

Didactics features of use of new information technologies and electronic textbooks during the study of physics at school



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(Received 14 April 2011; accepted 18 June 2011)

Abstract

A state of e-learning in schools in Ukraine is observed in the article. The necessity of use of new information technologies and electronic books in the study of physics in educational establishments is discussed. The advantages of NIT and electronic books in the study of physical theories are shown.

Keywords: Computerization of education, electronic textbook, physical theory.

Resumen

Indagado un estado del e-learning en las escuelas de Ucrania. Discutiendo la necesidad de utilizar las nuevas tecnologías de la información y los libros electrónicos en el estudio de la física en los establecimientos de educación. Mostrado las ventajas de NIT y libros electrónicos en el estudio de las teorías físicas.

Palabras clave: Información de la educación, libro electrónico, teoría física.

PACS: 01.40.Fk, 01.50.H-

ISSN 1870-9095

I. INTRODUCTION

Wide introduction in the educational process of modern information technologies on the basis of the use of PC is a characteristic sign of perfection of education on the modern stage. Computerization of educational process is an objective necessity, caused by socio-historical development. As the facilities of studies in educational-cognitive activity play the same role, as well as tools in production process, so, depending on the level of their development, optimum method of use, efficiency of education including its end-point depends substantially. That is why experts consider that introduction of computers in educational technologies is an event of the same weight, as the creation of textbooks with printing basis before [1].

II. REVIEW OF PROBLEMS AT PRESENT STAGE

Talking about the study of physics, we should say that a lot of electronic manuals presented on computer disks and placed on educational sites of Internet are lately created. Among them we should emphasize interactive electronic textbooks for secondary school, developed by the Russian

company "Physicon" (www.physicon.ru) within the project "Opened College" under the direction of professor of MFTI S.M. Kozel. It belongs to five of the best educational resources of Russia and is selected for budget-funded studies in 39400 schools of Russia. The textbook has network support that allows to modify it constantly and also to provide reverse link with user after official registration of CD code. It is mentioned at the same time, that the industry of development of electronic textbooks only begins to reform and requires systematic approach to creation of technology of electronic educational manuals.

As an analysis of electronic and printing information resources testifies, formidable searching work connected with the development of electronic facilities of studies; in particular physics is also conducted in Ukraine. It is also shown by great amount of publications of the appropriate subjects, which grows constantly.

On the modern stage it is talked more frequently not about computer schools, but about spreading of "interactive technologies", which provide a rapid adequate answer to the human's action and basis of which is made by working of information by COMPUTER.

This aspect of using of the computing engineering in an educational process is based on that concept, that computer is an instrument of information elaboration, and that is why it can strengthen mental abilities of pupils. Therefore, that

is not a problem - to acquaint children with the computer structure and to teach them how to use it, but to make their intellect more productive with the help of Computer.

III. ANALYSIS OF KEY PEDAGOGICAL METHODS AND MEANS OF MODERN EDUCATION

Informational educational environment is an aggregate of terms, which are instrumental in origin and development of processes informational educational co-operations between students, teacher and facilities of new information technologies, and also to forming of cognitive activity of student on condition of filling of components of environment (different types of educational, demonstration equipment, programmatic facilities and systems, educational-evident manuals, and others like that) with subject maintenance of certain educational course.

Today thousands of educational systems are created, however much of their general classification does not exist. Often the followings types of systems are selected:

- trainings, intended to fixing of knowledge, abilities and skills;
- cognitional, oriented to mastering of concepts and which work in the mode, near to the programmed studies;
- problematic studies, oriented to the studies mediation of solving educational-cognitive tasks and which will realize principles of indirect management;
- imitational and simulation;
- playing, in which a game is used in quality of the means of studies;
- testing and examination;
- reference-informative (databases and databank of knowledge, informational searching systems, dictionaries, and etc.).

Different technologies can be used for realization of ideas and principles of programmed studies in the educational systems, including computer facilities of developing studies (for example, electronic textbook) with "immersion" of student in an informative environment or design of real situations. The mixed systems, which combine various components are constructed with the purpose of upgrading the quality of process control of knowledge transmission (including from different groups - asynchronous and synchronous) [2].

