Valentina Shvets

Electronic resource “Electrotechnics” as a tool of students’ educational activity management

Pedagogika Szkoły Wyższej nr 1, 107-117

2015

DOI: 10.18276/psw.2015.1-07

Valentina Shvets
National Academy of Pedagogical Science of Ukraine

Electronic resource "Electrotechnics" as a tool of students' educational activity management

Introduction

The requirements to the learning process declared in the Bologna Declaration[1] and Bruges Communiqué[2], stimulate the search for innovative approaches in the education. The transition to the innovative technology change forms, methods and content of training. Conducting the research of the educational process in vocational colleges, assigned in this context by the Ministry of Education and Science of Ukraine, the Institute of Professional and Technical Education has shown that technical education are poorly equipped by the educational literature on general technical cycle, including textbooks of electrotechnics. The latest edition of the "Electrotechnics" textbook have been printed in 2002[3], that means it wasn't published for over 10 years. However, the rapid development of information technologies, the emergence of new types of devices (digital, fiber-optic), new types of light sources (LEDs) require updating semantic component of the textbook on electrical engineering. This lack, together with the need in using new methods of the educational information pre-

---

[1] *The Bologna Declaration of 19 June 1999*, www.magna-charta.org/resources/files/BOLOGNA_DECLARATION.pdf (24.09.2015).

[2] *The Bruges Communiqué on Enhanced European Cooperation in Vocational Education and Training for the period 2011–2020*, http://ec.europa.eu/education/policy/vocational-policy/doc/brugescom_en.pdf (24.09.2015).

[3] A.M. Gurzhii, A.M. Silvestrov, H.I. Povorozniuk, *Electrotechnics with Fundamentals of Industry Electronics*, Forum, K. 2002 (in Ukrainian).

sentation consistent with the information society condition, were the reasons to create a new electronic resource on electrotechnics.

The aim of the article consists of presentation of a new electronic resource "Electrotechnics with Fundamentals of Industrial Electronics" in the MOODLE platform for distance education, which is based on new approaches to the management of educational activity.

Methodology

The electronic resource "Electrotechnics with Fundamentals of Industrial Electronics" has been developed according to the principles of leading theoretical achievements of pedagogy, such as theory of interiorization (J. Piaget[4]), theory of the mental actions formation (P. Halperin[5], N. Talyzina[6]), algorithmic approach to learning (L. Landa[7]), frame approach (M. Minsky[8]), mind mapping (T. Buzan[9]), cognitive approach (D. Siemieniecka[10]) and contains significant improvement of didactic approaches such as individually differentiated approach and student-centered approach. Such didactic principles as scientificity, visibility, aesthetization of education also have been improved during implementation in the resource.

---

[4] J. Piaget *Structiralizm*, „Wiedza Powszechna", Warszawa 1972.

[5] P. Halperin, *Psychology as an Objective Science*, Publ. House Russ. Acad. Educ. Moskwa 2006 (in Russian).

[6] N.F. Talysina, *Management of the Learning Process*, Moskow State Universuty, Moskwa 1975 (in Russian).

[7] L. Landa, *Algorithmization in a Teaching*, Education, Moskwa 1966 (in Russian).

[8] M. Minsky, *A Framework for Representing Knowledge*, Massachusetts Institute of Technology, Cambridge 1974.

[9] T. Buzan, *Mind Mapping software from Tony Buzan*, http://thinkbuzan.com (24.09.2015).

[10] D. Siemieniecka, *Od konsumentów do twórców informacji*, w: *Edukacja a nowe technologie w kulturze, informacji i komunikacji*, red. D. Siemieniecka, Wydawnictwo UMK, Toruń 2015.

General description of the resource

The resource is designed for 55 learning hours and consists of the following parts: "Theory", "Didactic unit", "Video", "Materials for laboratory work", "Sources" and "Glossary". The theoretical part contains the following sections: "Introduction", "Fundamentals of Electrostatics", "Direct Current and Direct-Current Networks", "Electromagnetism", "Alternating Current and Alternating Current Networks", "Electric and radio measurements. Electrical devices", "Transformers. Electrical machine", "Electrical apparatus", "Vacuum devices", "Ionic (discharge) devices" (fig. 1).

