to the education system at different levels in order to develop students' skills that are in demand in a modern technological environment. Modern educational practice is more effective when it uses visualization.

Keywords: information, digitalization, training, education, information literacy, digital skills, cognitive technologies, visualization, information technology, motivation.

1. Introduction

The use of modern educational technologies in teaching is necessary for the development of students' understanding of the needs of the information world (Gálik, 2020; Gálik, Oprala, 2021; Gálik, Gáliková Tolnaiová, 2022; Gáliková Tolnaiová, 2021; Gáliková Tolnaiová, 2021; Vrabec, Odziomková, 2021), skills of safe and correct use of information. It is impossible to navigate the ever-increasing flows of information without mastering information literacy, self-learning skills throughout life will help to master emerging products and technologies faster. The use of traditional pedagogical techniques and methods no longer provide the learning outcomes that would satisfy graduates of educational institutions, and the main criterion for motivating students is their demand in the labor market. The use of information technologies in education helps not

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only to master various subject areas faster, but also form a high level of information literacy of students. In recent years, the concept of Industry 4.0 has been actively developing, within the framework of which new concepts of business models of the organization are being formed, the possibilities of digitalization of products and services, the Internet of Things, augmented reality technologies and others are expanding. Organizations are investing more and more in such advanced technologies as blockchain, artificial intelligence, augmented and virtual reality technologies, which requires new competencies from employees (Gorbatenko, 2022). The development of teamwork skills, the ability to creatively solve tasks, adapt to technological changes, and creativity are becoming increasingly important (Bonfield et al., 2020).

Technologies developing within the framework of this concept are used in the education system. The digitalization of education is an actual trend, which solves the tasks of improving the knowledge and skills of teachers in the field of digital technologies, improving technical equipment, developing online learning so that the learning process meets the requirements of a modern technological environment. Given that digital technologies provide good opportunities for independent study of the material, the role of teachers is also changing. It is not a simple translation of knowledge that is important, it is necessary to teach students to navigate the variety of information products and technologies, to build individual educational trajectories. As a result of the introduction into the educational process of training programs aimed at acquiring knowledge in the field of digital transformation models within the framework of Industry 4.0, students will be able to master the skills of working with intelligent systems, learn about modern technologies that organizations are implementing (Ingaldi et al., 2023).

The training of personnel to meet the needs of the Fourth Industrial Revolution takes place in the context of a new educational paradigm. In order to meet the requirements of the modern digital society, universities must develop their own digital transformation strategies (Hashim et al., 2022). The essence of the digital transformation of education is the achievement of individual educational results through the use of artificial intelligence technologies, virtual reality, and the development of a digital educational environment in educational institutions. At the same time, it should be borne in mind that it is not enough to simply introduce information technologies into the educational process, it is necessary to fill the educational process with new content based on the use of pedagogical techniques and methods that develop the creativity and creative potential of students. This is the advantage of digital and information technologies that provide diversity in the design of the educational process. Combining elements of virtual and real learning allows you to maximize the advantages of some methods and avoid the disadvantage of others.

For example, traditionally used gaming methods are transformed into the format of virtual games. Modern technological capabilities of information technologies allow students to work collectively on joint projects, use the global information space not only to search for information, but also to receive feedback about the created product or the received solution. This is important for the student's self-realization. Research shows that universities actively use social networks, virtual learning environment for organizing teamwork, mobile learning and other elements of information and digital technologies as they become available (Shen, Ho, 2020). The analysis of the main problems of using modern technologies has shown that the introduction of information technologies or e-learning technologies should be accompanied by the updating of educational content, the support of the teacher is important for students, the use of information technologies increases the information literacy not only of students, but also of teachers themselves (Nancy et al., 2020). Visualization technologies have great potential for developing cognitive skills and skills of working with large amounts of information.

2. Materials and methods

Visualization as a concept can be considered in two aspects: on the one hand, it is a graphical way of presenting large amounts of information, sometimes unnecessarily theoretical or containing many logical connections, and on the other, it is part of the cognitive sphere of the individual, a system of active imagination based on images already available in memory, meanings that you can dive into in order to increase awareness of comprehension of information. Currently, one of the key functions of visualization is the folding of information, its "cognitive compression" and coding in order to concentrate the key points that need to be learned or mastered. As part of visualization, mental images are brought to the external plane of consciousness (often later in verbal form) on the basis of past experience and the system of associative thinking and values inherent in a person, and meanings.

The initial structure of the information that employees master as part of visualization-based training remains, but is supplemented by the meanings and previous experience of the employee, which allows them to better remember, assimilate and use it in the future. All this increases the level of confidence of employees in their professional competence, the level of assimilation of skills and knowledge and the degree of possibility of their implementation in practice.