A. Computerization of education

As we know, depending on the character of access there are one user, networking and multi-user environments. An electronic textbook will be effective in every computer in class, regardless of teacher and other students. Clearly, that at the use of such textbooks at lessons it is possible to pass to the higher stage of their application, using local nets. In this case it is possible to organize groups of children, to arrange educational competitions for them. It enables students to co-operate, discussing material. In the high-quality equipped class, a teacher can easily organize work

of class, when everybody works separately, in a necessary rate for him, and then to stop on obscure things, or to help those, who has difficulties with material. It should be noted that speed of perception of information is different for every child. This way it is possible to plan work of students to make them busy in accordance with the possibilities, as material is extended and contains additional information. With placing of textbook into Internet, new possibilities mentioned, will be opened at once.

The base of global process of social development is computerization of education. Thus, it must leave behind computerization of other directions of public activity, so long as social, psychological, generally cultural, professional pre-conditions of computerization of society are formed exactly here.

Computerization of education, in the wide understanding – the complex of social pedagogical transformations, connected with the satiation of the educational systems by informative products, facilities and technology, in narrow introduction in establishments of the educational system of informative facilities, which are based on a microprocessor technique, and also informative products and pedagogical technologies, which are based on these facilities. Computerization of education is a part of process of computerization of society, theoretical basis of which is informatics – system of knowledge, which concerns making, processing, storage, search and distribution of information in its most various aspects, in nature, society, techno sphere. It should be noted that contradictions between the collective forms of studies, characteristic for the class-lesson system, and individualization of studies, stimulated by PC are possible here. The second problem is credible diminishing of interpersonal contacts due to expansion of address to information, deprived of personality lines. The circle of problems connected with legal frameworks of distribution of information in the system of education is also important.

Conception of computerization of school forms starting positions of process, which begins, re-erecting on the basis of information technologies, determines a purpose, tasks, basic directions and stages of decision, and also financial resources.

Purpose:

- preparation of specialist to valuable life and activity in the conditions of informative society;
- complex re-erecting of pedagogical process, increase of its efficiency, transference of center of weight to self-education.

The purpose of pedagogical technology consists in practical realization of theoretical constructions in the educational process of the counted results. In other words, technology is appointed in an order to create and reproduce the actual products of this process. This science on the essence is search of truth, and technology is a concrete method of realization of truth in every educational material, on a concrete lesson or seminar. Thus, technology of studies is the applied didactics, namely theory of the use of front-rank pedagogical ideas, principles and rules of "clean science" [2].

The tasks of computerization of school consist in the following:

- operative renewal of educational information connected with development of the probed area of science, technique;
- receipt of operative information about individual features of everyone who studies, that allows to go near organization of studies and education more differentiated;
- mastering of adequate (fully proper) to scientific maintenance of studies and individual features of users of methods of presentation of educational information;
- receipt of information about effectiveness of pedagogical process, that allows to bring in necessary amendments to it operatively. In those tasks it is possible to select two aspects.

First is an informative providing of pedagogical process. It was always necessary.

However, today it must be spoken about the high-quality new level of such providing. On the one hand, every teacher, student, pupil must have an access to the practically unlimited volume of information and its analytical treatment, possibilities for the direct plugging in the informative culture of society; on the other hand – the operative receipt of exactly that important optimum provided both on a volume and on maintenance of information. Exactly this way promises overcoming of aspiration to squeeze in the compressed term a large educational job mix and confusion before plenty of educational tasks and narrow-mindedness of time. Possibilities for realization of the modern informative providing of pedagogical process are seen in creation of wide computer infrastructures with an output on external computer networks in the institutes.

The second aspect is the use of computer as an effective mean of direct studies practically by any educational discipline.

Computer possibilities are not limited by transporting of arrays of information which are entered into it. It can redo them as far as socializing with user. As a result new information is created, new knowledge is accumulated. To the extent of expansion of economic feasibilities of computer of their value in the informative co-operating with a human (by a teacher and student) grows. However, raising and change of aims of cognition, intuitional, creative, unrealized thinking, possible for human, is inaccessible for computer.

