Electrotechnics didactics in the computer technologies use

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Abstract-- **The didactical issues of electrotechnics teaching in the conditions of the active computer technology use are considered. The peculiarities of theoretical material acceptance seminar and laboratory practical training and individual work developments are distinguished. The methodology of discipline structure forming is suggested.**

NOWADAYS electrotechnics didactics as the scientific school and ad the educational discipline can be regarded as fundamental. The second scientific-technical revolution expanded the sphere of the electrotechnical science achievements use. This was also caused by the intensive introduction of computer technologies.

Classically "The Theoretical Electrotechnics" as the educational discipline is logically accomplished discipline with the teaching aim – to give an understanding and realization of electrotechnical processes, and to give their physical explanation. Thus to teach how to electrotechnically think. To achieve this aim one must combine the theoretical researches with the physical experiment. This combination is completed by the use of the scientific electrotechnical results.

The basic elements of the teaching aim achievement are given on the picture 1.

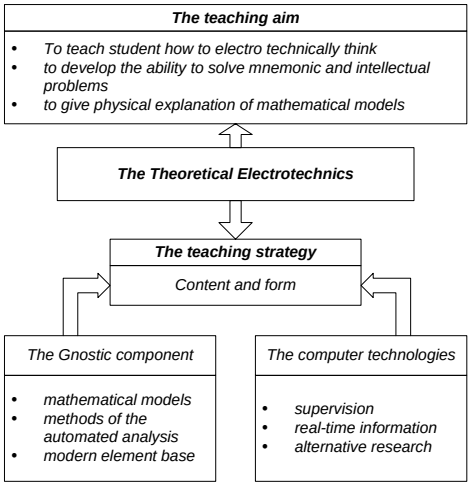

Fig. 1. The basic components of the teaching aim.

We must notice that the choice of some teaching methodology is defined by the available means which have to ensure the realization of the Gnostic component. On the present-days stage exactly the computer technologies provide this realization – to connect "The Theoretical Electrotechnics" with the scientific research.

It's no doubt that the computer technologies have the great influence on the teaching process. Thanks to their didactics properties the notion of the teaching process has been changed. But the use of the computer technologies show the number of questions that mist be solved. The teaching process computerization began with strictly algorithm disciplines and began to spread on other disciplines. And for some disciplines that had a positive effect, for other – negative. This fact was confirmed by the practice in such countries as USA, Japan, and Canada. That's why nowadays we don't have the unique methodology of computer technologies use, and the teaching elements are substituted by the researches elements.

But the teaching process is the conservative process. That's why it is important to save the structure of discipline and the presence of two basic elements of the teaching process - the book and the teacher. And because of this appear a question about the correlation between the "classical" and "computerized" forms of teaching. Especially it concerns the forming of teaching strategy of "The Theoretical Electrotechnics" as the fundamental for electrotechnical specialties. And in the most cases we see the duality of these two forms of the teaching process (picture 2).

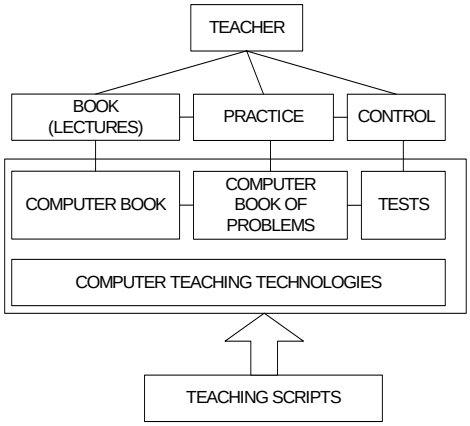

Fig. 2. The duality of the computers technologies teaching forms.

In this discipline the computer technologies are used to support the traditional forms of teaching. But this have no effect during the electrotechnical disciplines, because the computer technologies are not use as the whole. And this fact leads us to reconsider the methodology of teaching as this discipline at the

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whole as the some themes, and to change the psychological-didactics parameters of the electrotechnical problems.

We think that the role of traditional forms of teaching must be reconsidered. If we have the classical form "lecture –practice", lecture plays the leading role. But in the process of using the computer technologies we propose such form of teaching "lecture – practice – lecture" (picture 3).

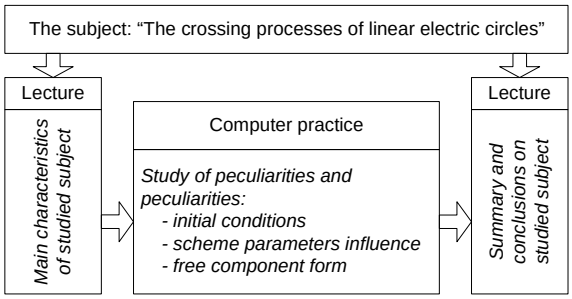


Fig. 3. The distribution of the training material between lecture and practice.

In such a structure the main accent is on the computer practice. For the didactics properties of the computer technologies student can more widely realize the peculiarities of the studied electrotechnical processes. The functions of the lecture (teacher) are to manage and correlate, that is to define the volume of the practice. This form is the most effective in the teaching of the dynamic processes, which are characterized by time dependences and require the many-sided supervision for understanding. For seminar practice the computer technology use leads to developing electrotechnical problems with new didactical parameters, thus to introducing element of rectilinear problems, but the form of computer laboratory practice is not unique.

