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REALIZATION OF VISUAL TECHNIQUE DIDACTIC APPROACH IN ALGORITHMIC TRAINING OF STUDENTS THROUGH INFORMATION AND COMMUNICATION TECHNOLOGIES OF EDUCATIONAL ENVIRONMENT

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The article examines the development of visual learning theory, states functions of accuracy and peculiarities of visual technique realization in modern studying process, it defines the concept of "Visual learning environment" and didactic role of interactive and multimedia visualization processes. Authors examine the problem of determination of cognitive visualization potential in algorithmic training of students through information and communication technologies of educational environment.

This article specifies functions of visual aids use and implementation features of the specified principle in modern educational process and proves the didactic role of interactive multimedia visualization process that stimulates cognitive activity of student and activates perceptive mechanism of teaching information. It analyzes problem of cognitive visualization potential capacity of training of future marine personnel using informational communicative educational environment.

Key words: *visual technique, visual learning environment, information and communication educational environment, cognitive visualization, algorithmic training of navigators.*

Problem setting. Modern pedagogical science is constantly developing and progressing. Views to the pedagogical process vary, educational techniques become more humane and effective. Changes in Ukrainian educational system are specified by a transition to the directed formation of students' ability to act creatively, to use their knowledge and experience practically and to exhibit competencies gained while working efficiently. Changes of learning objectives require adjustment of learning content and teaching techniques forwarded to student-centered education, aimed to mindset formation, self-education and development of values, critical thinking, self-cognition and self-realization in different types of creative and professional activity, using information technologies such as personal computer or any other gadget.

Strategic guidelines of Ukrainian education informational support are set forth in the Education Act of Ukraine, in State national program "Education. Ukraine of XXI century". State program "Information and communication technologies in education and science" 2006-2010, in which it is emphasized that development of Ukrainian informational society and modern information and communication technologies (ICT) implementation in all spheres of social life and State management, in educational establishments is the priority guideline of State policy.

Solving the problems connected with informational support in teaching of various subjects, especially algorithmization and programming, is related to the specification of theoretical principles of the learning process organization using ICT in psychological and pedagogical, didactic and methodological aspects. First and foremost, the scientific evidence, development and testing of appropriate learning algorithms and programming methods and effective combination of ICT with different training techniques are required. Methodological requirements for learning process organization during lessons on algorithms and programming using ICT in respect of their algorithmic competence formation are to be studied as well.

Usage of visual technique acquires particular significance in the study of algorithms and programming. Due to the thoughtful application of visuals it is possible to enhance the emotional impact on students, improve the accessibility of the learnt material, to speed up mental activity of students.

Taking into account that optimization, systematization and problematical character are the most important tasks in improving educational content, it is evident that personalization, differentiation and revitalization are necessary to improve teaching techniques. Visualization is considered to be the most important area in didactic methods improvement. In 2003 UNESCO declared the priority of visual presentation of training materials in education.

Analysis of recent research and publications. Usage of visuals in education is one of the basic principles of didactics, according to which the study is based on specific images that are directly perceived by students. For the first time this principle was declared by the Czech educational specialist J.A. Comenius in XVII century, and later by J. Locke, J.-J. Rousseau, J.H. Pestalozzi and K.D.Ushynskyi. Modern scientists of didactics consider visuals as a source of knowledge, on their basis sensible ideas and concepts such as illustration for information and support for abstract thinking are formed. Visual techniques are applied prior to the learning of new material, during learning the concepts and for revising and tests, etc. [27].

As the following didacticians of XX and XXI centuries mentioned, such as: S.P. Baranov, V.L. Bondar, N.P. Volkova, V.I. Yevdokimov, L.V. Zankov, A.I. Zilbershtein, A.M. Maslov, N.O. Menchynska, M.H. Moro, A. Rozumenko, O.Y. Savchenko, L.M. Skatkin, I.F. Kharlamov, V.V. Yahupov and others, visual technique is the most famous teaching technique, which has been used since the ancient times. The issue of development and adjustment of "the Golden Rules" in didactics to the modern conditions in terms of using models, the process of modeling the studying was investigated in the second half of the XX century by V.G. Boltyansky, D.B. Elkonin, L.M. Fridman, etc. The researchers analyzed theoretical and methodological aspects of the issue. The features of visual technique implementation in the learning process in upper school and higher education institutions were investigated in works of H. Vaschenko, S.I. Arkhanhelskyi. The application of computer models in higher educational establishments are reflected in works of N.V. Apatova, T.A. Boronenko, Y.A. Voronina, L.V. Horchakova, I.V. Robert, I.A. Tsviela. Besides, Y.R. Valkman`s and N.N. Manko`s works, which are related to cognitive visualization of objects for enhancing learning activities, are of some interest.