The methodology for implementing visualization as a cognitive technology includes two aspects:

- passive form of visualization – perception of graphically presented data and their analysis. This always happens at the first stage of training. The more complex the training, the simpler and more accessible the graphic schemes and visual constructs should be;

- the active form of visualization includes direct and reverse actions with images – their folding and deployment in the inner plane of consciousness for the implementation of mental operations or practical actions in order to assimilate information or develop skills, for example, in the learning process. The active form of visualization allows you to transform the assimilated information in accordance with the value-semantic content of the inner world of a person and his previous experience. Visualization in learning relies on the processes of thinking, perception, manifests itself in various levels of reflection, its main task in the context of learning is to "bring" and "take out" images into and out of the inner plane of consciousness. Images that are the result of visualization have the following characteristics:

– they are schematic;
– emotionally colored for the subject, have meaning for him;
– are of interest to him;
– undergo an active transformation on the part of the subject;
– created by the subject himself;
– they allow to systematize knowledge, data, information into generalized cognitive schemes, which gives a good result for memorizing and structuring them in the framework of practical activities.

Systemic thought forms, images of the structure and features of the educational environment for an individual can be the basis of his activity in the mental space, data from which can then pass into the real physical space. They arise, among other things, through the use of mechanisms of personification and subjectivization, when individual situations, phenomena, events, objects from physical space are endowed with subjective, personal traits, "humanized". In order for such systemic thought forms, images from the external environment to become part of the inner world of the individual, to be remembered or actively influenced by a person or used by him in the real world, it is necessary:

– so that a person actively interacting with various images from the external environment can see personal growth, development, transformation of his inner world, motives, emotions, values, etc.;
– so that these images become a kind of "bridge" between the personality and the external world or media space, which also lead to changes, for example, relationships with social group;
– so that these images become part of communication, interaction with other people, characters on the network.

The perception of information in texts and images in the educational environment is carried out in the F-pattern format – a clear horizontal movement along the top of the data block, then a vertical movement at the top and a shift down, then viewing the next line (a quick view of the upper lines, the top of the image and a cursory movement slightly down). Such scanning concerns not only texts and static images, but also the video sequence: in the 30s, the gluing of frames (editing) lasted an average of 10 seconds, in the 10s of the 21st century – 4 seconds, while the variety of action in one frame also increases – this allows you to keep the attention of viewers and their interest. As a result, all the perception of the training information is also aimed at the formation of holistic images, since the environment is not divided into parts and individual components. Deterioration of the level and quality of perception of educational information in comparison with the ability to study, analyze different views and a large amount of diverse information is not a significant deterioration, on the one hand. On the other hand, thoughtful and slow perception of information, data, images shows a downward trend.

Currently, we can talk about the formation of cognitive vulnerability of participants in the educational space – a deterioration in the understanding of information, an increase in the number of extraneous factors that reduce the focus of attention and increase its switchability. There is also evidence in studies confirming a decrease in the skill of returning to already perceived information,

a deterioration in the quality of induction, critical thinking, as well as a decrease in the level of productive imagination, the quality of thinking about data and the level of spatial imagination. In this regard, we can say that in the future it is possible to differentiate into those who can analyze, read and comprehend complex literature, texts ("longreads", where the essence is not in the number of characters, but in the number of thoughts that the author wanted to convey) and those who simply snatches out with the help of clip perception individual data and information.

To increase the level of cognitive complexity, the subject must go from a simple search activity to the formation of active cognitive emotionally saturated cognitive actions affecting the value-semantic structures of the personality, which allow modeling complex internal mental constructs (thought forms) that reflect complex systems, abstract concepts of the external world. Cognitive semantic integrity and consistency of these constructs is an ideal internal environment, a mental area within which objects, objects, abstract categories, subjects, situations and relationships "fit" into the inner world of a person, are easily remembered by her and subsequently used in practical activities, ordinary life. To create a cognitive semantic integrity, such an ideal internal environment, it is necessary to develop visual thinking, it is it that forms the inner picture and the basis of the "image of the outside world" of the personality, which contains not so much abstract categories as semantic images based on concepts that are close and actively accepted by the personality. Visual thinking is a form of cognitive activity of a person using visual operations based on a person's ability to visually perceive and interpret images. The key task of visualization (the process of active use of visual thinking) is to collect visual images and their series into a single semantic image, united by an emotional attitude, values that are significant for the individual.