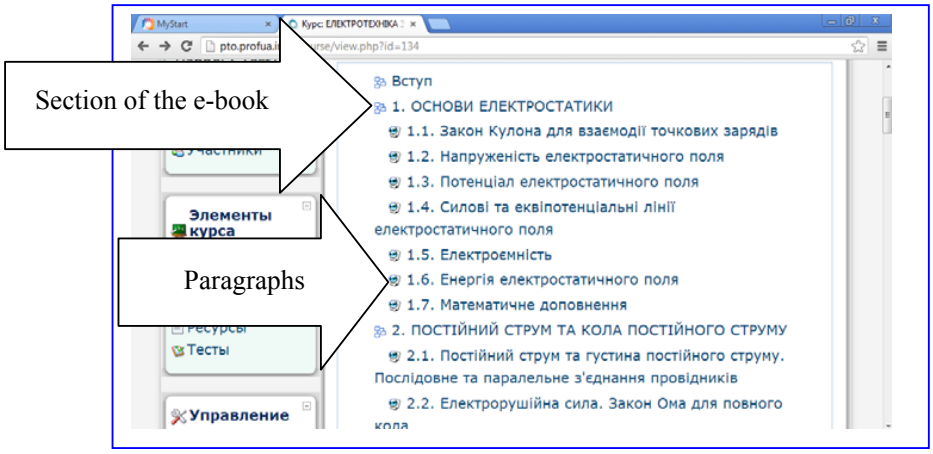

Fig. 1. Screenshot of the resource content

The part named "Didactic unit" consists of three sections: "Test Questions", "Corrective problems", "The tasks for the self-control". The test questions have been created using the standard MOODLE platform set of the test questions and include feedback reaction in the platform commentary for right or wrong answers (fig. 2).

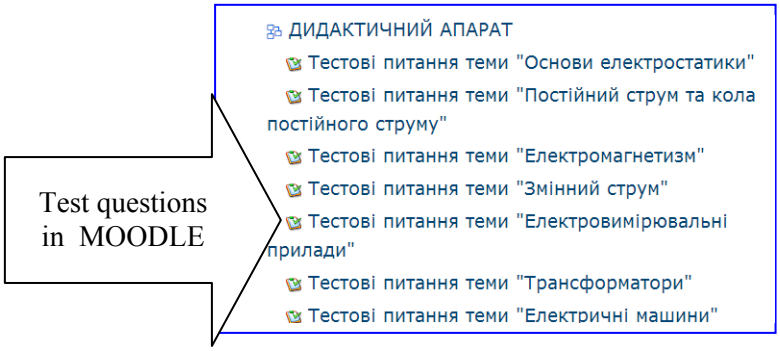

Fig. 2. Screenshot of the test content

In the tasks of corrective unit the author's hard feedback technology (copyrighted by author's certificate[11]) was used, the realization of which assumes creation of additional modules to the MOODLE platform written in JavaScript programming language. According to this technology the platform MOODLE performs additional training of student if he/she answered incorrectly in the process of solving problems of this unit (fig. 3).

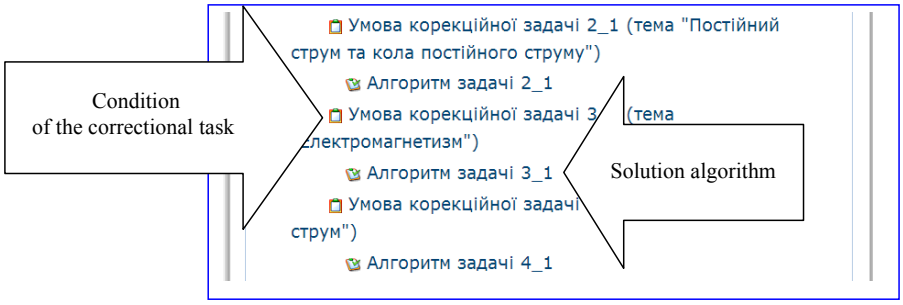

Fig. 3. Screenshot of the problems with hard feedbacks technology application

Algorithm of task solution consist of steps, which are formed in the form of test questions MOODLE. The platform MOODLE generates the hypertext comment, if student gives an incorrect answer. The activation of this comment leads to opening of theoretical window for a reading (fig. 4).