Using the method of demonstration in teaching programming is based on the concept of well-known methodologist in programming learning N.E. Wirth "The programming is the art of design. How can we teach the design and inventive activity? There is a method to choose elementary building blocks from numerous programs which exist and give them regular description. But programming is a large and versatile activity which often requires serious mental work. It is false to consider it as restricted by usage of ready-made models only. As a learning method we can only choose the careful selection and learning of specific examples. Of course, learning the examples can not be equally useful for everybody. In this approach, a lot depends on student`s guessing and intuition".

The reserches of M.S. Lvov, N.V. Morse, N.V. Spivakovskiy and others are dedicated to the role of visuals problems in increasing motivation and activation of learning activity from algorithmization and programming.

Objective statement (problem definition)

Research objective is to explain the role of visual technique in the context of algorithmic training of students under the conditions of information and communication technologies of educational environment.

Research tasks:

To follow up the development of the visual training theory. To define the visual technique functions and the visual technique principle realization in modern educational process.

To define the concept of "visual learning environment" and specify didactic value of interactive multimedia visualization processes in algorithmic training of students.

To explore the problem of the potential discovery of cognitive visualization in algorithmic training of students with the usage of information and communication technologies of educational environment**.**

Main part

In XVII century Czech pedagogue John Amos Comenius was the first to explain theoretically the necessity of visual technique materials usage in a learning process. He defined that the basis of learning should be knowledge of acquaintance. “To perceive everything easier, you should engage in perception all external senses as much as possible.” The outstanding teacher stated “the Golden Rule”: “Let the students know that the golden rule is everything than can be given for the sense perception, in particular, visible is for visual perception, the one we hear is for audition, the one we smell is for olfaction the one we taste is for gustatory sense, the one we touch is for haptic perception”. If some objects can be perceived by several senses at once, let them be prepossessed by several senses. So the more knowledge is based on perception, the more authentic it is [12]. The great merit of the author of "Didactica Magna" is disclosure the necessity of using the models as the original prototype. These models have signs of sensory perception and contemplation and are used to display "knowledge by description".

In XVIII - early XIX centuries a famous Swiss pedagogue J.H. Pestalozzi provided the theory of visual learning. He believed that the visual aspects are absolute foundation of any knowledge, and emphasized that sensorial perception is the only foundation of any human knowledge. Visual learning is "just a simple continuation of what has been laid down by nature as instinct and even in the natural manifestations" [21].

Visual learning by Johann Heinrich Pestalozzi is very close in meaning to "the Golden Rule": "The more feelings you use to cognize the essence of the phenomenon or any subject, the more correct will be your knowledge of it" [21]. In spite of the unity and commonness of understanding the basics of visual training of two teachers, J.H. Pestalozzi, unlike J.A. Comenius:

a) understands visual learning not only as obtaining knowledge through observation, personal sensual experience, but he sees in it an important factor in the development of logical thinking;
b) gives a psychological explanation of visual learning, noting that it is based on the ability of the human mind to generalize impressions received from nature through organs of the senses, to the kind of unity - the concept, and gradually lead them to clear understanding [19].

According to the conception of a famous pedagogue of the XIX century K.D. Ushynskiy visual learning in teaching is based not on abstracted ideas and words but which are perceived by a child or under the control of supervisor, or due to self-observation. Alongside with the pedagogical analysis of visual learning K.D. Ushynskiy carries out its psychological analysis, author writes that the more sensory organs take part in receiving any impressions or group of impressions, the stronger these impressions influence our automatic, nervous memories and are kept and easily recollected . K.D. Ushynskiy considers that visual technique is a didactic principle which penetrates either content or separates methods and ways of teaching and connected with all other didactic principles which are considered to be “necessary conditions of studying”.

