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Enhancement of Computer and E-learning Resources in the Process of Education

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Abstract: One of the main and leading directions in the process of establishing a new educational model is informatization (IT penetration). Extensive use of computers in learning and teaching process enables to implement and carry out basic didactic principles: principle of visualization, principle of individualization and differentiation, principle of taking into account students' abilities and level of knowledge, principle of durability of received knowledge. And implementation of all these principles is a major criterion for estimating an integral process of education. So the article reveals psychological, pedagogic and methodological characteristics and peculiarities, organization process for the main stages of new material perception by means of computer technology and information technologies usage. The article also deals with analysis of effective ways of application this computer technology to the cognitive and training process.

Key words: Perception · Innovations · Information technology · Visualization · Training · Cognitive abilities

INTRODUCTION

The prospects of development of the modern education are mainly determined by the efficiency of implementation and application of new information technology. This problem cannot be solved just by development of hardware, as the mere computers do not determine the real environment and culture of education. At the present stage, scientific rationale is required for pedagogical technology of the new type, developed based computer technology and ensuring the development of the students' cognitive abilities, their creative activity and implementation of innovations in the education process [1].

The currently performed research works target evolution of the basic models, which reflect the conventional qualification approach to the education process organization, towards the competence-building approach, which would take into account the abilities of the students to perceive, apply knowledge, skills and personal qualities for successful professional activity [2].

The person-oriented approach is the basis of the contemporary education space. It substantiates the necessity of changes in the organization of educational process, the main goal of which is the all-round development of a person, accounting of his interests and needs, opportunity for building individual education paths [2].

Formation of a creative person is one of the main tasks declared by the concept of Russian education modernization. Its implementation makes it necessary to develop cognitive interests, faculties and abilities of a person.

To improve the level of material perception, some students need graphic support only, where others need animation of the studied process dynamics. Works of foreign researchers [3, 4] also reveal the significance of the level of base knowledge and quality of perception of various forms of education materials visual reinforcement.

Delivery of information using computer technology: "integration of text information, graphic image, audio feedback, supplemented with video effects and animation, allows to involve several channels of student's perception, which encourages better performance of the perception abilities and results in better perception of the educational information" [5; 126].

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Consequently, the education process must be developed in accordance with the psychological logic of perception implementation [3]. Analysis of the structure of perception ability in its function as one of the cognitive abilities of a human will help us understand this logic.

The contemporary psychological and pedagogical science determines cognitive abilities as "the properties of functional systems fulfilling certain psychological functions, which have individual extent of expression resulting in success and qualitative originality of mastering and implementing the activity [6,10].

In fact, along with multiple abilities, there is a single structure of activity, which is multiplied into the structures of individual abilities. Ontologically, this single structure is implemented by the integrity of the brain as an organ of mentality and, functionally, it is determined by the goal of the activity and its motivation.

The performed analysis of the educational activity structure allows identifying the following elements of cognitive abilities: forecasting, sensing (sensory), perception (perceptive), thinking, memory (mnemic), attention (attentive), representation, imagination (imaginative) and psychomotor abilities.

The functions of various sections of the brain can be broken up into the prioritized and auxiliary, which are the integral part of the former, as they act together with them. Such functions do not exist separately from each other at all. The same refers to the respective abilities. For example, the process of perception always assumes engagement of the attention process in the action. And the reverse formula is not correct. A human cannot be attentive and at the same time imperceptive (except for anomalies related to the damage of certain brain sections). Therefore, for simplicity and better visual perception, the prioritized and auxiliary functions can be united into a single element in the structure of cognitive abilities, though the ratio of the prioritized and auxiliary functions' development degree can be different.

The study of the mental processes (or functions) shows their inextricable connection and mutual transitions.

The cognitive process and, consequently, the functional aspect of the cognitive abilities can be represented in the form of a scheme as shown in Figure 1. The hierarchy of cognitive abilities is determined by which of them has been selected as the source one, i.e. which of them we have put on the top [3].

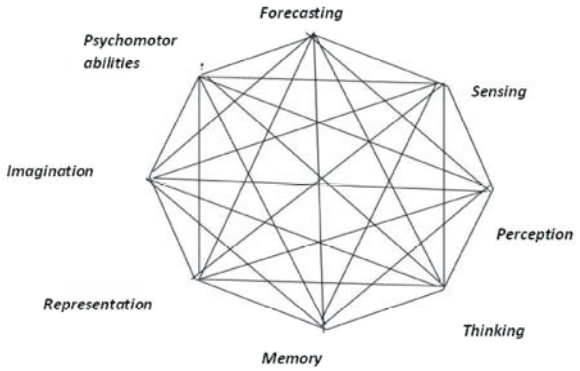

Fig. 1: The scheme of representation of structural elements of cognitive abilities

This figure is also a reflection of the structure of any of the cognitive abilities, as implementation of any of the provided functions assumes simultaneous implementation of all others. At that, the degree of manifestation of the functions will differ. For example, if we take implementation of the memory process, the degree of its manifestation will be more than the degree of manifestation of any other elements and the energetic balance of the magnitude will be distributed differently. If among other elements, the thinking would prevail, we would refer to logical memory, if the representation – to figurative memory, etc.