Currently, multimodal influence on students is increasingly used in educational practices, but still visual perception remains the dominant form of information transmission and perception, so it is worth relying on it, even when using active forms of learning, for example, training, discussion, brainstorming, etc. Methodological techniques of modern teaching should be they are focused on the visual analyzer to the maximum, for this you can use various visual technologies – scribing, sketching, infographics, videos, etc. It is these graphic forms that allow not only to transmit large amounts of information, but also to systematize them, build logical chains between them and memorize them quickly enough, with less effort. All this leads to the fact that:

– there is a growing interest in studying;
– increased involvement in the educational process;
– a system of internal motivation and motivation for self-study is being formed, taking into account modern employment and the pace of life and activity;
– cognitive skills are being developed.

Visualization as a process of perception of teaching material is based on certain properties of mental images – their meaning for the subject, reflection of emotional attitude and interest in the object of study, which makes them, as a result, more accessible and understandable for the student. Visualization allows you to design images that are based, on the one hand, on the ability and ability to solve a cognitive problem, which is based on the use of abstract logical thinking, and on the other, on the use of secondary images of memory, imagination, which allows you to work through educational tasks and educational content through the prism of the inner world of the individual. This allows all the primary perceived information to be processed into mental constructs and inscribed into the inner picture of the world during introjection.

Introjection is a mechanism by which a person includes various beliefs, views, meanings and values, motives into the framework of his inner reality on the basis of identification, which allows him to perceive, transform and preserve information received from the outside world in a certain way. Identification in the course of personality development limits his experience of the possibility of perception and processing of information. Thus, it turns out that, on the one hand, introjection and identification form a system of visual constructs in the inner world of the personality, and on the other hand, limit the possibilities of expanding their quantity and quality due to the individual experience of the personality, its upbringing, environment, etc. A person also translates mental constructs and thought forms outside, taking into account his experience, systems of interests, motives and values. Introjection makes it possible to focus a person's cognitive system on increasing the level of meaningfulness, perceived and transmitted information, expanding and clarifying mental constructs, applying the information systematized in them in practice, after training.

Learning based on visual images contributes to the most effective learning based on conscious perception and processing of information.

In general, the visualization-based learning methodology is built according to the following algorithm:

– analysis of learning goals, their presentation in graphic form by the teacher and by the students, search for common trajectories to determine the individual meanings of learning;

– preparation of various visual materials in the theoretical block, preferably with the possibility of actively "finishing" some of them in the learning process by the students themselves;

– during the execution of tasks within the framework of training, some of them should be formulated in the system of creating schemes and images, visual stories, metaphors based on the presented material;

– then part of the answers to the tasks by the students themselves should be thought out in such a way as to reflect their answers as symbolically and metaphorically as possible.

As part of the methodological tools, visualization is used as a directed technology for the formation of mental constructs and images, which includes:

– the product of processing external and internal information within the framework of mental reality;

– subsequent analysis and explanation of perceived images within the framework of psychic reality;

– the use of techniques for constructing and processing images, including those based on the symbols of basic archetypes.

Therefore, the use of visualization in teaching is integrative, including creating resource and motivational states. The purposeful use of visualization is based on the following methodological principles: integrity, constructiveness, potentiality, consistency, activity.

Within the framework of visualization, purposeful compilation of metaphors is used, which makes it possible to implement a learning system through creativity, personal meanings, the creation of a fundamentally new "product", object, idea, meaning. Metaphorical images allow us to form meanings that expand the boundaries of perception of the external world, information. Active visualization due to the inclusion of emotional and value components allows you to implement self-support during particularly difficult periods of training (when the level of motivation is especially strongly reduced), which in general, as a result, increases mental and physical well-being. Visualization also includes aspects of purposeful focusing on a particular object, which allows you to improve the quality of concentration during the training period.

The algorithm for using active type visualization in training is as follows:

– the first stage is training in various forms of visualization of the material that will be presented in the educational process (sketching, infographics, scribing, intelligence maps, logic diagrams);

– the second stage is the use of visualization in various forms within the framework of practical classes and lectures;

– the third stage is the use of visualizations between training blocks in order to analyze the effectiveness of training, replenish the resources spent;

– the fourth stage is working out in a visual format the possibilities of applying the acquired knowledge in practice.

A detailed representation of various images allows, among other things, to analyze the dynamics of sensations, experiences and the flow of the thought process. There is also a stage of introspection of the images that the student has and works with. The stage of introspection of invented images and visual schemes takes place with the support of the teacher, but without his active influence. The stage of group analysis of invented images can take place in microgroups (3-4 people) with a discussion of the resulting drawings, diagrams, images, metaphors, sketches, etc. This form of analysis can be implemented in the following forms:

– mini-lecture format for analyzing symbols and metaphors

– analysis of the possibilities of using specific examples of group

members – discussion of insights, moods, thoughts, experiences in addition to analyzing the required results.