“Pedagogical Dictionary” says that visual technique in studying is a didactic principle, according to which studying is built by specific images received by pupils [20]. That interpretation of an idea of visual learning predominated in the pedagogical science of XX century. So A.I. Zilberstain noted that the importance of visual technique is signified by theory based on “acknowledgement of environment and it`s reflection in human mind. People get knowledge from the environment by means of senses and perception. Thinking can not be developed without them” [22].

70-80’s are remarkable for works of V.G. Bolotyanskii, V.V. Davydov, D.B. Elkonin, L.M. Fridman. As known from literary sources principles of simulation in a process of learning were broken by D.B. Elkonin [6].

Psychologists of the XX century paid a lot of attention to perception of things and phenomena of environment by pupils and students. As a result, most of them concluded that "visuals do not isolate perception and images from the entire analyze-synthetical mental activities".

XXI century brings changes in understanding and usage of visual technique in didactics, causing the origin as well as new terms –"simulation", "new visual technique" and others, and the understanding of their peculiarity, necessity and purpose on the modern stage.

In modern pedagogy the interpretation of visual technique coincides with the understanding of visual learning by J.A. Comenius, J.H. Pestalozzi, K.D. Ushynskiy . Thus, in Volkova's pedagogy textbook (2001) the following is mentioned: "The visual technique provides learning on the basis of vivid perception of specific objects and phenomena of reality or their images" [4].

Visual technique provides that in the process of cognition, different sensations should be used, including the way of visual perception. Perceived things, as H. Vaschenko believes, remain in our minds certain images, ideas. Higher forms of thinking are developed on this basis. Especially it concerns the childhood, when only one verbal way of presenting the information contributes the so-called verbal way of thinking, which is characterized by superficiality and incomplete correspondence between a word and a thought. Finally, according to H. Vaschenko, we should not abuse this principle, especially dealing with students of upper school, where the emphasis is shifted on the abstraction stage.

In technical educational establishments visual technique of the teaching materials is supplemented by using of technical means that can extend the opportunity of sensory organs. S.I. Arkhanhelskiy determines the value of technical means as follows: "Technical training means extend content side of visual learning, can transmit information in more active form of perception, they leave their mark on mental activity of students, their emotional state, and change their mental load" [2].

While learning some definite object visual technique in studying combines together the two aspects of cognition – receptive and mental. It also contributes to the opening of external signs and characteristics of the object. As to S.I. Arkhanhelskiy, one of the main functions of visuals is to create the concepts as the basis for ideas. He considers the visual technique as "the transition in studying from specific to abstract, from reality to notion, from the signs and ideas to concepts and definitions" [1]. The main task of the visuals in studying is providing connection between the existing signs and the concepts created with the conscious and profound understanding of the essence of the subject learned by the student. S.I. Arkhanhelskiy divides the visuals in studying into two types: "spontaneous visuals based on the reality observations and indirect visuals, which determine the phenomena, events and the subject learnt in the definite visual form, which reflect the essentiality, connections and relations" [2]. To sum up, the visual technique in studying provides the initial expansion of the external signs and characteristics of the subject learnt. It also stimulates the student's cognitive activity and activates the information learnt procedure perception.

V.M. Vergasov considers that "the visualization contributes to the initial neuron image, concept and phenomenon model at the perception stage. That is why the visuals shall confirm this stage of information transformation from the external surroundings to the intellect memory" [3].

The studying functions of visuals were investigated in the traditional didactics by such researches as L.V. Zankov, F.I. Menchynska, M.I. Makhmutov, V.A. Vialykh and others.

L.V. Zankov selects the three main functions [9], where the visuals appear to be as:

- a source of information;
- a means of information illustration;
- a support for understanding of connection between the phenomena, objects and notions.

M. I. Makhmutov adds one more function, where visuals are considered as means of forming problem situations which, in its turn, stimulates the development of creative skills at independent future professional activity [18]. V.A. Vialykh ascribes to visuals the function of activation student's cognitive activity, considering it as a basis of abstract thinking. [7]

The modern theory of visual learning is based on the usage of the past achievements, taking into account present requirements. Therefore, the traditional understanding of the visual technique

in the learning process is not enough. This issue has to be developed and improved. In our opinion, the adaptation of simulation in teaching is the next level of visual aids usage and a new stage in the history of its evolution.

