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## Development of Educational Motivation of Adults with the Help of Visual Technologies

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### Abstract

A necessary skill of a modern person existing in the information world is information literacy. Educational organizations of various levels actively use modern information technologies in the educational process, which contribute to improving academic results, developing digital literacy, and increasing the motivation of students. Promising technologies that meet the above requirements are visual learning technologies. A significant number of publications devoted to visual technologies and the peculiarities of their use in teaching various sciences speak about the prospects of these technologies and their undeniable advantages. With the help of visual images, graphics and diagrams, complex material is absorbed more efficiently, students work productively with complex schemes and algorithms. By transforming the information that needs to be processed into visual diagrams, students easily memorize it and use it to solve their tasks. The purpose of this study is to study the possibilities of using visual technologies in the educational process to develop students' motivation, improve the quality of the educational process. The study suggests using visual technologies, such as: intelligence maps, infographics and pictograms, scribing, sketching. The research program is based on the diagnosis of the level of motivation to learn before and after the use of active and passive visual technologies in adult education. The study was conducted for four months as part of adult education directed from organizations using visual technologies. Teachers were instructed and methodical training, after which classes were implemented. The results of the work showed that the use of visual technologies makes it possible to increase the level of motivation of students, as well as to better memorize, reproduce information and use it in their practical activities.

**Keywords:** information literacy, visual literacy, information technology, education, motivation, visual technology, information, visual images.

### 1. Introduction

Information and communication technologies, digital technologies are already actively used in many fields of activity, such as education, healthcare, public administration, trade, production. Telecommunications infrastructure, global networks, and information services markets are developing rapidly. Information technologies have made it possible: a massive transition to remote work, the opportunity to buy food and necessary medicines without leaving home, to conduct remotely the process of classes in schools and universities, therefore, the demand for digital technologies is growing. At the present stage of society's development, information and communication and digital technologies are becoming the main means of communication,

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supporting people's joint activities in the information space. In order to exist in the modern world and conduct active creative activity, it is necessary to master the skills of working with the latest technologies perfectly. In this regard, a person has the skills to work with technical devices and information technologies, the ability not only to search, but also to determine the relevance and usefulness of information, to assess the possible risks of communication in the information space is an urgent need. As the Internet has developed, people have been able to search for and receive much larger amounts of information. The Internet is now not just a technology or an information search tool, but is also a source of new forms of activity, cultural practices in all spheres, while important issues are not just how to find the necessary information, but how to evaluate and apply the information received. The possibilities of the global network makes it popular both among the younger generation and youth, and for the adult population, which implies exploring the possibilities of a safe existence on the Internet from the perspective of those unlimited opportunities that the network provides for the implementation of various types of human activity. The academic results of schoolchildren and students, the professional success of specialists in all fields now directly depends on the availability of a sufficiently large set of competencies that need to be studied in the light of the information literacy paradigm. The formation of the digital world has a huge impact on personal life and professional activity and this determines the importance of understanding issues related to the study of what knowledge and skills of information culture will allow a modern person to exist in an information society. Given the convergence of the virtual and real worlds, it is not enough to consider a person only as a user of information technology and the global network. The study of the concepts of information literacy, information competence, digital skills and related concepts is an important practical task, because this task is consistent with the latest trends both in education and in other areas and opens up new opportunities to apply innovative ideas in the paradigm of digital transformation of society.

The ability to adequately assess the source of information, analyze it and apply it in the personal or professional sphere is one of the skills of information literacy. In the context of digital transformation, information literacy allows users to evaluate and process information, adequately apply the information received for its intended purpose for successful existence in rapidly changing environmental conditions, taking into account the complexity and unpredictability of the modern world. In other words, information and media literacy is a priority basic skill in demand in the 21st century (Fedorov, 2014; 2015; 2019; Fedorov, Levitskaya, 2015; 2016; 2017; 2018; 2019; 2020; Fedorov et al., 2016; Fedorov, Mikhaleva, 2020; Gálíková Tolnaiová, 2020; Levitskaya, Fedorov, 2016; 2020; 2021; Svensson et al., 2022). The generation of modern young people grew up during the rapid spread of digital technologies in recent decades, when the Internet and mobile communications were already well developed and widely available, which suggests that young people are familiar with information technologies and use them from an early age, for example, video games, digital music players, mobile gadgets, tablets, computer networks and communities (Gálik, 2020; Gálik, Oprala, 2021; Kačínová, 2019; Prensky, 2001; Vrabc, Bôtošová, 2020).