Let us count basic positive moments, connected with introduction of computer to the educational process [3]. The use of computer gives the possibility:

- to extend the methods of presentation of information, that allows to attract the additional mechanisms of its mastering and memorizing;
- to promote the level of motivation of educational process;
- to increase the amount of students, which are actively attracted in a process to adapt educational material in accordance with the level of concrete student;
- to extend the kinds of educational tasks and means of their solving;

- to change the control system of student's knowledge in a quantitative qualitative order, their ability to think, to create and solve tasks. Applying dynamic control, it is possible to control personal educational process in a flexible way with the help of computer;

- to encourage the forming of reflection of the student's activity. A "reaction" of computer to the student's action is the information about the actions of the student and promotes self-examination;

- to give possibility for less time to execute large part of educational (and not only) work, extending the limits of presentations of students about the modern world;

- to pull out to the teacher large requirements as to the specialist in his area;

- to carry out substantial influence on the management of educational process due to dynamic and complete information;

- at the same time to be the mean of studies and the mean of increasing of interest of students to the subject.

We can mention another important detail. At the traditional methods of control a teacher runs into certain difficulties. At writing control it is necessary to make individual tasks for every student, to outlay plenty of time on registration of these tasks. During the oral verification difficulties are expressed in that fact that simultaneously questioning only a small group of students is engaged, other, as a rule, are passive observers. Thus, difficulties which are tested by teachers at the traditional methods of control of mastering of knowledge can be partly or fully removed due to the using of facilities of the automated control – computer and supervisory programs.

Experience of introduction of the computing engineering in educational process can be summed up in such points:

- optimal age for systematic acquaintance with computer in many countries is considered to be 11-12 years;

- only on the first stages of computerization the main attention was paid to study of computer and programming languages.

- studies with the help of computer include for itself the use of the conversational mode for tutor work, implementation of various trainings exercises, calculations, exercises of creative character etc.

The next step becomes the using of the computing engineering as a hardware for solving of cognitive tasks of different sort on many educational disciplines.

Obviously, that introduction of computer facilities must not have the appearance of simple building in the traditional system of studies. It is necessary to break forms which became firmly established, to reconsider traditions. Thoughtless application of computer will only strengthen a tendency to formalization of process of studies, which eliminates the real mastering of bases of sciences in force of absolutization of generalizations in consciousness of personality and their isolation from reality. Therefore an output must be searched in the new constructing of maintenance and organization of educational- programme material, pedagogical activity of teacher and educational

work of a student. That means the use of computer possibilities in a design perceptibly objective world, logic of research and professional activity. The main thing is not "reading" by a Computer course, but to represent the very object at higher level in the educational process, transition from descriptive or analytical presentation of this object to the design of its substantial properties and by the principle of computer-aided designs. Only then by computer studies all way of ascent from abstract to concrete will be presented, that must reproduce educational-cognitive and pedagogical activity.

It is impossible not to take into account that the use of computer technique in educational aims can lead also to negative consequences. An impermissible admiration of computers without awareness of clear limits of their application in relation with development of personality, thought, consciousness, and afterwards to development of human culture.

Computer and computer technology cannot be examined as a panacea for the decision of all humanitarian problems. If education will lose a humanitarian aspect, it will unavoidably put society to risk to lose an opportunity of deep human contacts and relations. There is a danger, which consists in standardization of thought, which is conditioned by the knowledge from computer and ways of thinking of students. In fact, knowledge passed by computer facilities is often simplified or limited.

The analysis of basic pedagogical methods of modern education, based on computer and telecommunication technologies, shows that maintenance of pedagogical activity in the new educational system differs substantially from traditional [4]. It is connected with that fact that the center of weight at the use of new information technologies is gradually carried on the person, who studies, who builds actively his educational process, choosing a certain trajectory in the developed educational environment.

Conducting the analysis of sources, concerning NIT as facilities of activation of cognitive activity of students at lessons, it is possible to assure that re-erecting is tested by the different forms of studies, as presence of generous amount numerical, graphic and other visual material is reasonable which is expedient to present by computer. Computer takes advantage by its availability. It can help teacher to attain the maximal mastering of new material by students with less expense of time. There is possibility not only to illustrate quickly practical application, but also to conduct calculation for authenticity of that or other theoretical position [5].

The analysis of the state and prospect of improvement of method of studies of physics shows that introduction of computer technique in to educational process is a problem of our days. It stands as one of the progressive tendencies of education trends on the whole and physical education in particular. Thus, unlike educational cinema, a teacher remains the central figure of educational process, because he has an opportunity to lead the process of the reflection of information.

B. Electronic textbook

An important value at the use of computer technologies in educational activity has an electronic textbook.

