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TO THE PROBLEM OF DIDACTIC INTERACTION: AN INFORMATIONAL APPROACH

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To the Problem of Didactic Interaction: an Informational Approach

The paper shows that the use of a new class of information systems (intellectual, expert and expert training systems) significantly changes didactic interaction and requires taking them into account as one of the subjects. For the first time, a classification of learning concepts (didactic systems) was developed, based on the features of didactic interaction, which includes three main groups of didactic systems (DS): homogeneous DS; hybrid DS; mixed DS. The components and definitions of these groups of didactic systems are given. It is shown that the developed classification system is consistent: 1) with the views of Yu.K. Babansky; 2) with existing systems and approaches to the classification of didactic systems; 3) with the forecast of development of pedagogical technologies V.P. Bespalko. This confirms the validity of the developed classification system for didactic systems.

Key words: didactic interaction, classification, information systems, intellectual systems, expert training systems, teaching concepts, didactic systems.

1. Formulation of the problem and its relevance to important scientific or practical tasks. Modern education is increasingly based on the use of a new class of information technology training (artificial intelligence systems, expert training systems, etc.), which significantly expand and change existing pedagogical approaches and need to take into account their peculiarities in modern concepts of learning theory (didactic systems) [1; 2]. However, today, this area of pedagogical study is poorly researched [2 – 4].

Therefore, it can be argued that there is an objective pedagogical problem associated with the need to study pedagogical concepts of learning theory, which are based on the use of modern information technologies and systems. This makes it relevant to conduct research on this problem [2; 5].

2. Analysis of the latest research and publications. A large number of scientific researches: monographs, manuals, dissertations and other publications are

devoted to the pedagogical problem of teaching research learning theory concepts based on the use of a new class of information technology and systems (intelligence, expert systems and teaching, etc.) [6 – 11].

The analysis of these researches allows to distinguish the following main directions: 1) informatization of assessment, design and development of pedagogical technologies and systems of training; 2) design, development and use of the educational environment on the basis of modern information technologies of education (intellectual, expert and expert training systems); 3) analysis of the conceptual apparatus of theoretical concepts of the theory of learning in the conditions of use of a new class of information technologies of training; 4) didactic interaction, including the use of a new class of information technology training [6 – 11].

However, research of this problem and the main areas of focus tend to be fragmented, not systemic in nature, and the crucial tasks remain unresolved.

3. Selection of previously unresolved parts of the general problem. The problem of studying pedagogical concepts of learning theory solves the urgent task of analyzing didactic interaction and classification of concepts of learning theory (didactic systems), including modern ones, based on the creation and use of a new class of educational information technologies (intellectual, expert and expert training systems).

The author's conception of the research is based on the idea that didactic interaction when using a new class of information systems (intellectual, expert and expert training systems), has significantly changed and needs to be taken into account as one of the subjects of the educational process. This concept is supported by and consistent with numerous studies [12 – 23].

4. Formulation of the purposes of the article (task statement). The purpose of this work is to analyze the features of didactic interaction, including the use of a new class of information technology training, as well as the development of criteria and system of classification of pedagogical concepts of learning theory (didactic systems).

Research methods. To achieve this purpose and verify the author's concept of the study used: methods of finding relevant information; methods of theoretical analysis; methods of comparative analysis; methods of classification.

5. The main research material. In modern pedagogical and psychological studies on the theory of learning, a considerable number of theoretical concepts of learning (concepts of theory of learning) have been developed, which are used in the educational process for the acquisition of knowledge, mastering practical skills and abilities [6, p. 119]. As practice of application of these concepts shows, today, there is no single, generally recognized, theoretical teaching concept (didactic system) [7, p. 10].

This is due to the fact that each of the concepts of the theory of learning takes into account only certain psychological and pedagogical characteristics of the learners, individual features and patterns of their cognitive activity, has a different understanding of the interaction (didactic interaction) between the learner and the teacher, as well as offering its own technology for learning and managing cognitive activity, etc.

There is also no single approach to the use of the term "teaching concept" in the pedagogical literature (N. Bordovska, V. Zagviazynskyi, V. Okon, I. Podlasyi, A. Rean, S. Rozum, S. Smirnov, V. Yagupov) use instead such synonyms as: "didactic systems", "didactic theory", "didactic concept", etc. [6, p. 119; 7, p.10; 8, p. 42; 9, p. 248; 11].