[11] V.D. Shvets, *Copyright Certificate* 45753 Ukraine, 25.09.2012 (in Ukrainian).

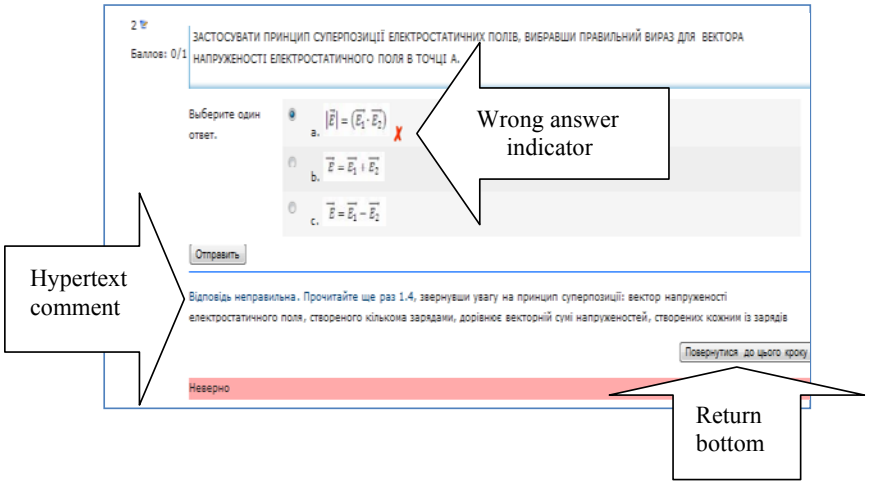

Fig. 4. Screenshot of the wrong answer common with hypertext comment

The platform MOODLE passes of the student to the next step, if the student answers correctly (fig. 5).

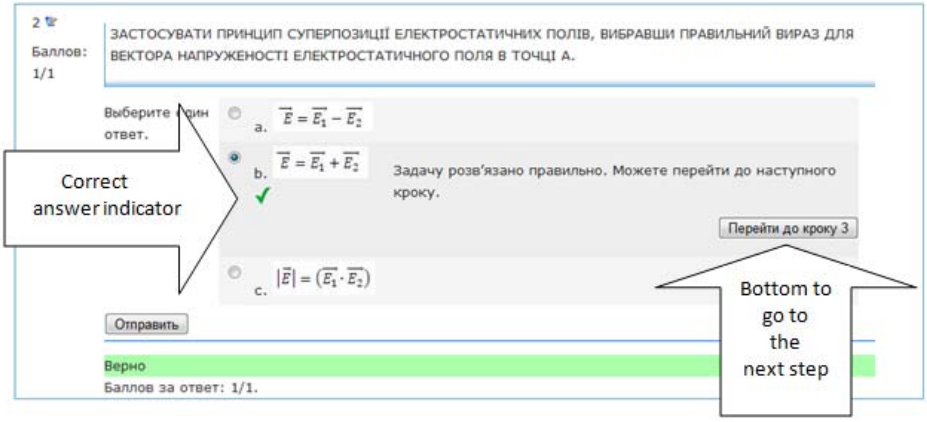

Fig. 5. Screenshot of the correct answer common with hypertext comment

It should be noted that standasrt platform tools do not allow to organize such an algorithm: for its creation was performed the additional programming of the platform MOODLE by JAVA (O. Vetchynkin).

The part “Didactic unit” has been completed also by the tasks for self-control, which consist of the problem conditions and answers to them (fig. 6).