Nevertheless, schoolchildren need to develop skills in the cultural use of technical means, understanding the opportunities and threats of network communication, meeting their information needs, understanding the specifics of existence in the global information space. Students of higher educational institutions need to identify sources of information, choose the necessary information for their educational and research projects. To do this, various information and communication and digital technologies are being actively introduced into the educational process, working with which forms information literacy skills. In addition, school teachers and teachers of higher educational institutions use specially designed courses, educational technologies formed on the basis of the information needs of modern students. One of the promising technologies that allows students to improve their academic results and develop information literacy skills is visual learning technology. As scientific research shows, visual technologies in teaching develop one of the important aspects of information literacy – visual literacy (Goldstein, 2016; Hobbs, 2017; Romero, Bobkina, 2021). The effective development of one's own information literacy can occur together with a person's desire to acquire these skills, which means that the issues of improving the level of information literacy are directly related to the problems of motivation of students. The presence of motivation means a meaningful desire to increase the level of information literacy. This means that the competence of information literacy implies not only the knowledge and skills to exist in the digital world, but also the desire to get the maximum effect from their activities, educational or professional. All components of information literacy are used in different ways in the information space, but there is

no doubt about the need to improve them. In this regard, understanding the importance of information literacy for the development of an individual's professional career and personal life requires the use of modern technologies to organize the learning process at all levels of education.

## 2. Materials and methods

A theoretical analysis of the literature on the development of information literacy of students based on the study of the possibilities of using visual technologies in the process of teaching students has shown that the effectiveness of encoding information into images, especially those that meet the interests and values of students allows you to master the material as much as possible, remember, and, most importantly, comprehend it. It is the active transformation of visual information that makes it possible to endow all perceived and analyzed images with meaning and link them into unified cognitive constructs. Individual visual images reflecting the information that needs to be mastered, analyzed, structured and systematized, through active comprehension, make it easier to link it into a certain scheme, a map that makes up a cognitive construct. In the future, such cognitive constructs become perceptual guides that make it possible, among the entire amount of processed information, to single out specifically the one that is necessary for learning and development. In order for cognitive constructs to become such perceptual guides, to help select information for learning and to assimilate it more easily, several conditions are required:

- the data of cognitive constructs should not only contain the information necessary for learning, but also include the ability to track dynamics, progress in development and learning;
- these cognitive constructs should be integrated into the process of professional communication and interaction with the environment (teachers, other students, etc.);
- the data of cognitive constructs should be easily transformed into the format of schemas and metaphors in order to be understood, correctly interpreted, and also to be easy to remember.

To form a system of cognitive constructs, which eventually form into an integral complex of professional or other required information, it is necessary to use various visual technologies.

Also, the systematization of literature on modern learning technologies has shown that for effective schematization of information, its transformation into cognitive constructs, it is necessary to use visual technologies, such as: drawing up mind maps; use of infographics and pictograms; scribing; sketching; augmented and visual reality technologies.

All of these technologies are focused on the use of graphic images and diagrams. On the one hand, the use of these technologies allows for faster and more efficient assimilation of complex theoretical material or materials with complex algorithms of work and implementation in practice, on the other hand, to memorize and assimilate data that students can independently transform into thematic blocks and visual schemes for ease of perception.

The use of visual techniques allows for a more detailed and in-depth analysis of educational material, forming cognitive constructs from it, which the student gives meaning and learns faster. All this makes it possible to increase the internal motivation of students aimed at cognition and independent development in professional activities.