Modern development of information technology and computer equipment makes it possible to use visuals on another level in general, increasing its informational and educational component [8].

Informatization of the educational process reveals new ways of thinking, providing new opportunities for active learning. As visual figurative components play a vitally important role in human life, their usage in the learning process is rather effective. Computer graphics can be used at all stages of the learning process, e.g.: for explanation of the new material, practice, revision and control, modeling of professional tasks execution via "immersion" into real conditions of future workplace. Thus, it becomes necessary to move beyond the view of visuals, as one of the auxiliary aids for learning algorithms, to full usage of visual thinking in the process of algorithmic navigator students training.

According to V.P. Zinchenko: "Visual thinking is a human activity which generates new characters, creates new visual forms having semantic loading and making meanings visible"[10].

The contents of visual technique in its modern understanding determines logic understanding from sensual-visual to abstract-logical, from sensual-particular visuals (real objects, pictures, models, etc) to abstract and symbolic visuals (charts, tables, diagrams). The visuals are related to work of sensory organs (analyzers), visual, auditory, tactile, etc. It turned out, however, that visual technique appeared to be wider. Now it is told about the role of visuals as a means of conversion from sensual material to its abstract interpretation and from abstract to deep sensual cognition. Sensual material is a content of visuals, such types as natural visuals (realia), descriptive visuals (pictures, photos, etc.), and real models of implementing the competencies gained while training in execution of future professional tasks.

On the stage of conversion to abstract understanding it is necessary to use other means of visuals – schemes, tables, symbols. This kind of visuals is abstractly-symbolic. It helps to master the essence and dynamics of the investigated phenomena and processes.

Usage of visual aids should be subjected to specific aim, development of students' independent behavior and activity taking into consideration their age peculiarities. They must be extensive, aesthetically executed and complying with psychological laws of perception. That's why it is crucial to follow the rules of implementing the principle of visual aids:

1. Memorizing of objects in realia, on pictures or models goes faster and better than ones presented verbally in oral or written form.

2. A child thinks via forms, colors, sounds, images in general: hence expediency of visual teaching based on particular images is proved.

3. Golden rule: everything possible must be perceived via senses (eyesight, aural sense, olfaction etc). It mainly applies to the process of elementary education.

4. Visual aids are not the aim but the way to reach the stated aim.

5. Ideas come into students' consciousness easier when they are supported with peculiar facts, examples and images. All kinds of visual aids must be used for their explanation.

6. Visual aids must be used as an independent source of information for creating problematic situations! Modern visual aids give the possibility to organize participatory preconceptual and investigating study for students.

7. Students' observations must be systematized and must stay in balance of cause and effect irrespectively to the time of their acquisition.

8. Visual aids must be considered primarily in general, than in division into primary and secondary, and in general once again in the end.

9. Overplus of visual aids distracts students' attention and interferes understanding the main idea.

10. Using visual aids it is necessary to actualize students' sense experience: ideas they already obtain, to specify and illustrate ideas which are being formed.

11. It is crucial to try creating teaching aids together with your students.

12. Visual aids for a lesson must be thoroughly prepared.

13. It is necessary to make scientifically reasonable use of modern visual aids: multi screen projections, teaching television, videos, code slides, computers, projectors etc: to have perfect skill of using technical aids and to know methods of their proper usage.

14. In conditions of classroom teaching possibilities of visual aids usage are better hence it requires their through planning and balancing.

15. As students grow up objective visual aids must be gradually substituted with emblematic ones. Teacher's specific attention must be paid to adequacy of understanding the essence of phenomena and their visual representation.

16. Under the circumstances of excessive usage of visual aids artificial obstacles are created on the way to gaining substantial knowledge: they become brake of abstract thinking development and understanding the essence of general laws. [14]

Didactic means are the crucial component of properly created educational process. As V. Okon highlights, despite the fact that didactic means do not have dominant influence on final results of studies and educational work nevertheless enriching methods of teaching they increase their efficiency. Properly selected and built into the system of methods and organizational forms of education used by a teacher didactic means simplify the realization of visual aids approach. Due to this they don't only improve conditions of student's getting proximate knowledge but also present material as impressions and observations which are the basis for mediated perception, cerebration and various kinds of practical activity.