Theoretical and practical studies of didactic interaction, as an essential characteristic of a holistic pedagogical process, systematic analysis of their conceptual apparatus, and more are devoted to a number of monographs, publications and dissertation research [1; 14; 15; 17 – 19; 22 – 24], but their analysis in the work is limited by the aims and objectives of the study.

To date, the didactic interaction of teachers and students in pedagogical concepts of teaching, including the use of a new class of information technologies and systems, is not subject to special analysis [1]. This makes it relevant to analyze didactic interaction in pedagogical concepts of teaching (didactic systems), both in

"traditional" and based on the use of a new class of information technologies and teaching systems.

As shown above, there is a great many theoretical concepts of teaching (didactic systems) in pedagogical science, which necessitated their classification. Today there is no single system of classification of such concepts (didactic systems) [6 – 10; 25; 26].

An example of such a classification of teaching concepts is the classification proposed by I.P. Pidlasnyi [26, p.129], which distinguishes three didactic systems that are fundamentally different: 1) the system (didactics) of J.F. Herbart; 2) J. Dewey's didactic system; 3) the modern system [26, p. 129].

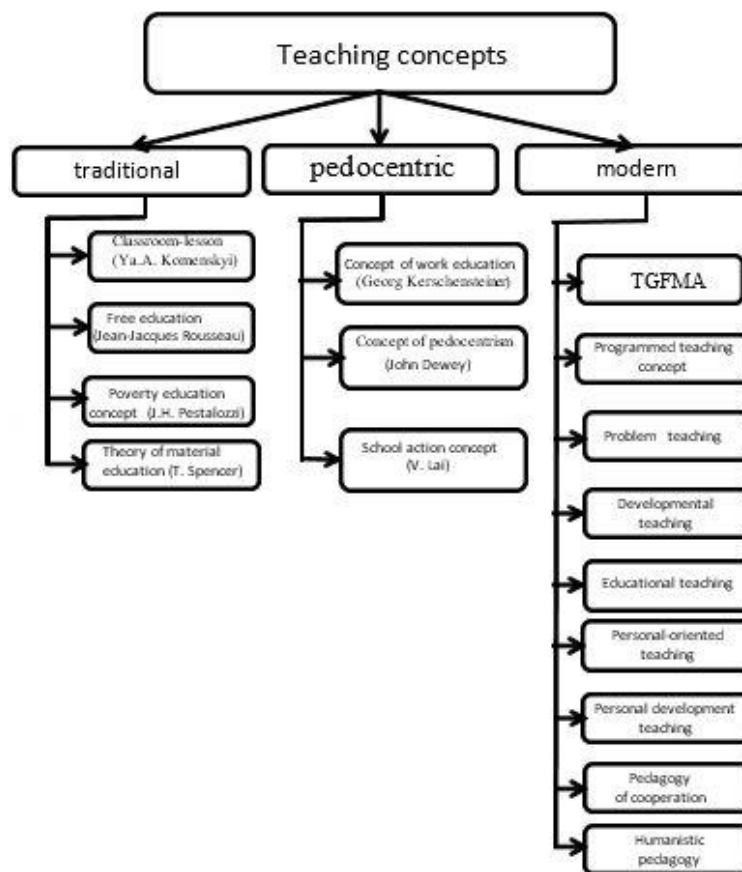
As a criterion for the classification of didactic systems, I.P. Pidlasnyi uses "the peculiarity and specificity of the internal structures of the didactic system formed by the unity of goals, principles, content, forms and methods of teaching" [26, p. 129].

This criterion is poorly formalized because it does not explicitly indicate what specificity and originality was used, which does not allow the classification of didactic systems to be uniquely (formalized).

The most commonly accepted in pedagogy is the "classical" system of classification of concepts of the theory of learning, which is shown in the Pict. 1 [7, p. 12].

This classification divides the teaching tconcepts into three groups (traditional, pedocentric, and contemporary), which include the most prominent areas and pedagogical theories of teaching [10, p. 87].