Such a psychological component allows you to optimize the learning process.

3. Discussion

In the context of the digital transformation of education, educational institutions invest in educational innovations and actively introduce information and digital technologies into the

educational process, expanding the skills of information literacy that are in demand in the modern professional environment. As modern research shows, digital technologies activate the use of higher-order skills when searching for solutions to non-standard tasks or solving a problem (Martín-Lucas, García del Dujo, 2023). Digital technologies provide universities with opportunities to improve the educational process in such a way as to improve the quality of education and provide students with opportunities to acquire in-demand knowledge and skills. Such tools and methods include augmented reality, virtual reality, learning management systems, gamified learning platforms, mobile learning, technologies and artificial intelligence tools. Such components of artificial intelligence as machine learning, personalized learning, joint human and computer learning are increasingly influencing educational technologies and teaching methods in the global space. As an educational tool, artificial intelligence provides a wide range of opportunities for students, for the intellectual development of educational programs, the creation of intelligent learning systems (Hashim et al., 2022; Okoye et al., 2023).

One of the most popular modern learning technologies is virtual and augmented reality technologies. An increasing number of educational institutions use these technologies in their activities. The popularity of virtual reality technologies is due to the fact that they are becoming more and more accessible as the cost of technical equipment decreases, the amount of software increases. Virtual space allows you to visually see objects and processes that are difficult to see in the real world or those whose access is limited. Virtual reality is also used to study processes that are dangerous to humans. You can practice the skills of managing complex objects, conduct various experiments without harm to yourself and others. Virtual reality is used to study various subject areas, and in each there is a high involvement of students in the process, higher results. Spatial thinking skills and creativity are developing.

However, the technology itself will not provide positive results, high-quality educational content is needed. Not all universities are ready to invest in virtual reality technologies, not being sure of the results, the use of equipment can cause physical discomfort. Nevertheless, virtual reality is a promising technology and is being actively introduced into educational institutions. (Marks, Thomas, 2022). Since recently, educational institutions have been using an e-learning system. Despite the obvious advantages, such as flexibility, time savings, the ability to return to the material studied, the opportunity to study on the job, there are a number of difficulties in this area. The main problems are the quality of educational content, the high cost of traffic in some countries, low Internet speed, poor quality of technological infrastructure in educational institutions (Sewandono et al., 2023). Nevertheless, e-learning technologies are a popular, flexible and safe environment, increasing the competitiveness of the educational institution (Yalley, 2022).

Within the framework of the new educational paradigm, technologies such as visualization, virtual reality, and gamification are included in the educational process. The use of game techniques in a non-game context provides ample opportunities to choose the form of the lesson. Game methods develop cognitive interest in the subject area, form skills for assessing the long-term consequences of their activities, thanks to which gamification has become an actual trend in education. Information technologies allow to improve game methods using visualization for this purpose. During the virtual game, real situations are simulated, elements of reality are used, and at the same time it freely correlates time and space. In a team game, each participant is responsible for their actions, but mistakes cannot cause real damage, but it helps to gain real experience and develop the ability to assess the consequences of their actions and take responsibility for them. The variety of types of gaming activities allows using them as the predominant form of classes or embedding them as an element in the existing scheme of educational activities.

Thus, gamification as an innovative learning technology has great potential for developing the skills needed for Industry 4.0 (Almeida, Simoes, 2019). Studies of how gamification technologies affect learning confirm the fact that game-based learning improves academic performance, increases motivation and involvement of students. Gamification technologies have proven their effectiveness at all levels of education (Dahalan et al., 2023).

Intellectual interfaces and technologies of virtual and augmented reality have received significant development in the format of the use of visual technologies in the educational process. The inclusion of information visualization tools makes it possible to develop and adapt open intellectual models for individualization and educational content. The possibilities of visualizing information, its graphical representation consist in the fact that the student uses visual perception for a deeper understanding and analysis of the subject area. An educational environment that

generates large amounts of data has great potential for studying and applying various scenarios for the use of information visualization technologies. This concerns the tools that teachers and learners can use to change the way knowledge is created and used.

Visualization technologies in education are used in the context of improving learning, as a feedback tool for managing one's experience, as a support mechanism in online learning, as well as for evaluating information about academic performance and monitoring the academic success of students by teachers and students themselves (Ferreira et al., 2019).