In our opinion one of the efficient methods which are favourable for the development of algorithmic and technological competence is usage of computer models of various informational processes and objects while teaching algorithmization.

Researchers define the following program means which are used during algorithmic training: algorithm executors; computer educational environments or microcosms; electronic trainers; imitators; models of informational processes and computer-based systems etc. Visual aids become an important part of these means.

Visual environment of teaching is a special didactic system aimed at processing and transferring of educational knowledge which in its turn are based on accent on the usage and development of student's visual way of thinking. These conditions suppose the existence of both traditional visuals and special means and methods which allow activating eyesight work.

Solution of the problem of the possibility to create educational process in contemporary informational environment on the single method which importance was highlighted by Jan Amos Komensky is in activating eyesight work and in changing it into gnostic perception with the help of special means and approaches. Visualization of educational content must be taken as a game rule in this system; it means presentation, structuring and execution of educational knowledge in informational content of static or dynamic (multimedia) means of teaching. This content is supposed to be based on constant interaction of three ways of presenting information (text-drawing-formula), which leads to creation of single image and in its turn it allows activating of student's visual thinking during studying of subjects from various educational fields [23].

Unique peculiarities of virtual informational environment (multimedia, intellectuality, modeling, interaction, communicativeness, productivity) define absolute efficiency of its usage in education.

As O.V. Spivakovskiy and L.Y. Pyetukhova distinguish in their researches of triple-subject didactics "it came as a huge surprise to many professional including certain percent of teachers that informative-communicational environment including its integral part, informative-communicative educational environment (ICDE) started getting all features of a subject (naturally in philosophical, not psychological viewpoint) which motivates a student and a teacher rather efficiently and also interacts and competes with them both. Nowadays more and more researchers understand that in reviewing various didactic questions it doesn't seem possible to get actual and evidential results without including ICDE as not an auxiliary but equal subject of modern didactic model".

Didactic importance of multimedia-visualization processes appears first of all in implementing the principle of visual aids in education on the whole new level. They allow creating more progressive nature-aligned environment for reflection of educational content, its visual interactive modeling and research: hypermedia architectures provide person-centered developing nature of teaching. Extreme emphasis and visual appeal of multimedia are crucial while working with new video-generation which easily perceives knowledge via works of screen computer culture. This culture forms students' willingness, inclination to perceive surrounding world via image-visual presentation of information based on ICT, willingness to interact in informational society.

Multimedia-visualizations (except other advantages) have more informative density, merge of conceptual and visual which naturally uses both verbal and conceptual thinking. Hence, methods of visualizing information based on ICT allow harmonious development of all student cognitive structures.

Usage of multimedia for revision, generalization and classification of knowledge not only helps to create specific visual-image idea about the subject, phenomenon or event which is being studied but also add new facts to already known ones. We can observe not only process of cognition, reproducing and specification of already known facts but extension of knowledge as well. While working with educational program it is important to focus students' attention on the most difficult parts, enhance their autonomous research activity.

New properties of visual aids which were not studied in pedagogics in connection with the concept "visuals" but became known due to researches of visualization of didactic objects, must encourage transformation of basic elements of educational process (studied didactic object, educational activity and subject of teaching). Basing on the fact that modeling is "active" and the most productive form of activity, necessary pedagogical condition of positive enhancing educational activity was distinguished – informing of modeling environment, which includes technology, means and methods of didactic objects of modeling which is being studied – way of spontaneous creation of cognitive-visual images of studied object and operation of their properties for simplification of cognitive process, usage and interpretation of reality, allows creation of semantic environment of research, provides the possibility to experiment on model including logical systematization, reflection and other forms of cerebration [15-17].

Important problems of detecting the potential of cognitive visualization in algorithmic training of students are studied in Research Institute of Kherson State University where program-methodical array (PMA) "Video interpreter of search and assortment algorithm" was developed under the authority of M.S. Lvov and O.V. Spivakovskiy [13].

Program-methodical array "Video interpreter of search and assortment algorithm" is aimed to be used by students of higher educational institutions while studying educational subject "Basic concepts of algorithmization and software engineering" as a possible way of learning algorithms, programming languages, program check-out, improvement of algorithms and programs development reasoning. Class of PMA's tasks is various algorithms of mass-data processing including assortment, search of unique elements (maximums, minimums etc.) Using this PMA it is possible to study topics connected with programming languages, auxiliary algorithms, recurrence etc. Operating programming language of PMA is Pascal. The main advantage of the array is visualization of algorithms execution in dynamics which conduces better understanding of basic concepts of algorithmization and software engineering.