The classification of the teaching concepts (didactic systems) is based on the criteria that characterize the following features of the didactic process: 1) the activity of the one who teaches (teacher, lecturer); 2) the activity of the learner (pupil, student); 3) object of assimilation (content of training); 4) pedagogical theory of teaching [7, p. 50].



Pict. 1. Classical groups of teachingconcepts, where: TGFMA – the theory of gradual formation of mental actions [7, p. 12]

There is a large number of scientific publications, monographs, dissertations, textbooks, etc., dedicated to a detailed description of these concepts of teaching (didactic systems) [6 – 10; 25; 26] (see Pict. 1), so their consideration will be limited only by the tasks of the study – the analysis of the features of didactic interaction. It should be noted that there is no formalized definition of didactic systems and their groups in these and other works.

In the group of traditional systems of teachingconcepts (J.F.Herbart, Ya.A. Komenskiy, J.G. Pestalozzi, J.J. Rousseau, G. Spencer, etc.) the essential role belongs to the activity of a teacher (lecturer)[10].

Thus, in the group of traditional systems of concepts of teaching didactic interaction is carried out in the system of teacher – pupil (lecturer – student), where

the teacher (the one who teaches) acts as a subject, and the one who learns – as an object.

The main disadvantage of traditional teaching concepts is the poor ability of those who learn to use the knowledge gained in practice, as indicated by many studies and scientific publications [5 – 7; 9; 10; 26].

In the group of pedocentric teaching concepts (D. Dewey, G. Kerschensteiner, V. Lai, etc.) the main role in learning belongs to the activity of the learner (pupil, student, child) [10].

As an example of a didactic system where the learner (student) is not the object of activity of the teacher but is the subject of learning, one can cite the author's concept, which was created by the psychologists D.B. Elkonin and V.V. Davydov in the mid-60s of the XX century [25, p. 138].

According to the didactic system (“subject-subject didactics”), the main result of teaching is the emergence and development of theoretical thinking in elementary school pupils, which the authors sought to achieve [25, p. 138]. Therefore, the ability of a group of pedocentric teaching concepts is limited by the ability to manage the dialogue between the teacher and the student, as well as the result – the development of theoretical thinking.

The group of modern didactic systems of teaching (J. Bruner, P. Halperin, V.V. Davydov, L. Zankov, K. Rogers and others) is based on the position that teaching and learning are an integral part of the learning process, and their didactic interaction and diverse interconnections in the structure of this process are the subject of didactics [10].

The teaching process in a group of modern didactic systems is in most cases implemented as two-way (subject-subject interaction) and guided by the one who teaches (teacher, lecturer, educator) according to the goals, objectives and content of the learning.

In some pedagogical studies, for example, such as the research of T.B. Kazachkova [16, p. 52] and others [14; 17; 22; 23], polysubjective interaction is explored as “a form of interaction of subjects with each other that is capable of

providing mutual conditionality and a special type of community, and subjects under such conditions of interaction are able to be active, act, integrate, ready to transform the the world and themselves, function as a subject in the process of self-development and in relations with other subjects”[16, p. 52; 14, p. 64].

Studies by T.B. Kazachkova, O.Ye. Spivakovska and others have shown that the ability of subjects to integrate in polysubjective interaction leads to the creation of polysubject (group or collective subject) [16, p. 52; 19; 23]. In pedagogy there is almost no research on the creation of polysubjects (integration of subjects into polysubject), the interaction of subjects with polysubjects. This pedagogical direction is also poorly researched [16; 19; 23].

The polysubjective interaction is considered in these and other works [12; 16; 19; 23], as well as the polysubject-subjective, as well as the subject-subjective interaction, do not fully take into account the possibilities of modern information technologies of training. and changes related to didactic interaction when used.

Numerous studies show that such systems are able to transfer knowledge (experts) in a particular area of knowledge ("study"), perform complex analytical calculations and use knowledge, distribution on the Internet (knowledge bases, databases, etc.) and more [3; 4; 12 – 14; 17; 22; 24; 27; 28].

This has led to the fact that the circle of students who administers educational and cognitive activities of students (learners), and so on, has changed and expanded significantly. That is, didactic interaction in the use of such information systems has changed significantly, and is not limited to interaction in the teacher-student system. (subject-subject, subject-subject and polysubject interaction) [13].

