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PSYCHOPHYSICAL ASPECT OF BLENDED LEARNING

У статті розглядається психофізичний аспект змішаного навчання, яке передбачає, що частина пізнавальної діяльності учнів відбувається на уроці під безпосереднім керівництвом учителя, а інша – у самостійній роботі з електронними ресурсами. Встановлено, що змішане навчання передбачає не тільки інтеграцію зовнішніх (методичних) і внутрішніх (психологічних) аспектів освітнього процесу. Відтак, на особливу увагу заслуговує найбільш «експериментальний» психолого-педагогічний аспект змішаного навчання – психофізичний, елементи якого можна застосовувати в освітньому процесі.

***Ключові слова**: концепція функціональної асиметрії півкуль головного мозку, електроні ресурси, цифрова компетентність,*

The article considers the psychophysical aspect of blended learning, which assumes that part of the cognitive activity of students takes place in the lesson under the direct guidance of the teacher, and the other part - in independent work with electronic resources. It is established that blended learning involves not only the integration of external (methodological) and internal (psychological) aspects of the educational process. Therefore, special attention deserves the most "experimental" psychological and pedagogical aspect of blended learning - psychophysical, the elements of which can be applied in the educational process.

***Keywords**: the concept of functional asymmetry of the cerebral hemispheres, electronic resources, digital competence,*

Introduction.

Today, the education system is faced with the task of maximally revealing the unique creative potential of each individual. The idea of developmental and creative learning is at the focus of the new direction of the pedagogical process. The renewal of society, and even more so its radical change, is a contradictory, complex, long-term process associated with the search for new ways and means of implementing transformations in all spheres of people's lives. That is why, in the conditions of the spiritual and economic revival of our society, the activities of educational institutions require specific, and drastic, changes that are caused by the need to form a socially active, creative personality, which is possible only when creating favourable

conditions for the comprehensive development of the potential capabilities of the individual in the educational process, which should be made as effective as possible.

For this, blended learning technologies can be used. In the general sense, blended learning is learning in which part of the cognitive activity of all participants in educational process takes place at the lesson under the direct guidance of a teacher, and the other part – in independent work with electronic resources [1-4].

We can talk about such aspects of blended learning as a new technology of educational and scientific activity [8; 12; 14; 16; 17-19], as a locomotive of reforming the educational sphere [9; 10], as an important means of university education [5; 7; 11; 15; 21], as transcultural learning method [13; 20], as a tool for creating educational aids [6].

There are several options for "blending": combining face-to-face with distance learning; combining different learning formats within the same class (face-to-face learning as the main one, that uses distance learning technologies and various forms of working with electronic resources, online courses, etc.); combining independent learning and interaction/collaboration in the classroom; mixing the main educational content (textbooks and educational materials) with external materials (electronic resources).

We can talk about certain models of "blended learning".

Rotational model. The essence of this model is the so-called "rotation" of students in school/university. There is also a "rotation" of types of student activities – online and offline. A variation of this model is work using the "Flipped Classroom" technology, when students work partly with the materials independently, and in the classroom they discuss different questions, consult with the teacher, or study the next part of the material. This is the model that is currently implemented by most schools in Ukraine that have chosen a blended learning format.

Flexible model. In this model, students work individually according to adjusted schedule, mostly online, and the teacher is an instructor who coordinates their activities and provides consultations. Moreover, the teacher can provide consultations both in person and online in a synchronous mode. This model is often chosen by distance learning schools. Some schools in Ukraine, mostly in rural areas, also implemented this model during the pandemic and the active phase of military operations (in relatively safe regions).

Personality oriented model. Provides for learning process according to individual educational trajectories (students study in person, and in parallel work with external electronic resources, online courses). Such a model can be used for in-depth study of separate subjects, in the case of a combination of face-to-face and external, face-to-face and online or other forms of obtaining education.

Model of an enriched virtual environment. The model provides for the main work online according to the developed distance courses. At the same time, the student can attend separate lessons/classes (if this model is used individually), or separate lessons are held for students of the entire class (for example, at the beginning and end of studying the topic, for project defense, discussion of individual topics).

Such a model will be useful for communities where the school has been destroyed or damaged as a result of military actions, but there is an equipped digital hub or other premises that can be used for conducting individual classes with students.