Reasonable further development of this application was WhB-oriented Integrated environment of the course "Basic concepts of algorithmization and software engineering" for higher educational institutions, developed in 2007-2009 to be used in teaching process while studying topics connected with algorithms of mass-data processing, tasks of selection, search and arrangement of data [5, 11, 25, 26].

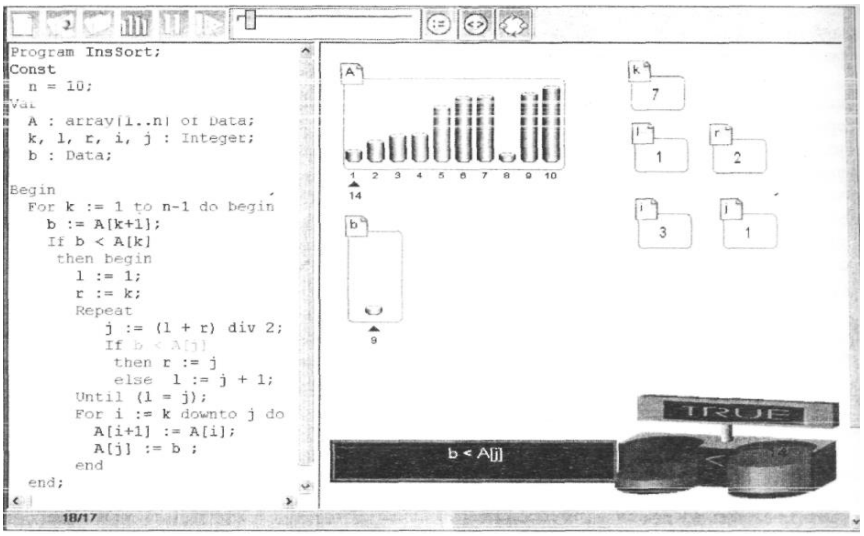

Fig. 1. *Visualization of inserters assortment algorithm in the environment of demonstrating integrated environment of studying the course "Basic concepts of algorithmization and software engineering"*

Integrated environment of the course "Bases of algorithmization and programming" includes the following modules: e-tutorial, library of lectures, library of tasks, the environment of programs' demonstration (Fig. 1), the system of current and final control of knowledge that contains algorithmic tests, electronic journal [5, 11, 25, 26].

The module "Presentation environment" is intended for using at lectures, during the practical and laboratory works for the visual demonstration of algorithms' implementation and for organization of computational experiments with analysis of their efficiency. The undeniable advantage of "Presentation environment" module is the option of visualization of classic algorithms that are in the collection of the system and algorithms developed by the user.

The visualization tools of integrated environment for studying "Bases of algorithmization and programming" course create opportunities of their efficient use in the algorithmic training of students and for enhancing learning activities. The proposed didactic visual aids (interactive hypertext textbook, library of lectures, library of algorithms, presentation environment, etc.) differ in scope of represented knowledge and difficulty of their operating, explication opportunities of key concepts of educational topics and detail (particularly generalized) capabilities of optimal support of the intellectual and learning activities - i.e. for informative and especially logical (functional) component of skill and knowledge demonstrations.

In 2012-2016 Kherson State Maritime Academy realized several international projects due to which modern educational training complex was created. Multimedia-visualization has become the main element in implementation of competency-oriented training. It has become possible to create training conditions which are the closest to real work on board a vessel. Consequently modeling certain work patterns in the conditions of real workplace it is possible to check the quality of scheduled competencies gained by students.

One of these training devices is simulator "Command Bridge". Command bridge is designed in actual size with real equipment which is used on the vessels nowadays. Multimedia-vizualization is created with 26 big displays and the coordination between the bridge and visual space is maintained with 14 computers. All the navigator's commands and actions are realized through virtual relocation of the vessel in strict real life order.

Fig. 2. Simulator "Command bridge".