Thus, as the analysis suggests, a group of "classical" modern concepts of teaching (didactic systems) based on traditional subject-subject and polysubjective interaction, such changes, as a rule, do not take into account, or take into account partially [13].

L.Ye. Petukhova and her colleagues [12; 13] developed an innovative didactic system, called "three-subject didactics" [12; 13; 29]. This didactic system is based on

a historical-logical model of the dynamics of didactic approaches (didactic interaction) to the organization of the educational process [29, p.77].

Based on this model in the study of L.Ye. Petukhova [12; 29] it is shown that the modern development of information technologies has led to the emergence of a third subject of knowledge transfer – the information-communicative pedagogical environment (ICPE), which acquires the status of an equal subject.

Thus, a complex system is formed: "teacher-student-information-communicative pedagogical environment (ICPE)" [13, p. 98], that is, in today's context, the educational environment (ICPE) acquires the status of an equal subject.

Further development of polysubject interaction studies [16; 19] and the three-subject didactics were continued in the works of EA Spivakovskaya [14; 23], J. Kenon-Bowers and K. A. Bowers (J. A. Cannon-Bowers, and C. A. Bowers) [24] and others [17; 18; 28].

O.Ye. Spivakovska in the study [23] identifies (introduces) a new category of ICT polysubject (group or collective entity) as a full participant of interaction in the learning environment, alongside the subject-teacher and the subject-learner, forming a polysubjective learning environment (PLE) [23, p. 272 – 273].

In addition, synthetic environments in studies (synthetic learning environments, mixed, synthesized, hybrid learning environments, etc.), in which training is based on simulation and computer simulation, are developed in the works by J.A. Cannon-Bowers and C.A. Bowers [24].

These studies also conclude that the level of the subject is acquired in such environments, which also leads to a three-entity, multi-entity, and (or) multi-entity multi-component didactic interaction [15; 17].

Considering new opportunities that have emerged with the development of the Internet, some pedagogical studies attempt to re-understand modern didactic systems and traditional approaches to learning, finding and developing new approaches (teaching concepts, didactic systems). Examples of such studies are the works of Stephen Downes and George Siemens, who proposed a new "theory of learning in the digital age" –connectivism [18; 28; 22].

As shown in studies [22, p. 113; 30, p. 41], connectivism presents computer networks (local and global networks, including the Internet) as a multi-component network, a network of connections in which knowledge and data are shared.

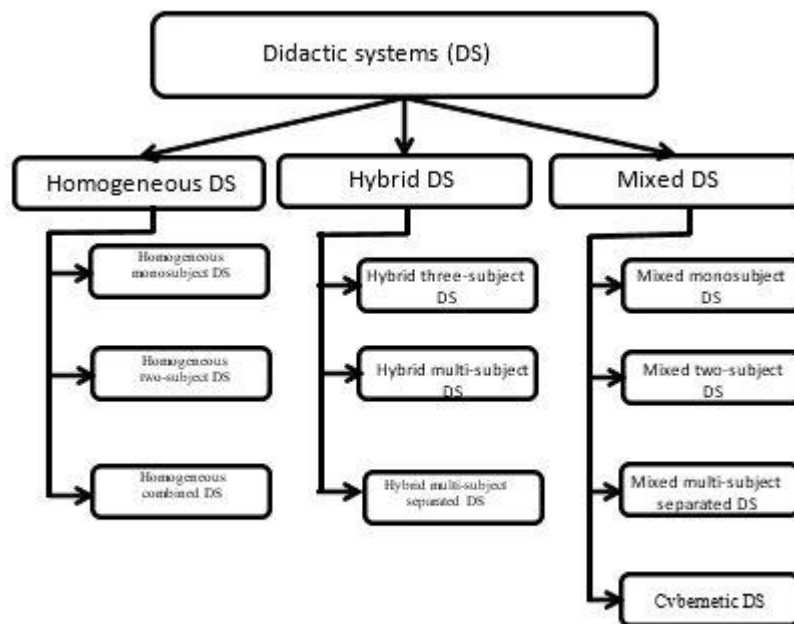
That is, didactic interaction takes place in a multicomponent distributed environment (communication network), which is not under the complete control of the learners [22, p.114].