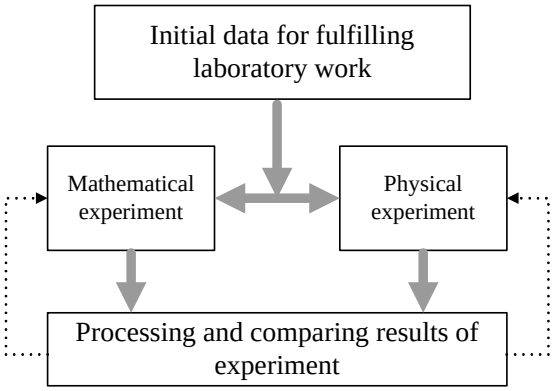
The pedagogy of the high school defines the laboratory practice as the main component of the teaching process. It is the basic stage of the realizing of the essence of the electrotechnical processes in the electrotechnical disciplines. In the "classical" form this practice provides the practice abilities available during constructing the electrotechnical schemes and using the measuring devices.

Now the applied programs for the imitation of the laboratory works and the computer systems are widely spread. This computer programs are oriented on laboratory practice conducting on electrotechnical or radio engineering type. For the functional properties we can distinguish such systems as *Electronics Workbench*, *PLATO-4*, *CACHOC*, *АДОНИС*, etc. The comfortable interface provides the great opportunities for researching electromagnetic processes. But these opportunities are only for researching and for stating the final result, not for realizing the essence of the phenomena. The most spread teaching systems are: *PLATO-4, Costos, Link Way, Qust, Ten Core* and etc. They are characterized by the good interface but require the special training. Besides these systems don't have the teaching aim, because these systems are oriented on the process of receiving the abstract information, which don't realize the main aim – to teach student to think.

Most of these systems have such main components: the library of electrotechnical system elements, the library of applied programs, the bloc of computer simulation and the subsystem of the interface. The forming of electric schemes and mathematical models of their elements is carry out by the dialoged form "question – answer" (*CACHOC*) or by the proposed menu (*Elektronics Workbench*). Thus student mustn't have the deep preparation, only some skills how to work with such system. We must notice that the modern teaching systems are supplied with the programs of computer simulation, which have great opportunities on the didactical view, especially on the view of the visual expectance of information.

The practice of use such systems have shown that the teaching effect during the studying of "The Theoretical Electrotechnics" is insufficient. Absence of control on each stage of the realizing studying process doesn't provide the achievement of the teaching aim. Thus it is reasonable to use these systems on the level of specialist's or master's training.

On the initial level of the studying of "The Theoretical Electrotechnics" is more reasonable to use hybrid laboratory practice (picture 4).



Picture 4. The structure of the hybrid laboratory practice.

In such hybrid practice the laboratory work is done in two correlated stages: the stage of physical experiment and the stage of computer simulating. Because of such combining the psychological component is provided – the confidence in the accord results of computer simulating is produced, and at the same time the confidence in the atomized system of analysis and designing, that is of much importance for the expert in the sphere of electrotechnics. Besides this the computer didactics devices allow to expand the diapason of the researches of the influence of the changing of parameters of the model on the dynamic of the process.

The important stage in getting the teaching aim is the student self-instruction. On this stage the professional thinking is forming. When using the computer technologies the question about content and form of the self-instruction is very important. We can say that elaborated packages of used applied programs are directed on realization of programs, which were present in the traditional teaching. In this point of view

the most systematic method is in program for self-instruction on the base of package "EUPEKA the solver", made by firm BOPL AND INS. This program is oriented on different works and is supplied with the library of applied programs. Recently the computer system analysis of electric circles are widely use. These programs are directed on investigated work and final results, thus they have very few teaching elements, especially on the didactics view.

The disadvantages of the mentioned forms of using computer for self-instruction are non-efficient use of those methodical-didactical devices, which provide current informational technologies to the process of teaching, and insufficient level of the proposed problems – both of form and content. Thus it is important not only to discharge student from computation work and receiving the final result but to skillfully combine the elements of problematic teaching with the imitational computer abilities for forming the professional student intellect.

To solve this question it is necessary to change fundamentally not only the form, but the content of self-instruction. It is caused by wide didactic abilities of modern computer teaching system, which essentially influences on changing the methodology of execution of self-instruction. The main aspect for forming the structure of self-instruction is the object-oriented approach. The work mustn't shatter on separate fragments, but have to solve the correspondent engineer practical problem, basing on the material of chapter. Thus study of every chapter of the discipline is followed by doing theoretical-applied problem, and simultaneously it is the stage of checking learned information. The realization of such problem structure as the separate program module for discipline as a whole or for some of its chapters needs special bank of reference theoretical-methodical information and library of applied programs. Thus more efficient is the realization of some chapters in form of automatic system teaching while using computer technologies. In such case study of every chapter is logically followed by self-instruction, which allows highlighting key points of learned material.

The important role in forming the content of self-instruction plays teacher-script writer, who combines methods and elements of problematic teaching with imitational computer abilities. This requires deep understanding of teaching discipline, high methodic qualification and pedagogic experience. Exactly teacher defines the main aspects of student self-instruction, forms the professional intellect of student and abilities to solve theoretical-applied problems. Simultaneously, while using the abilities of computer didactics, the illusion of independent problem solving has been achieved and this fact draws student's attention to work with computer and made some psychological effect.

CONCLUSION

So the mentioned in paper didactic-methodic trends to discipline "The Theoretical Electrotechnics" realize its teaching aim while using computer technologies. Combination of traditional form of presenting educational information with didactic abilities of computer technique ensures the psychological compatibility, and also emphasizes the leading role of teacher in training process.