The same idea can be referred to the other elements of the represented scheme, provided in Figure 1.

The above conveys the suggestion that the process of formation and development of abilities must be of integrated nature. For example, thinking cannot be formed without developing memory, imagination, forecasting abilities, etc.

However, in order to substantiate the psychological and pedagogical conditions of success at perception of information provided to the student using computer technology, it is necessary to carry out a psychological analysis of the perception ability's elements.

Perception is a mental process, residing in the reflection of an item of a phenomenon as a whole as it directly affects the receptor surfaces of the sensory organs. Any possible feeling can serve as the basis of perception of objects or phenomena. People cognize the world by watching at it, smelling it, listening to it, tasting it, etc. Computer technology allows integrating such prevailing types of sensations as visual and acoustic senses in the education process.

The beginning of such perception is accompanied by setting up the psychomotor systems of an organism; during it, the human carries out tonic and regulatory actions through taking a comfortable position, focusing his sight and ears, etc. Then, the sensations are engaged, which target perception of the information flow from the display and acoustic systems. While analyzing and synthesizing this flow, the thinking allows identifying the perceived object from the common information background.

Engagement of memory and thinking in the process of information perception allows selecting the already existing necessary percepts of the studied object in memory by measuring and comparing.

The performance of memory, thinking (analysis, synthesis, classification, etc.) and imagination allows to associate the existing percepts with the newly perceived feelings and implement elaborative actions. It results in generation of new initial concepts of the sensed objects.

Thinking and imagination carry out controlling and correcting actions, compare the appearing image with the peculiar features of the sensed object and correct the occurring errors.

Thinking and percept allow generalizing the main concepts on the object or the phenomenon.

The performed analysis allows identifying the conditional stages of such perception process:

- Actualizing perception by sensing; tonic and regulatory actions;
- Distinguishing the object from the sensory background
- Recognizing the object;
- forming initial percept of the object (the perception hypothesis);
- Comparing and correcting the initial percepts, perceiving the object.

According to this procedure, we can suggest the following methodological peculiarities of arranging the education material perception using computer technology in the education process:

- The first and most important stage is to be the setting of perception as the objective, which is carried out simultaneously with didactic setting.

It can be implemented using acoustic information or video sequence. Such setting must actualize the motor and motion elements of perception, an efficient method of which is to instruct the students about the sequence and order of perception of the object or the phenomenon. Later on, it will form skills and experience of unassisted arrangement.

- The second stage is demonstration of the object or the phenomenon (the stage of sensing).

At this stage, the object or the phenomenon is demonstrated visually on a display with audio feedback, which orients the stream and order of senses of the student. If there is no opportunity to demonstrate the object, either its model, drawing, or scheme is to be used. In some cases, at certain circumstances, demonstration can be replaced with the audio picture of the object or the phenomenon. At that, we will base on the acoustic feelings of the students and the enhanced performance of their imagination.

In accordance with the gestalt laws, it is important to select such objects at the stage of sensing, which have a finite, simple and orderly shape (the *good shape* factor) [3].

The scale of the objects suggested for perception must be perceivable by the students as a whole, but not by parts. This would be in line with the completeness factor and aid better perception.

If it is necessary to unite several objects or phenomena during perception, they need to have spatially (at visual perception) or temporally (at acoustic perception) proximity (the proximity factor) at the stage of sensing.

And the factor of grouping all objects requires placing objects so that there would be no standalone items beyond vision.

Students need to be allowed certain time for unassisted sequential viewing of the object by students, after which it is important to arrange transition to the scaled-down perception by drawing attention to the significant points of the object. These points must be visually highlighted on the display with color or its saturation.

- The next step is the elaboration of initial percepts of the object or phenomenon.

At that, it is important to arrange revealing and analyzing the significant qualities of the object, actualizing the already existing representations and comparing them.

To provide an efficient selection of the already existing representations or comparison of different objects, it is important to represent their images on the display or provide audio information on them. At that, it is important to draw the attention to the similarity factors (color, size, base, shape, etc.). In the course of the education process, it is necessary to form with the students the skill of unassisted detection of these factors and identification of the main ones.

- Control and correction of perception.

At this stage, detailing, correction and verification of the initial percepts of the studied objects or phenomena are arranged. At that, it is allowed to repeat video or audio demonstrations of an object or a phenomenon.

The teacher is to remember the importance of formation of the representations base, which will further fulfill the signal function. Elements of this base are often called *sensory master samples*. They are the ideal images of objects, i.e. representations of the most significant distinctive attributes of real objects or phenomena. Formation of such sensory master samples requires training in recognition of the distinctive features of objects when the demonstration environment changes.

- The process of perception is ended with generalization and formation of the concept of the object or the phenomenon.

At this stage, it is necessary to arrange summarizing the results of the objects or phenomena study and reinforcing main concepts of the objects, i.e. the sensory master samples.