For consideration of this problem, it is necessary to give determination of basic pedagogical concepts.

A textbook is a book, which contains bases of scientific knowledge of certain educational discipline in accordance with the purpose of studies, certain program and the requirement of didactics [6, 259].

A textbook must provide scientific quality of maintenance of educational material, quality, exactness, simplicity and availability of exposition, clearness in formulation of determinations of rules, laws, ideas. It must be written in exact and accessible language, to have distinctly allocated educational material according to sections and paragraphs; to contain illustrations, charts, pictures, selection of important material by font. Artistic design is also very important.

Structure of textbook:

1. Texts: basic, additional, explanatory.
2. Out of text components: vehicle of organization of process of mastering of maintenance; question and task; instructional materials, tables; inscriptions-explanations to illustrative material; exercises; illustrative material (pictures, maps, drafts, etc); vehicle of orientation (introduction, contents, bibliography).

After the character of reflection of reality, texts can be empiric (to represent facts, phenomena, events, to contain exercises, rules) and theoretical (to contain conformities to law, theories, methodological knowledge). Most school textbooks contain texts of both types.

After the basic method of exposition of material texts can be reproductive, problematic, programmable, and complex. Reproductive texts – structural, clear to students, are appropriate to the tasks of explanatory illustrative studies. Problematic text – is given in the form of problematic monologue. In programmatic text the maintenance is given by parts, and mastering of every informing block is checked up by control questions. Complex text contains certain doses of information, necessary for students to understand the problem, and the problem is determined according to the logic of problematic studies.

Text of textbook can be analytical or synthetic, built by a deductive or inductive method. With the exception of basic, there are additional texts which have a purpose to extend, to deepen knowledge of students in relation to the important components of maintenance of educational material (documents, historical certificates etc).

All questions and tasks of textbooks after the degree of cognitive independence of students can be divided into: reproductive and productive. Reproductive texts are questions and tasks, which require from a student the recreation of knowledge without substantial changes. Productive texts foresee transformation of knowledge, substantial changes in the structure of their mastering or search of new knowledge.

The table of contents of educational material in a textbook can be formed after: genetic (in a sequence in which it was formulated historically); logical (its exposition in relation to the modern logical structure of the proper science); psychological (taking into account cognitive possibilities of students) by principles. In most textbooks these principles interlace.

In the process of studies a teacher is oriented on a textbook, because it specifies tutorial programme, shows, what maintenance must be inlaid to the programmed themes, as it is needed to interpret the certain questions of the program and orients students in relation to the method of work. It is also important during home tasks preparation, review of material etc.

Material of textbook must be complemented by the additional information, because its maintenance is too concise and knowledge got by students only from it will be limited. Therefore, except for a textbook, additional material must be used.

General educational establishment works after educational programmes, textbooks, manuals which have the proper vulture of Department of Education and Science, and executes educational-educate tasks on every degree of studies in accordance with age-old features and natural capabilities of children.

An educational accessory, school appliances, material of which extends the limits of textbook, contain the additional, the newest and certificate information [6, 260].

Atlases, reference books, collections of tasks and exercises, dictionaries, reading-books etc. belong to this category of educational editions.

Textbooks and school appliances are instrumental in forming of skills, independent cognitive activity, self-control; they are the mean of guidance of cognitive activity.

An electronic textbook differs from the ordinary textbook by reading (computer reading). And it means that it is possible not only to make the electronic variant of school textbook, and to convert conservative text with pictures to interactive environment of cognition.

Consequently, electronic textbook – is a programmatic methodical complex which provides possibility to master independently an educational course or its section. It combines the features of textbook, reference book, book of problems, and laboratory practical work.

A traditional textbook is a book, which contains bases of scientific knowledge of certain educational discipline in accordance with its school programme. The study of material of textbook must provide mastering of knowledge in full, determined by the school programme of discipline, and the development of thinking. In this connection, educational material of textbook must be first scientific, formulation of concepts and laws must correspond to the modern level of science development. At the same time exposition of material must be clear and accessible for mastering by students and pupils. So, presence in the of pictures in such kinds of books, (like -schematized, schematic etc) is very important, because it allows to understand maintenance of concepts and laws [7]. This

remark is especially substantial for the study of physics, which operates concepts and laws of high level of abstract.