The basic teaching concepts (didactic systems) and variants of didactic interaction when using a new class of information technologies and learning systems, including the creation of different learning environments based on them, consider only the mode of their application, but, as shown in a number of studies [27; 29], there is also a special kind of didactic interaction that arises when transferring (acquiring) knowledge ("learning" mode) from those who teach (teachers, lecturers, experts, etc.) to information systems (intellectual, expert training systems, etc.). This particular kind of didactic interaction is poorly researched.

Thus, the results of the analysis show that one of the quite complete characteristics of learning concepts (didactic systems) are features of their didactic interaction, which should be used as a criterion that uniquely characterizes the didactic system or group of such systems, including the use of a new class of information technology learning (intellectual, expert and expert training systems).

Based on this criterion, a classification of teaching concepts (didactic systems) is developed, which is shown in the Pict. 2.

Below are definitions of the main groups of teaching concepts (DS) that characterize them only because of the didactic interaction features. This allows to: 1) uniquely identify the DS or the DS group; 2) reveal (identify) features of both "traditional" and existing concepts of learning based on the use of a new class of information technologies (intellectual, expert and expert training systems); 3) design and develop new teaching concepts (didactic systems) based on the use of a new class of information technologies and systems.



Pict. 2. Classification of teaching concepts (didactic systems) based on the criterion of features of didactic interaction, where: DS – didactic system or group of didactic systems

In scientific publications, the concept of "information system" has a very broad interpretation, which largely depends on the context. This, in some cases, leads to discussions about the definition of the term. The main factors behind this are the rapid development of hardware and software, as well as the expansion of the use of information technologies and systems. In this regard, there are quite a number of publications on the conceptual apparatus of information systems [31].

Based on this, in the definitions of didactic systems (see Pict. 2), the term "information system" will be understood in the broad sense: as an intellectual system, expert, expert training system or any other artificial intelligence system capable of detecting the qualities of "sub ".

According to the classification criterion – features of didactic interaction (see Pict. 2), the following 3 main groups of didactic systems (teaching concepts) are distinguished: homogeneous DS; hybrid DS; mixed DS. Below are their definitions.

Definition 1. Homogeneous DS are didactic systems where only people (teachers and students) act as subjects and objects of didactic interaction.

Homogeneous DS can also use a variety of technical training tools, including information, but they do not manifest themselves as subjects. That is, only people can learn as teachers and learners, not artificial systems or environments.

Definition 2. Hybrid DS is a didactic system that combines (integrates) didactic interaction of homogeneous DS with information systems that have certain qualities of a subject or entities, polysubjects, distributed entities, etc. that are capable of implementation part of the functions of the teacher.

Definition 3. Mixed DS are didactic systems where only students (learners) or teachers (experts, lecturers, etc.) and information systems who have certain qualities of the subjects.

A group of homogeneous DS consists of the following three DS: homogeneous monosubject DS; homogeneous two-subject DS; homogeneous combined DS. Their definitions are presented below.

Definition 4. Homogeneous one-subject DS are didactic systems in which didactic interaction is carried out in a system of "subject-object", where the subject is the one who teaches (teacher, lecturer) and the object – the one who learns (the student).

Definition 5. Homogeneous two-subject DS are systems in which didactic interaction is carried out on the basis of "subject-subject" interaction between the teacher and the student.

Definition 6. Homogeneous combined DS are complex systems of interaction between the participants of the educational process: teachers and students, in which didactic interaction is carried out on the basis of a combination (integration) of different types of multi-subject interaction: "subject-object", "subject-subject", "polysubject", etc. between those who teach (teachers, lecturers) and those who learn (students).

The hybrid DS group includes the following three DS: three-subject hybrid DS; hybrid multi-subject DS; hybrid multi-subject distributed DS. Below are their definitions.

Definition 7. Hybrid three-subject DS are didactic systems that combine (integrate) didactic interaction with homogeneous two-subject DS with information systems that have certain properties (status) of an equal third entity capable of implementing part of the functions (the one who teaches).