Three-dimensional visualization technologies are popular in education, which digitally recreate objects of the real world, but there is no consensus in the literature about the impact of realism on cognitive processing. At work A. Skulmowski, S. Nebel, M. Remmele et al various points of view are considered on how suitable realistic visualizations are for learning, and whether abstract visualizations can be more effective from the point of view of learning. A. Skulmowski, S. Nebel, M. Remmele et al propose a cognitive learning model with realistic visualizations, which can be used to formulate more specific recommendations on the use of realism in educational visualizations (Skulmowski et al., 2022). The analysis of research on various aspects of the use of information technologies in educational activities shows a great interest in virtual reality technologies, visualization technologies. This study shows how the use of visualization techniques as cognitive technologies affects the results of the educational process.

4. Results

148 employees of commercial organizations aged 25 to 45 years, 72 of them women and 76 men, took part in the study of the possibility of using visualization. The choice of respondents was based on the diagnosis of motivation of employees of commercial organizations with low motivation for vocational training. They were invited to participate in a training program based on the use of active visualization. For 6 months, employees were trained in various programs, but active visualization was used everywhere. As part of the research, methods were used that allowed determining the level of professional motivation before and after training based on active visualization. We emphasize that the level of attitude to vocational training before that was not high enough or even average. 87 % had a negative attitude to learning, there was no interest. 76 % of respondents note a decrease in professional motivation and general tone in work during the training period. The respondents were tested before and after the use of visualization using the following methods: methods of personality diagnostics for motivation to success and avoiding failures, assessment of the structure of motivation for work, assessment of the type of personality orientation, methods of assessing career anchors.

With the help of methods of studying motivation, changes in attitudes towards success and avoiding failures were revealed (Table 1).

Table 1. The level of expression of motivation for achieving success of employees before and after training using visualization (% of the sample)

Employees	low	medium	moderate high	high
Before learning with visualization	67	20	–	–
After learning with visualization	–	–	30	70

The level of motivation before learning with the help of visualization was generally low and average, there was a lack of desire for achievements, as well as there is no excessively strong desire for this. Which suggests that the motivation to achieve success decreased more among those who could not adapt to the conditions of remote work.

As for the motivation for avoiding failures, the results were as follows (Table 2).

In general, the level of motivation was high and too high. The highest level of failure avoidance among employees who were unable to adapt to the training conditions.

Table 2. The level of motivation for avoiding failures of employees before and after training using visualization (% of the sample)

Employees	low	medium	moderate high	high
Before learning with visualization	–	–	30	70
After learning with visualization	30	30	40	–

Now let's present the results of studying the structure of work motivation (Table 3).

Table 3. The structure of employee work motives before and after training using visualization (% of the sample)

Employees	internal	external positive	external negative
Before learning with visualization	10	60	30
After learning with visualization	60	30	10

According to Table 3, it can be said that the internal motivation of almost all employees was lower than the external positive. The highest internal motivation is found among employees after. External positive motivation is of great importance. External negative motivation plays an important role among both groups, which may be related to working conditions in general.

The next method offered to the respondents was an orientation questionnaire. The results are presented in Table 4.

Table 4. Personality orientation before and after learning using visualization (% of the sample)

Employees	On yourself	On communication	On business
Before learning with visualization	30	60	10
After learning with visualization	10	30	60

According to the data described above, it can be said that respondents are less self-oriented and more on communication before training in work. This trend suggests the need to develop and improve the communication system within the organization. The focus on business is significantly higher compared to the focus on communication among employees who were able to adapt to remote work.

Next, the respondents responded to the "Career Anchors" methodology, the data for which are presented below (Table 5).

Table 5. Results of studying career orientations before and after training using visualization (% of the sample)

Career orientations	Before learning with visualization	After learning with visualization
professional competence	20	31
management	11	23
autonomy	20	32,1
service	23,5	10
stability	11,2	30,4
challenge	9,2	27,4
integration of lifestyles	22	31,2

Here we see that in the career, employees who have been trained are focused on professional competence, autonomy and integration of lifestyles.

5. Conclusion
Structuring, coding, presentation of educational material with the help of various visualization tools stimulates the use of such cognitive mechanisms that allow optimizing the

quality of the educational process several times. It is graphically designed materials containing large amounts of information that make it possible to form the logic of the educational process of a new generation – text and visual images form an organic system that creates a new level of learning efficiency and the development of students' proactivity. The purposeful use of visualization as a systemic educational psychotechnology becomes an effective targeted tool in professional training, which makes it possible to maximally correlate personal meanings, emotions, previous experience and the desired result of applying the acquired knowledge in practice.

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