In modern methodical literature there is no only one look to maintenance of concept "electronic textbook" (in future ET) [1]. At the same time, being component of informatively educational environments, as well as traditional textbook with printing basis (TPB), it is the carrier of text data. However, methods of organization of educational information in ET can differ in high-quality from the methods of its organization in a traditional textbook.

This fact is connected in the first place with a number of reasons of TPB that have a limit of volume. TPB also does not allow plugging dynamic illustrations in its maintenance: during work with it, a pupil or a student has no possibility to operate dynamic visual aids.

Concerning ET, there are always possibilities of plugging of the different educational information into its maintenance. It allows carrying out the differentiated approach material during the study of new in a considerably greater measure, than during the use of TPB [8]. In case of using of ET there are more favorable terms for development of thought of pupils and students connected with the structure of the proper scientific theory. During the work with ET there can be attained development of process of cognition like the process of educational cognition, characteristic for science which is studied. In our case it is spoken about development of process of cognition in physics as science and its reflection in organization of educational material in textbook. Accepting into consideration the value of structurization of educational material in textbook, let us stop in detail on conformities to law of cognition in physics as developed natural science and on the structure of physical theory as product of this process of cognition.

C. Advantages of electronic textbook in the study of physical theories

Analyzing development of process of cognition in physics, A. Einstein marked: "All cognition of reality goes out from experiment and goes back to it... Exactly because Galileo had realized it, and especially because he proposed this truth to scientists, he is the father of modern physics and actually modern natural history in general" [9]. The follower of Galileo, I. Newton said about the quality of purpose of physics: "... to show out of the phenomenon two or three simple general principles of motion, and then find out how properties of all material objects follow from these simple principles" [10]. As we can see, the process of cognition in physics develops cyclic, so that it makes sense to talk about cognitive or gnoseological cycle: cognition in physics walks away from reality to clarification of maintenance of the most general acts, postulates, principles, and then goes back to reality, producing new knowledge about reality on the basis of these laws, postulates, principles.

As a result of realization of cycle of cognition, physical theory as the completed knowledge about the certain class

of the physical phenomena contains three functionally different parts – informational blocks of macrostructure of theory. For their denotation in scientific methodology there is no generally accepted system of terms to this time. We will take advantage of terminology, accepted in [11]. According to [11] a physical theory is formed in unity by its basis, core and conclusion cover (consequences of theory).

Basis of theory as a product of empiric cognition of reality in quality of components contains an empiric base, concepts and sizes. The empiric base of theory is well-organized system of the most substantial scientific facts, got by experimental way. Here belong, in particular, also fundamental physical experiments, namely: experiments of Galileo, Cavendish, Sterna, Ersted, Faraday, Hertz, Stoletova, Yung's experience of interference of light, experiments of Frenel of diffraction on the round opening and on the disk, determination of velocity of light, etc.

Regulation of scientific facts collection is carried out in a way of logical induction on the basis of comparison of properties of the separate phenomena, that allows to set the most general properties, inherent to the certain group of the phenomena, and to select these phenomena in a separate class, to overcome them by the defined notion with expressly certain maintenance. By such method, for example, the concepts of interference and diffraction of light were entered by Yung and Frenel at one time.

Let us notice that during forming of maintenance of concepts, only those properties and relations between properties, are taken into account, which hypothetically consider substantial for development of the phenomena of certain class. Consideration of substantial and argued abstracting from unimportant – idealization of the phenomenon is the starting point of construction of ideal model of the phenomenon. An ideal model allows giving integrity and unity to separate aggregate of facts, to build framework of the phenomenon at the level of his essence, as a result an empiric base acquires system character.

Taking into account the important role of ideal models in physics, the Nobel laureate S.G.Basov notices that "... physical science operates not real reality, but some of its idealization, so-called model, which includes the basic lines of the phenomenon which is examined when it is possible" [12]. A model is always more "poorer" than reality, however, what is important, it takes into account its principle sides. An ideal model completes the construction of basis of physical theory and is a foot walk between basis of theory and its core.

Very often ideal models are built not by inductive way ("from below upwards"), but deductive ("from above downwards"), and they are the product of logical transformations, which are tested by the core of theory. In this connection we will notice, that a geometrical model of light radiation, which is based on a basic concept "light ray" and which primitive was built by generalization of empiric facts (K. Ptolomey, In. Snell, Dekart), is a conclusion from more wide wave model (Yung, O.Zh. Frenel) basic concept of which is "light wave". In the process of development of physics maintenance of concepts and ideal models undergoes development, they are specified, limits of their

applicability are clarified, so, in an eventual account, limit of applicability of physical theory too.