These ideas made it possible to formulate a goal and develop a research program. The purpose of the study is to explore the possibilities of visual technologies in the development of students' motivation.

The research program included the following stages:

- at the first stage, methods for diagnosing motivation and evaluating the effectiveness of training that has been implemented to date were selected (feedback questionnaires);
- at the second stage, visual technologies were selected for training, teachers were instructed on the subject of purposeful work with cognitive constructs;
- at the third stage, these technologies were implemented as part of the training;
- at the fourth stage, repeated diagnostics of motivation and effective learning with the use of visual technologies and active work with cognitive constructs were carried out;
- at the fifth stage, intermediate and final results were summed up.

The following materials were used as part of the empirical program:

- 360 degree learning performance assessment questionnaire: students, their classmates and teachers were interviewed (determines 3 levels of performance: low, medium and high level of learning value);
- a test for determining the stereotypes of a successful student

- the methodology of studying the attitude to academic subjects of G.N. Kazantseva (suitable for students of different ages),
- methodology for studying internal motivation K. Zamfir.

The proposed methods of Kazantseva and Zamfir are described in detail in Ilyin's book "Motivation and Motives" (Ilyin, 2011).

218 people took part in the study, 18 of them were teachers with more than 5 years of experience, 200 people were students aged 23 to 33 years, mastering various educational programs. Of these, 110 are male and 90 are female.

Educational programs are implemented according to the standard scenario: lectures, practical classes.

As part of the planned research, a training briefing was conducted with teachers, where, as part of the classes, they were asked to use various visual technologies (drawing up intelligence maps; using infographics and pictograms; scribing; sketching). Teachers also had to use active visualization methods, which are based on understanding and structuring information in accordance with the needs, values and practical interests of the students themselves.

Among such methods was the invention of metaphors, symbols, various infographics, which the students endowed with meanings that mattered to them. After each lesson, there was a reflection with an assessment of what was learned and where it can be applied in practice. One of the key tasks of the training was to systematize all the information received into visual images and put it into practice. The study was conducted within one module for each group of respondents in order to clearly track the progress and effectiveness of the methods used.

Teachers have developed materials and structured information, dividing it into separate small blocks for ease of perception, analysis of educational information.

Among the visual technologies, simple technologies were selected, as well as forms, schemes and constructs that were used in training for 4 months. The training was both in the technical and humanitarian spheres, but at the same time the subject was filled with a fairly large volume of abstract information, data, concepts.

Among the recommended visual technologies were used:

- passive visual technologies (pictures, videos, memes, films that are understandable and interesting to the audience)–
- active visual technologies that are based on the fact that students independently develop diagrams, sketches, metaphorical maps, scenarios of various stories, comics that are related to the material being studied.

In general, about 50 units of visual material were selected for passive technologies and about 30 tasks where you need to actively create various images, schemes.

The main idea of the study is that it is the visual structuring of information, combining it into cognitive constructs that form a single system of knowledge, that allow them to act as perceptual guides for subsequent learning, which increases the involvement of students and increases their motivation. It is cognitive constructs that include images that have value potential for students, they are emotionally colored and endowed with personal meaning, which allows them to be used in further education and practical activities.

The results of the work carried out are confirmed by modern research in the field of evaluation of educational motivation, the use of visual technologies in teaching, the development of innovative forms of involving students in the process of mastering new knowledge are presented in the next section.