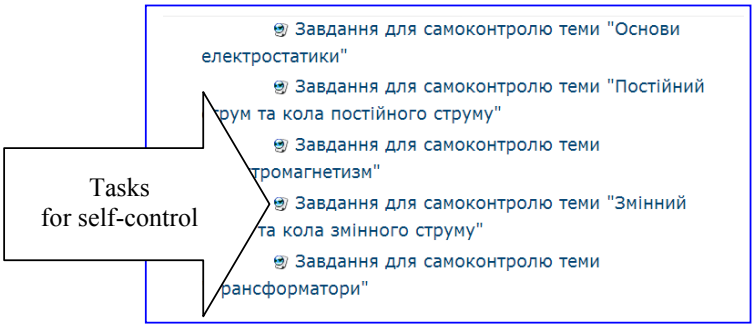

Fig. 6. Screenshot of the tasks for self-control

The part “Video” includes the following video: “Production of the optical fiber”, “Series circuits”, “Parallel circuits”, “Capacitors”, “Curie point of the ferromagnetics”, “Electric motor”, “What is the magnetic field?” (fig. 7).

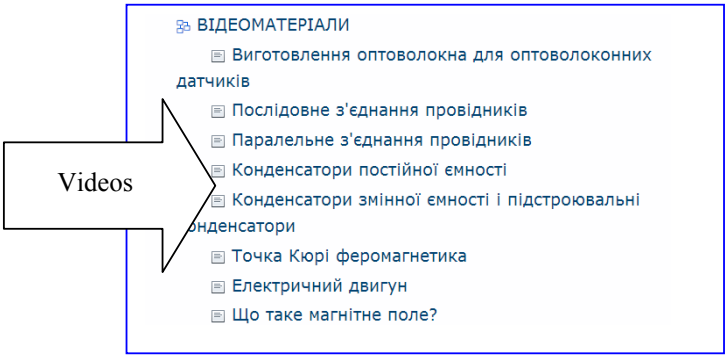

Fig. 7. Screenshot of the video section

The part of the resource titled “Materials for laboratory work” includes recommendations for laboratory works according to the content explained in the theoretical part. These recommendations also accompanied by a video assembly of electrical circuits.

Methodological features of the resource

The scheme of the interaction between different parts of the electronic resource is shown on fig. 8.

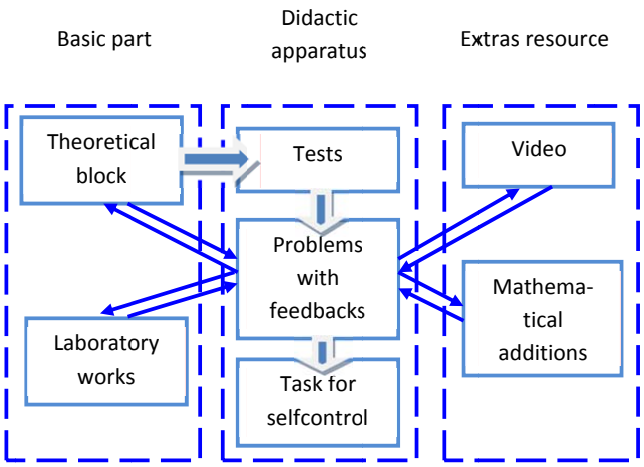

Fig. 8. The structure of the resource "Electrotechnics with fundamentals of industry electronics"

This scheme of the interaction indicates that the learning process is not linear. Each student has his/her own cognitive trajectory, which is similar to the non-linear structure of the rhizome proposed by postmodern French philosopher G. Deleuze[12] [12]. In this sense, a learning process becomes nonlinear. Electronic resource written for one specialty, can be used as a learning resource for other specialties (Tab. 1).

Table 1. Correlation between content of the electronic resource and training programs for different specialties

Specialty	Program coverage [%]
Installer of electrics	70
Installer of drywall constructions	80
Installer of technical equipment	80

[12] G. Deleuze, *Empirisme et subjectivité*, Presses Universitaires de France, Paris 1973.

The work with the resource begins by study of a theoretical content, which is followed by formation of the skills for problems solving and by laboratory work. The material of laboratory work is closely intertwined with the theoretical study material, tests and corrective tasks, which form the preliminary stages of the laboratory work.