Another example of implementing multimedia-visualization is simulator «Heavy Lift». 12 big displays and 8 computers create virtual reality of student's presence in the cage of heavy lift for loading a vessel. Workplace equipment is the same to a real heavy lift. Work of computers, displays and equipment allows full virtual execution of loading-unloading task. Simulator creates real situations which can take place on real workplace. Modeling various work situations a teacher can help to create or precisely check the quality of graduate's formed competencies.

Fig. 3. Simulator «Heavy Lift».

Experience of recent 5 years has proven that work with the usage of modern simulators with multimedia-visualization increases the quality of maritime specialists training by 23%.

CONCLUSIONS

Multimedia visualization can be viewed as a modern form of the visual presentation of educational information through integrated use of ICT (multimedia and hyper textual structure of educational environments - hypermedia, computer graphics). Multimedia visualisation allows to realize the potential of multimedia technologies and, above all, provides realization of the use-of visual-methods principle in training to a new level.

The results of the accomplished experimental work on visualizers implementation in the process of algorithmic training students show not only the enhance of the cognitive processes of learning activities and mechanisms of student self-development, but also that there are some changes in the pedagogical activity, which are based on the integration technology of cognitive visualization of knowledge with training technology. The changes are the raise of learning motivation and creativity, activation of students' searching activity.

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РЕАЛІЗАЦІЯ ДИДАКТИЧНОГО ПРИНЦИПУ НАОЧНОСТІ В АЛГОРИТМІЧНІЙ ПІДГОТОВЦІ СТУДЕНТІВ ЗАСОБАМИ ІНФОРМАЦІЙНО-КОМУНІКАЦІЙНОГО ПЕДАГОГІЧНОГО СЕРЕДОВИЩА

У статті досліджено розвиток теорії наочного навчання, визначено функції точності та особливості реалізації принципу наочності у сучасному навчальному процесі, встановлено суть поняття «візуальне середовище навчання» та дидактичну значущість процесів інтерактивної мультимедіа-візуалізації. Досліджено проблему виявлення потенціалу когнітивної візуалізації в алгоритмічній підготовці студентів-судноводіїв з використанням інформаційно-комунікативного педагогічного середовища відповідно до компетентністно-орієнтованого навчання.

У статті визначено функції використання наочності та особливості реалізації вказаного принципу у сучасному навчальному процесі та встановлено дидактичну значущість процесів інтерактивної мультимедіа-візуалізації, яка стимулює пізнавальну діяльність студента та активізує механізм сприйняття навчальної інформації.

Досліджено проблему виявлення потенціалу когнітивної візуалізації в підготовці майбутніх морських фахівців із використанням інформаційно-комунікативного педагогічного середовища.

Ключові слова: принцип наочності, візуальне середовище навчання, інформаційно-комунікаційне педагогічне середовище, когнітивна візуалізація, алгоритмічна підготовка судноводіїв.

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РЕАЛИЗАЦИЯ ДИДАКТИЧЕСКОГО ПРИНЦИПА НАГЛЯДНОСТИ В АЛГОРИТМИЧЕСКОЙ ПОДГОТОВКЕ СТУДЕНТОВ СРЕДСТВАМИ ИНФОРМАЦИОННО-КОММУНИКАЦИОННОЙ ПЕДАГОГИЧЕСКОЙ СРЕДЫ

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В статье представлено развитие теории наглядного обучения, определены функции точности и особенности реализации принципа наглядности в современном учебном процессе, установлено суть понятия «визуальная среда обучения» и дидактическую значимость процессов интерактивной мультимедиа-визуализации. Рассмотрена проблема выявления потенциала когнитивной визуализации в алгоритмической подготовке студентов судоводителей с использованием информационно-коммуникативной педагогической среды в соответствии с компетентностно-ориентированным обучением.

В статье определены функции использования наглядности и особенности реализации указанного принципа в современном учебном процессе и установлено дидактическую значимость процессов интерактивной мультимедиа-визуализации, которая стимулирует познавательную деятельность студента и активизирует механизм восприятия учебной информации. Исследована проблема выявления потенциала когнитивной визуализации в подготовке будущих морских специалистов с использованием информационно-коммуникативного педагогической среды.

Ключевые слова: принцип наглядности, визуальная среда обучения, информационно-коммуникационная педагогическая среда, когнитивная визуализация, алгоритмическая подготовка судоводителей.