### 3. Discussion

Educational organizations successfully use such technologies as video lessons, training videos, interactive presentations, virtual reality in order to increase the effectiveness of teaching and develop students' information literacy. The study by W. Shire, P. McKinney analyzed the use of Web 2.0 tools by teachers of British universities. The results obtained indicate that most of the teachers use these tools in their teaching activities and consider them useful for teaching. There is also a small group that does not yet use these tools, although it recognizes their effectiveness and usefulness. Given the need to develop students' information literacy skills, it is advisable to consider modern technologies that contribute to this. One of these technologies is the technology of visual learning. The use of visual technologies, on the one hand, improves the academic results of students in the academic subject, and on the other hand, develops visual literacy, which is an

aspect of information literacy. Visual learning technologies are successfully used in teaching at various levels of education in various sciences (Gandolfi et al., 2021; Loftus et al., 2017; Molina et al., 2018; Wu, Rau, 2018). The use of images and media content, virtual reality elements, and videos is an effective strategy in teaching students and assessing how they understand subjects in science, engineering, and art education (Gunev, 2019). Visualization technologies, for example, virtual reality technology, not only improve students' academic results, but also increase their motivation to learn. Visual technologies are more interesting for students compared to traditional ones. In addition to improving the perception of educational material, these technologies teach students to understand the principles of visual technologies, their features and further apply them in their activities. Interest in learning with the help of visual technologies better motivates students to acquire new knowledge and skills (Liono et al., 2021; Yang et al., 2021).

An important condition for successful learning is the motivation of students. Unmotivated is a person who does not feel the urge to act, and a motivated person actively achieves his goal. Most often, in the theory of motivations, various authors consider motivation as weak or strong, internal and external. Internal motivation orients students to acquire new knowledge and skills, to master the profession at a high level. Extrinsic motivation has a situational character, for example, to avoid punishment for a bad assessment (Marinova, 2019). A study by R.M. Ryan and E.L. Deci shows that it is necessary to distinguish not only the motivation itself, but also to take into account the type of motivation. This means that a student at school can do the teacher's tasks because he is interested in it, or he can do it in order to get the approval of parents. Also, a university student studies a training course because he understands its usefulness for acquiring new knowledge or because he only needs a good grade. These examples show that motivation itself remains unchanged, but its nature and orientation are different (Ryan, Deci, 2000). A study by L. Hornstra, A. Bakx, S. Mathijssen, J. Denissen, dedicated to the motivation of gifted and non-gifted students, summarizes that students who are internally motivated to succeed have better learning outcomes and are active in their studies, their internal motivation makes them psychologically well-off. Lack of motivation and less self-determined forms of motivation of students are associated with low academic results, such students are not active, they have increased anxiety before exams (Hornstra et al., 2020).

The issues of student motivation are well covered in scientific research from various sides. The presence of internal motivation and focus on results contributes to higher academic achievements (Ntoumanis, 2001). The study by F. Guay, C.F. Rathelle, A. Ray, D. Litalien, based on the theory of self-determination, examines the relationship between self-esteem, autonomous learning motivation and educational achievements of students of different ages. To increase the motivation of students, it is proposed to adapt complex courses to the needs of students, provide regular feedback to students and actively demonstrate the interest of teachers in the academic success of students (Guay et al., 2010).

An analysis of the literature on the use of visual technologies in the educational process has shown that there are many studies examining the benefits of using visual technologies to improve students' academic results, while the impact of visual technologies on the learning of poorly motivated students has not been well researched. Despite a large number of studies on student motivation, there is a gap in the study of poorly motivated students and methods that would help them improve their academic results. Taking into account the undeniable advantages of visual learning technologies, this paper presents the results of a study on the use of visual technologies for teaching poorly motivated students.

#### 4. Results

The results of the study can be divided into several areas: a survey of teachers based on the use of visual technologies, a survey of students based on the formation of cognitive constructs based on visual technologies, as well as a comparative analysis of motivation and learning effectiveness before and after the use of visual technologies.

As for the survey of teachers who, as part of the study, used visual technologies in their work in order to explain new material, following the results of the conversation with them, the following was revealed (answers that were found in more than 75 % of the answers)

- students became 80 % more involved in research and practical work in the classroom;
- student activity increased by 38 %;



– students began to express their opinions more often by 46 %, while simply reproducing the memorized material less often by 25 %;

– students began to focus more on how to use the acquired knowledge in practical activities, it became easier for them to explain why they need this knowledge and information, what they mean to them;

– teachers also note that the amount of information that students have mastered has decreased slightly (by about 20 %), but has become much better;

– students were able to link the mastered information with the educational data they already had into a single cognitive construct, which, in general, was conceived at the beginning of the study.