Definition 8. Hybrid multi-subject DS are complex systems of didactic interaction of participants in the educational process: teachers, students and information systems, which envisages their joint activity as subjects with the possibility of acquiring the status of a group or collective subject (polysubject).

Definition 9. Hybrid multi-subject distributed DS are complex systems of didactic interaction between the participants of the educational process: teachers, students and distributed information systems in the real and cyberspace (Internet and other local and global computer networks), envisaging their common activities as entities with the possibility of acquiring the status of group or collective entities (polysubjects).

A mixed DS group includes four of the following DSs: mixed single-subject DSs; mixed two-person DS; mixed multi-entity distributed DS; cybernetic DS. Their definitions are as follows.

Definition 10. Mixed monosubject DS are didactic systems in which didactic interaction is carried out in a subject-object system, where the subject is the information system (the one who teaches) and the object is the one who learns (student).

Definition 11. Mixed two-subject DS are systems in which didactic interaction is carried out on the basis of "subject-subject" interaction between the information system (the one who teaches) and the student (the one who learns).

Definition 12. Mixed multi-subject distributed DS are complex systems of didactic interaction of students and distributed in real and (or) cyberspace (Internet and other local and global computer networks) information systems, which envisages

their joint activity as subjects with the possibility of acquiring the status of group or collective entities (polysubjects).

Definition 13. Cybernetic DS are systems in which didactic interaction is carried out between an information system that has certain properties of the subject and components (entities, polysubjects and objects) containing the necessary data and knowledge that the information system is needed for its training and further functioning.

The goal of cybernetic DS is to teach (transfer knowledge) of the information system, and teachers, experts can act as components of didactic interaction.

The system of classification of teaching concepts (didactic systems) (see Pict. 2), based on the features of didactic interaction, agrees: 1) with the ideas of Yu.K. Babanskyi, who considered didactic interaction of teachers and students as a system that can be implemented in different variants [1]; 2) with existing systems and approaches to the classification of didactic systems (see Pict. 2 [7, p.11 – 12]); 3) with the prognosis of the development of pedagogical technologies of V.P. Bespalko [32] and others.

Thus, according to V.P. Bespalko [32]: homogeneous DS are an era of educators; hybrid DS – occupy an intermediate position that corresponds to the transition from the era of teachers to the era of learning machines; mixed DS – correspond to the era of learning machines. This confirms the accuracy of the results obtained.

6. Conclusions from the study and prospects for further research in this direction

1. It is shown that the general problems of improvement of pedagogical technologies are given considerable attention. However, the problem of research of modern pedagogical concepts of the theory of teaching (didactic systems), which are based on the use of a new class of information technologies and systems (intellectual, expert, expert training systems, etc.), as well as their classification is not finally resolved; researches have fragmentary character.

2. It is shown that the known systems of classification of teaching concepts are based on not formalized or "poorly" formalized criteria, such as: the originality and specificity of the internal structures of the didactic system; activity of teacher (teacher); student's activity; object of assimilation (content of training); pedagogical theory of learning and more. This does not allow to uniquely and formally carry out the classification of didactic systems, as well as formalize their conceptual apparatus.

3. On the basis of formalized analysis the features of didactic interaction are revealed: 1) in the group of traditional systems of concepts of teaching didactic interaction is carried out in the system of teacher – student, where the teacher acts as an entity and the learner – as an object (subject-object didactic interaction); 2) in the group of pedocentric concepts of learning the main role in learning belongs to the student (the activity of the learner). He is the subject of learning, that is, subject-subject didactic interaction; 3) in the group of modern didactic systems of education, as a rule, in addition to the formation of knowledge, skills and skills, as well as the overall development of the student's personality, and aimed at his whole personal growth as a subject of learning (subject-subject interaction).

4. Based on the didactic interaction analysis, the ability of subjects to integrate and create a polysubject (group or collective entity), called polysubjective interaction, is identified. It has been shown that this pedagogical line of research on the creation of polysubjects, the interaction of subjects with polysubjects, and more, is poorly researched.

5. It is shown that the use of a new class of information systems (intellectual, expert and expert training systems), significantly changes didactic interaction and requires them to be considered as one of the subjects.