In a situation where a school/university has a need and opportunity to organize blended learning, it is necessary to determine the model/models by which the educational institution will work. The legislation does not provide for a blended form of education as such, so if a school

organizes blended learning, the form of education is face-to-face with the use of distance learning technologies.

The advantages of blended learning in higher education institutions are the following [2]:

− expanding students' educational opportunities due to accessibility and flexibility;

− taking into account individual educational needs, pace, rhythm of educational material;

− increasing students' motivation for educational and cognitive activity, independence, social activity, reflection and self-analysis, and the formation of responsibility;

− pedagogical freedom and autonomy of the teacher regarding the choice of material presentation, educational services and platforms;

− changing the role of the teacher;

− the ability to control one's own activities;

− formation of digital competence;

− personalization of the educational process;

− increasing the efficiency of the educational process and learning outcomes as a whole.

The aim.

Since blended learning involves not only the aggregation of external (methodological), but also internal (psychological) aspects of the educational process, the most "experimental" psychological and pedagogical aspect, or the approach to blended learning – psychophysical (it is known that psychophysics can be defined as a branch of psychology that studies the diverse influences of physical stimuli/signals on sensory perceptions and mental states of a person), deserves special attention, the elements of which can be applied in the educational process. This is the **purpose** of the article.

Presentation of the material.

One of the promising ways of involving the psychophysical approach involves the use of the concept of functional asymmetry of the human cerebral hemispheres in the educational process. This concept reveals certain features/algorithms of the perception of the world by participants in the educational process in the context of the functioning of the cerebral hemispheres – right and left. These features are increasingly being taken into account by the world pedagogical community in the process of forming effective strategies for the educational activity of participants in the educational process in educational institutions of various types.

Thanks to the generalization of the content of this concept, it can be stated that the hemispheres function both in differentiated and synthetic (holistic) ways. If the synthetic mode of functioning of the hemispheres involves a combination of their psychophysical strategies of perceiving the world, then the differentiated mode reveals a certain dichotomy of the functioning of the hemispheres in the context of sensory features of perceiving the environment.

Generalizing these features with a sufficient degree of simplification allows us to state that the continuous aspect of reality (continuous geometrical forms of objects, hot color gamut, melodic aspect of sound information, figurative-concrete, non-contrast aspect of visual information, emotional aspect of human interaction, etc.) is perceived by the right hemisphere, and the discrete aspect (discrete geometrical forms of objects, cold color gamut, sound rhythm, sign-symbolic, contrast aspect of visual information, abstract-logical aspect of human interaction, etc.) – respectively, by the left hemisphere.

It is important to note that visual objects located in the right field of vision are perceived by the left hemisphere, and in the left field of vision – by the right hemisphere (i.e. here we have a

cross-visual model of perception of the world by the hemispheres). The same can be applied to the perception of perspective – direct and reverse.

Blended learning in the context of the concept of hemispheric asymmetry assumes that educational information can be received by participants in the educational process in accordance with certain algorithms developed by us [22].

Conclusions.

From the point of view of the concept of functional asymmetry of the human brain hemispheres, the combination of ICT resources concerning the method of supporting signal method is an effective means of representing educational material. On the one hand, students are offered verbal information that explains certain educational objects at the verbal level, and on the other hand, this same information is presented in the form of a graphic image.

The information provided to students is differentially located in the right (verbal) and left (figurative) visual fields, which corresponds to hemispheric information processing strategies and contributes to the synergistic effect of the convergence of hemispheric functions of the brain.

In general, we can talk about certain algorithms of presenting the educational information.

1. Blending algorithm: in order for the information of educational character (or a work of art) to have a meditative and synergetic effect on a student (when this information simultaneously affect both hemispheres, thus synchronizing their processes), it is necessary to combine right- and left-hemispheric information so that the two hemispheric strategies/functions blend, thus receiving a compensatory effect (as evidenced by encephalographic studies, the hemispheres are functionally synchronized in a meditative and creative state being the highest level of human activity/life and the highest goal of human development).

2. Harmonizing algorithm: in the information of educational character (or a work of art) to have a harmonizing effect on a student (when this information simultaneously affect both hemispheres, thus harmonizing their processes), it is necessary to combine right- and left-hemispheric information in such a way that the two hemispheric strategies be realized in a harmonious proportion (in mathematical terms, – this proportion is called a "golden ratio"), that is, the information transmitted to the right and left hemispheres must be correlated in a harmonious proportion.

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