The teachers also noted that it took them a while to connect visual technologies with the information and techniques they teach. At the same time, on the one hand, it was difficult, on the other, we revised and redesigned some of our courses, updated information and our own methods of work.

All this also increased their motivation, allowed them to reconsider their professional interests as much as possible, and get inspiration in their work. They noted an increase in their interest in the information they tell, as well as in interaction with students.

Also, all the teachers participating in the study began to say that they had new non-standard ideas that allowed them to improve the quality of teaching and bring professional activity to a new level.

As for the survey of students on working with new material based on visual technologies, they noted the following:

– for 89 % of students, the material has become more accessible for perception and understanding;

– 82 % noted that it became easier for them to memorize the received material and reproduce it;

– 77 % of respondents said that their interest in the studied material increased, they began to keep their attention on the information received for a longer period;

– 90 % of respondents began to note that the information received began to be "systematized in groups", "united on similar topics" (what the authors of the work meant by cognitive constructs), all this began to lead to the fact that new information began to be selected automatically in order to be inscribed in a cognitive construct on a certain topic, therefore, it can be noted that constructs are already becoming perceptual guides for the active development of new data;

– respondents in 88 % of cases note that it has become easier for them to interact with teachers, exchange information with them, set up contact in professional activities;

– respondents in 90 % of cases began to structure information more clearly, it is easier to find new information on the right topic, as well as to structure it in the right way;

– the students who took part in the study also began to treat the information they analyze and master more consciously;

– 90 % of respondents speak about the value of perceived information, readiness to apply it in practice, and further study this topic.

As for assessing the level of the motivational construct, three diagnostic techniques were used, which allowed us to study in detail the features of students' motivation before and after using visual technologies.

Before describing the results, it should be noted that the training was initiated by employers, so the motivation was not high, since the decision to study was not made by the students themselves.

The first stage of the study of motivation was conducted before the start of training using visual technologies. The following results were obtained:

a) according to the methodology of studying the attitude to academic subjects of G.N. Kazantseva, among the dominant motives were utilitarian: training is necessary "for future work", training is "easy to master".

These responses were provided by 88 % of respondents. On the one hand, the training is really aimed at ensuring that knowledge and skills are used in subsequent work, but at the same time more than 15 different motives are presented in the methodology. Perhaps such a narrow choice of motives is explained by the fact that respondents were not interested in such a topic of study, but are forced to study at the request of management.

b) according to the methodology of studying K. Zamfir's internal motivation, the following data were obtained:

- 67 % of respondents have the following motivation scheme: internal motivation is less external positive, but more external negative;
- 30 % of respondents have the following motivation scheme: internal motivation is less than external positive, external positive is less than external negative;
- 3 % of respondents have the following motivation scheme: internal motivation is more external positive, and external positive is more external negative.

Thus, the dominant motivation is external positive, while a fairly high percentage of students are inclined to external negative motivation, internal motivation is expressed in a very small number of respondents.

c) Among the stereotypes of a successful student, the following were dominant until the time of the study: general (77 %), adaptive (23 %).

Students before the study can be characterized as disciplined, diligent, accurate and moderately responsible. At the same time, they tend to use other people's results (notes, practical tasks), can cheat, show complaisance in relations with the teacher. They are least likely to show cognitive abilities, creativity and volitional control in learning.

In general, cognitive motivation and motivation to study as a value, a separate type of activity that deserves attention, are practically not formed. External stimulation of educational activity prevails.

After the training, the following results were obtained:

a) according to the methodology of studying the attitude to academic subjects of G.N. Kazantseva, cognitive motives appeared among the dominant motives in addition to utilitarian ones (more than 75 % of respondents appeared)

- training “makes you think”;
- training allows you to show “observation, intelligence”;
- training allows you to get “pleasure from the learning process”;
- training is “just interesting as a new activity”;
- training is needed “for future work”,
- training is “easy to master”.