Basis of theory is its descriptive part, its construction is completed by development of the system of concepts and sizes, adequate to certain class of phenomena, and their next application, for cognition of the phenomenon at the level of essence - by development of ideal model. Consequently, the construction of core of theory becomes possible "... which forms the system of general acts, shown in mathematical equalizations which determine connections between physical sizes, setting the change of the last in space and time" [13]. There are little amount of such laws (principles, postulates) in the core of theory, because "... primary purpose of physics – to give explaining to all physical phenomena on the basis of little amount of fundamental principles" [14].

A core of theory is connected with reality in two directions. At first, laws of core of theory are generalization of scientific facts of basis of theory and allow giving explaining to the features of flowing of the proper phenomena. Secondly, the laws of core of theory contain the most general information about flowing of the phenomena of certain class and can be used for the prediction of features of flowing of the phenomena, which was not included in the volume of consideration during the construction of basis. It means that the core of theory allows realizing the basic functions of theory – interpretation and prognostic. The main value of core of theory consists exactly in the last.

If the concrete phenomenon is recognized as a representative of some class of the phenomena, that is if the phenomenon is brought under some concept, taking into account the cores of theory of feature of flowing of this phenomenon in general acts, it is possible to get new knowledge about the phenomenon, to obtain information, practically meaningful for a separate person or society on the whole. Thus, the prognostic function of theory will be realized by the synthesis of general acts, which this class of the phenomena is subject, and features of flowing of the phenomenon, which is identified as a representative of this class. Such synthesis is carried out by logical deduction.

It is marked, that predominating of logical deductive deductions is the sign of the developed scientific theory. Moreover, it is emphasized, that thinking characteristic to modern science, scientific-technical thinking is built on logical deduction [15]. Thus, logical deduction provides the receipt of veritable knowledge, if the proper laws are applicable to this concrete phenomenon, and features of the phenomenon are clarified correctly and if these features are concrete values of sizes or connections between sizes, legalistically correctly taken into account in equalizations of general acts of theory.

Due to the construction of mathematical model of relation between properties of the phenomenon – formalized sizes and productive transformation of mathematical model – mathematical design in future is possible up to the receipt of necessary information about the concrete phenomenon, receipt of consequences from the core of theory, meaningful in, technological, ecological and

other cognitive aspects. The systematized aggregate of such conclusion consequences forms the cover of theory.

Schematically development of process of cognition during the construction of physical theory is represented on the Fig. 1.

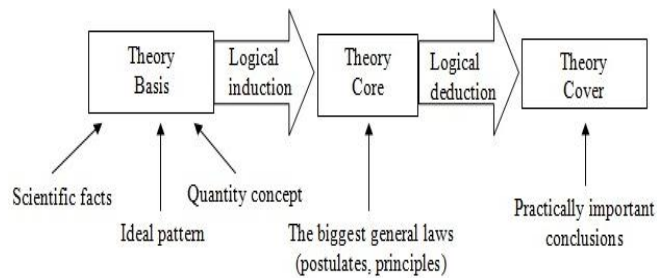


FIGURE 1. Development of process of cognition during the construction of physical theory.

When psychologists mark that the basic sign of scientific theoretical thinking is realization of logical deduction ("an ascent from general to concrete" [15]), in relation to functioning of scientific theory in physics (physics as scientific theory) it is necessary to notice that here we can talk only about displacement of accent in cognition on logical deduction, while logical induction always remains integral part of cognition. On this occasion we find from A. Einstein: "It is exceptionally impossible to get new knowledge facilities of logic about the real world – every cognition of reality begins by experience and ends with it" [16]).

IV. CONCLUSIONS

Making a conclusion, we will underline that when we speak about development of naturally scientific thinking of pupils and students, obviously, in the first place it is mentioned about forming of structure of their own thoughtful activity, adequate to the structure of process of cognition, characteristic for natural sciences in general and for physics, as the most developed natural science, in particular.