This stage is implemented by arranging verbal or visual formulation of concepts, demonstrating a scheme on the display, which would show the place of the perceived sensory master sample in the overall system of master samples. This allows forming associative links in the consciousness of the students.

The important conditions of efficient usage of computer technology at arranging perception of the education material are as follows:

- Taking into account the individual peculiar features of perception and its regularities;
- Taking into account the probable volume of perception;
- Accuracy and completeness of the objects perception.

Arrangement of perception of dynamic objects using computer technology has its own peculiar features. Such perception type is called observation. We understand *observation* as intentional, systematic and purposeful perception of phenomena and objects with the purpose of studying their changes and finding the idea of the phenomena.

Observation: is the most advanced form of intentional perception; it is characterized with the increased activeness of the observer. When differentiating items or phenomena, the observer must arrange perception in such a manner, so as not to let them leave the area of his activity.

Such perception begins with correct setting, which is the creation of the condition of readiness and aptitude of the student to observation and ensures stable and purposeful nature of the activity progress with respect to an object or a phenomenon.

The main psychological function of the setting at arranging observation is to identify the stable, consequential and purposeful nature of the activity progress of the student. Setting acts as a mechanism of perception stabilization allowing keeping it oriented to the goal in the permanently changing situations. Setting must include three levels: semantic, purposeful and operational.

The semantic level of the education process must contain:

- The informational element (the topic of the issue or the phenomenon under study);
- The emotional and evaluative element (sympathy and antipathy to the process);
- The behavioral element (readiness to act with regard to an object or a phenomenon, i.e. certain psychomotor setting-up).

The purposeful level of the setting at the observation arrangement acts as a training task. It can be broken up into several small tasks that are to be solved gradually. Thus, we can set tasks at the beginning of the observation arrangement or gradually return to this problem as we accumulate the facts being observed.

Activation of thinking (analysis, synthesis, etc.) and memory (previous experience) in the process of perception allows passing to the next structural level of setting:

Operational Level: In this level, based on the arising observation tasks, a detailed plan of its implementation is developed. It allows providing for various aspects of the

observed phenomenon and avoiding occasional or spontaneous perception wherever possible.

To achieve it, along with the thinking, the process of perception must include imagination and representations, which would allow visualizing the course of the process or the phenomenon, suggest working hypotheses, mark the objects or their fragments, which will be changing, the order and method of recording these changes.

The next stage of the observation process is the preliminary preparation of the observer, i.e. actualization of theoretical knowledge, measuring and recording skills and faculties. At this stage, it is necessary to include thinking and memory in the perception process.

This stage is followed by the stage of direct perception of the dynamic object of phenomenon (i.e. direct observation) with recording and measuring the happening changes as required by the working hypothesis and the plan. The following psychological functions are important at that: voluntary attention, conation and thinking.

A necessary stage of observation is its final stage- generalization the observation results. At this stage, the obtained results and those assumed in the working hypotheses are compared using thinking, memory, imagination and percepts.

- If the conclusions are vague or inconsistent, it is necessary to return to the stage of the objective setting and suggest new hypotheses or correct the existing ones. Then, it is necessary to repeat the observation process in an extended or scaled-down format.

To summarize the above, we can distinguish the following observation stages, which are supposed to be taken into account in the informational methods of demonstration of changing objects:

- Semantic setting for perception.

It assumes visual or verbal communication of the future work topic, elaboration of positive attitude to it, actualization of the motor elements of perception.

- Goal setting for perception.

At this stage, a specific observation task is stated, which can be divided into smaller tasks if necessary.

- Operational setting for perception.

At this stage, using visual or verbal images, the existing scientific and worldly knowledge is actualized, which allows to suggest the hypothesis, shape a plan of observation and record changes and methods of measuring the changes.

- Preliminary training of the observer.

This stage can be carried out in a scaled-down format provided a relevant home task has been done. In this case, only operative actualization of knowledge, skills and faculties is required. In case it has not been done, the students need to pass complete training to prepare for the future observation. In this case, they will repeat a particular material given on the display and recollect or study the methods of recording the changes of objects or phenomena and their measuring.

- Direct observation.

At this stage, the process of perception of the changing objects or phenomena shown on the display and (or) reproduced by acoustic systems is arranged. This process must comply with the gestalt laws, which have been mentioned before. The results of measurement of the recorded changes of the object must be written down in a comprehensible form for further generalization.

- Generalization of the observation results.

It is carried out based on the obtained data and the original hypothesis.

The important conditions of efficient usage of computer technology at arranging the observation are as follows:

- It is necessary to achieve understanding of the didactic and personalized (developmental) goals of the work, which will aid to create positive psychological environment.
- It is necessary to reach accuracy of perception of changes of the objects or phenomena and their recording. In case of inaccurate measurements, it will be impossible to come to correct conclusions, which will blunt the didactic and developmental effect.

Thus, it is possible to achieve the optimal build-up of the education process using computer technology only based on such control of the process, which is arranged with account for the regularities of implementation of the students' cognitive abilities (in our case, these are the perception abilities).

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