6. Found that the basic concepts of teaching (didactic systems) and didactic interaction options when using a new class of information technologies, including the creation of different learning environments based on them, do not take into account the special kind of didactic interaction that occurs when transferring (acquisition) knowledge from those who teaches (teachers, lecturers, experts, etc.) to information systems (intellectual, expert training systems, etc.).

7. Based on the analysis it is shown that one of the full characteristics of the concepts of teaching (didactic systems) are features of their didactic interaction, which should be used as a criterion that uniquely characterizes the didactic system or group of such systems, including the use of a new class of information technology learning (intellectual, expert and expert training systems).

8. Classification of didactic systems based on the features of didactic interaction, which includes three main groups of didactic systems (DS) for the first time: homogeneous DS; hybrid DS; mixed DS, defined as follows: homogeneous DS are didactic systems where only people (teachers and students) act as subjects and objects of didactic interaction; hybrid DS are didactic systems that combine (integrate) didactic interaction of homogeneous DS with information systems that have certain qualities of a subject or entities, polysubjects, distributed entities, etc.; mixed DS are didactic systems where the subjects and objects of didactic interaction are only students or teachers, and information systems that have certain qualities of objects.

9. It is shown that a group of homogeneous DS consists of three components: homogeneous one-subject DS; homogeneous two-subject DS; homogeneous combined DS. The hybrid DS group includes: three-subject hybrid DS; hybrid multi-subject DS; hybrid multi-subject distributed DS. A mixed DS group includes four of the following DS: mixed single-subject DS; mixed two-subject DS; mixed multi-subject distributed DS; cybernetic DS.

10. It is established that the developed system of classification of teaching concepts (didactic systems) agrees: 1) with the ideas of Yu.K. Babanskyi; 2) with existing systems and approaches to the classification of didactic systems; 3) with the forecast of development of pedagogical technologies of V.P. Bepalko. This confirms the reliability of the developed system of classification of didactic systems.

11. In the future, the new classification of didactic systems and formalized conceptual apparatus will allow to make scientifically grounded pedagogical researches on problems of development of new teaching concepts (didactic systems),

approaches to designing and application of intellectual information technologies and training systems.

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Шевчук О.Б.

До проблеми дидактичної взаємодії: інформаційний підхід

У роботі показано, що використання нового класу інформаційних систем (інтелектуальних, експертних та експертних навчаючих систем), суттєво змінює дидактичну взаємодію і потребує врахування їх як одного із суб'єктів. Вперше розроблено класифікацію концепцій навчання (дидактичних систем), що базується на особливостях дидактичної взаємодії, яка включає три основні групи дидактичних систем (ДС): *однорідні ДС*; *гібридні ДС*; *змішані ДС*. Наведено складові та дефініції цих груп дидактичних систем. Показано, що розроблена система класифікації узгоджується: 1) з уявленнями

Ю. К. Бабанського; 2) з існуючими системами та підходами до класифікації дидактичних систем; 3) з прогнозом розвитку педагогічних технологій В. П. Беспалько. Це підтверджує достовірність розробленої системи класифікації дидактичних систем.

Ключові слова: дидактична взаємодія, класифікація, інформаційні системи, інтелектуальні системи, експертні навчаючі системи, концепції навчання, дидактичні системи.

Шевчук О. Б.

К проблеме дидактического взаимодействия: информационный подход

В работе показано, что использование нового класса информационных систем (интеллектуальных, экспертных и экспертных обучающих систем), существенно меняет дидактическое взаимодействие и требует учета их как одного из субъектов. Впервые разработана классификация концепций обучения (дидактических систем), основанная на особенностях дидактического взаимодействия, которая включает три основные группы дидактических систем (ДС): *однородные ДС; гибридные ДС; смешанные ДС*. Приведены составляющие и дефиниции этих групп дидактических систем. Показано, что разработанная система классификации согласуется: 1) с представлениями Ю. К. Бабанского; 2) с существующими системами и подходами к классификации дидактических систем; 3) с прогнозом развития педагогических технологий В. П. Беспалько. Это подтверждает достоверность разработанной системы классификации дидактических систем.

Ключевые слова: дидактическая взаимодействие, классификация, информационные системы, интеллектуальные системы, экспертные обучающие системы, концепции обучения, дидактические системы.

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