It means that educational material of textbook of physics must be structured in accordance with the structure of physics as science with the purpose to enable the person who studies physics to monitor conformity of process of cognition in natural sciences, to master these conformities, to form ability to apply conformities of process of cognition in own cognitive activity. In this connection it is very important concordance of structures of the generalized methods of cognitive activity during the study of new material according to textbook or lecture and during its application in the process of solving the tasks and implementation of laboratory practical work.

In this connection methodology of science E. V. Il'enkov, analyzing the problems of studies of students and students to natural sciences, underlines that: Individual

development of student can and must be carried out on the same chart, as the process of historical development of science" [17]. Well-known psychologist V. V. Davidov agrees with him: "... a problem is refract the principles of dialectical thought and express development of educational material in technology, in the methods of forming of concepts, in facilities of organization of own thoughtful activity of those, who studies" [15].

Taking into account this fact, we should mark that during creation of textbook, including electronic, educational material must be structured in accordance with the structure of theory of the proper class of the phenomena. In this relation the use of proper visual aids is important on beginnings of iconic, and consequently schematized and schematic, which allows conducting schematization and code of the phenomenon, without what in subsequent a conscious operation by ideal and mathematical models is impossible [7].

However, main attention in textbook should be paid to forming of the most general acts (principles, postulates) of core of theory. At the same time textbook must contain the enough consequences of theory, meaningful in cognitive, technological and other aspects. The receipt of such consequences, where it is possible, must become the article of own cognitive (prognostic) activity of students in quality of the requirements of the proper educational tasks. Let us notice that clarifying of such consequences – elements of theory cover, meaningful in a practical relation, strengthens interest of students to studies, forms their motivational sphere.

We should also underline that study of physics pursues a double purpose: as a result of study of general physics a student must master knowledge of both world view and polytechnic character. It means that the proper electronic textbook must plug in the volume all that information which is needed for effective creative work of teacher of physics at secondary school, and also that methods of serve of information during the proper adaptation must be applicable by a teacher. In this connection we should avoid bulky legalistically mathematical expositions, and to give advantage support on schematic visual aids, meaning that in many cases such output with application of powerful mathematical vehicle will be carried out in the course of physics of high school [18, 19].

Taking into consideration that during long decades achievements of the Ukrainian physicists and foreign physicists of the Ukrainian origin were concealed or ignored because of the national belonging of the Ukrainian physicists with the purpose to annihilate national memory and development of national consciousness. It is expedient to include into electronic textbook information of the proper maintenance, which can be adopted from [20, 21, 22]. Certainly, with this we should not forget that physics of Ukraine developed in the context of development of world physics, and Physicists-Ukrainians carried out the researches in unity with the physicists of other nationalities of world scientific association.

Structure of educational material of electronic textbook of physics, paying of the proper attention all elements of

structure of scientific theory, including in its maintenance practically meaningful consequences of theory, reflection of materials of history of development of physics, will promote, to our opinion, development naturally scientific thinking, mastering of knowledge of educational and educate character, important in general (to the world view) and professional relations.

In methodical literature the question of expedience of the use of those or other educational systems is often discussed. In fact they can assist development of personality of student, his capabilities, to give him new knowledge and abilities. A lot of teachers worked on the problems of individualization and differentiation of studies. The use of informative educational environments opens the ways of realization of these problems, as there is possibility of selection of software according to personal interests, and also according to psychological features, possibilities and capabilities of students. Organization of studies has more individual character, so as directed on achievement of development of knowledge and creative abilities of student.

Practice of the use of electronic manuals and textbooks in the system of controlled distance education showed, that they provided a primary didactics purpose – self-education.

Problem of transformation of information in to electronic kind, meaning creation of electronic informative resources, - is a problem which needs to be examined from two sides. At first, creation in an electronic kind searching-certificate vehicle, namely descriptive system of information in an electronic shape, that we name an electronic catalogue, and replacement of paper catalogues. Secondly, creation of full text arrays. In Ukraine it is needed to create a virtual library. Then every listener of distance education will be able address to it and to get a concrete certificate, document, see him on the screen, to read. Its creation - is a protracted and laborious work. Information which will be kept in this library will consist of two levels.

The first level is information as electronic magazines, facilities, which do not have multimedia hard copies, analogues in a printing shape.

The second level is information which is the reflection of printed information. Traditionally the depositories of such information in a printed shape are libraries, informative centers, where books, brochures, abstract, magazines are kept. A problem of transfer of this information in to electronic form is not basic; many years are spent for it.

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