The expansion of the choice of motives is explained by the fact that respondents became interested in the subject of training and the possibility of applying the acquired skills in practice, they had a feeling of the need to study at the request of management.

b) according to the method of studying K. Zamfir's internal motivation, the following data were obtained: 78 % of respondents changed the motivation scheme: internal motivation became more external positive, more external negative motivation.

Thus, the dominant motivation has changed – the internal motivation of the majority of respondents has become predominant. This indicates an increase in initiative, responsibility and interest in the activity as a process.

c) Among the stereotypes of a successful student, the following became dominant after the moment of the study: subjective-creative (77 %); motivational and strong-willed (73 %); general (67%), adaptive (63 %).

Students after the study can be characterized as more focused on success, proactive, more independent in their conclusions, confident. They began to look for new solutions more often, began to defend their ideas more often, to show strong-willed control.

In general, cognitive motivation and motivation to study as a value, a separate activity that deserves attention, has become more pronounced. Internal motives for stimulating educational activity, in particular, and cognitive activity in general, began to prevail.

Students, their classmates and teachers were interviewed using the 360-degree learning performance assessment questionnaire.

Low, medium and high levels of learning performance were identified:

- a low level was identified in 16 % of respondents;
- the average level is highlighted in 20 % of respondents;
- a high level was highlighted in 64 % of respondents.

Prior to that, respondents said that the effectiveness and efficiency of their training was significantly lower.

Teachers note the progress in mastering the educational material, which began to manifest itself after intensive use of active visualization.

All data were processed using frequency analysis and verified using statistical analysis for the validity of differences (Mann-Whitney U-criteria).

Table 1 below presents comparative data on the severity of individual motivation parameters before and after the study.

All the data obtained are significant at the level of 0.01.

In general, we can say that the level of motivation has changed from the focus of external stimuli to internal stimulation and self-development in the learning process.

**Table 1.** Data on the results of the assessment of students' motivation before using visualization techniques in teaching and after

Evaluation parameter	Before using visual technologies	After using visual technologies
internal motivation	3 %	78 %
learning allows you to show "observation, intelligence"	10 %	75 %
learning allows you to get "pleasure from the learning process"	12 %	76 %
learning is "just interesting as a new activity"	18 %	80 %
subjective-creative stereotype of student behavior	15 %	77 %
motivational-volitional stereotype of student behavior	29 %	73 %

At the last stage of the study, general conclusions were formulated based on the results of the data obtained.

## 5. Conclusion

The implemented empirical work allows to sum up the following findings:

- the use of visual technologies in a passive and active form allows us to form cognitive constructs that become perceptual guides for the subsequent collection, evaluation and mastering of material in the framework of training;

- the use of visual technologies allowed teachers to rethink their professional activities, strengthen the effectiveness of teaching, increase the motivational potential of both teachers and students;

- visual techniques made it possible to increase the level of internal motivation of students, to choose behavioral stereotypes associated with creativity and the manifestation of volitional efforts in the framework of training; also, students began to perceive the material more meaningfully and use it in the practice of their professional activities;

- visualization of data, development of visual diagrams, pictograms, symbols by students made it possible to treat the material as personally significant, to perceive it better, to memorize and assimilate it.

The results of the study allow us to talk about the effectiveness of using visual technologies in teaching practice in terms of developing motivation to learn, increasing interest in performing more complex tasks, striving to develop one's expertise, and forming trajectories of personal and professional development in the future. Also, the use of images, metaphors, and interesting visual designs of pictures allows you to share experiences and achievements in teaching students with different levels of training and performance.

Visual technologies in the study proved their effectiveness in the framework of the implementation of training initiated by employers, and not implemented at the request of the students themselves, which also allows them to be used in the format of corporate training in the short and long term, since visual work and data structuring allow you to be creative and apply non-standard ways of solving problems.



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