Formation of skills for problems solving comprehend the use of advanced didactic system, consisting of multiple choice questions, corrective tasks and tasks for a self-control:

1. The test questions are aimed to test the student's understanding of the nature of the basic concepts and laws of the electrical engineering. The student has three attempts to answer test questions. For every wrong attempt to answer, platform counts penalty points of 0.1 value.
2. The corrective tasks are aimed to form the practical skills in solving problems, to identify the gaps in students' knowledge profiles and to correct them. Each task implements corrective algorithmic approach whereby the solving process is divided into several steps, which are formulated in the form of question posed by platform MOODLE. If the student incorrectly answers the test question of the algorithmic step, he/she can use the help options to learn the appropriate theoretical material section immediately. After the knowledge gap has been filled student returns back to the algorithmic step and answers the next test questions of the following algorithmic step. In such way the strict feedback between the student and distance learning platform is implemented.

The tasks for self-control allow to develop the problem thinking and review the course material conceptually, containing the problem condition and its solution. The tasks for self-control are preceded by the laboratory work and constitute the final stage of the learning section.

Methods of the resource application to the learning process

Methods of the resource application in the classroom depend on technical devices present for use:

1. In the case when the lesson is conducted in a computer lab, allowing an access to the PC for each student, the lesson follows all traditional steps: the updating of the knowledge, the explanation of a new material, the checking of a learning level, the conclusions. The use of the electronic textbook does not change the order of the lesson, but alters the form of students' educational activity. Explanation of a new material can be made using the theoretical material of the resource together with viewing the video content on PCs. The lecturer plays a coordinating role in this process and the role of a consultant. To check the level of assimilated knowledge students are asked to answer the test questions related to the topic, using MOODLE platform. Conclusions after the lesson are easily formulated on the basis of the control, the distance learning platform highlights the test results of each student.

If the classroom is equipped with a multimedia projector or multimedia board only, the lecturer has the opportunity to apply the elements of Harvard technologies, consisting of a scheme of learning according to which students prepare in advance a material of the resource to the appropriate lesson at home using their own PC. The lecturer explains the obscure places of the electronic resource content with the use of a multimedia projector.

Conclusions

The variety of the ways to manage educational activities of students characterizes the present state of the educational thought development. According to the different authors' propositions there are the following methods of this aim achievement: the structuring of educational information[13], the new forms of knowledge representation[14], the programming of training activities[15], and different types of educational assessment[16].

---

[13] V.A. Jakunin, *Psychology of the Management Training and Cognitive Activity*, Publ. House of Leningrad Univ., Leningrad 1986 (in Russian).

[14] *Ibidem*.

[15] N.F. Talysina, *Management...*

[16] S.V. Duplik, *Models of Pedagogical Testing*, www.dupliksv.hut.ru/pauk/papers/testmodel.html (24.09.2015).

The electronic resource "Electrotechnics with Fundamental of Industry Electronics" uses new methods for management of the students' training activities, such as hard feedback technology, a new form of didactic system, new ways of interaction between theoretical and practical material in laboratory work. This electronic resource has been created on basis of a teaching of the electrotechnics in Poland[17].

The electronic resource developed and implemented a number of important didactic principles: the principle of scientificity of knowledge is implemented through actualized information about the methods of a current measuring, description of a modern point of light sources and modern magnetic materials; the principle of visibility was implemented through the introduction of links to online video resources; the principle of differentiation of learning has been implemented with a special form of feedback between students and the educational system – the proposed differentiation consist in the ways of the problem solving and not in the differentiation of the subject complexity, as previously. Thus, the use of the MOODLE platform with additional programming modules allows creation of a new type of electronic resource for distance learning.

Keywords: *electronic resource, electrotechnics, distance education, management of educational activity*

PLATFORMA KSZTAŁCENIA NA ODLEGŁOŚĆ – „ELEKTROTECHNIKA" – JAKO NARZĘDZIE ZADANIOWEGO ZARZĄDZANIA EDUKACJĄ STUDENTÓW

Streszczenie

Szybki rozwój systemów e-learningowych i wynikający z niego problem sprzężenia zwrotnego między studentem a nauczycielem platformy kształcenia na odległość wymaga stymulowania skomputeryzowanego procesu edukacji oraz poszukiwania innowacyjnych rozwiązań dydaktycznych. Zastąpienie nau-

[17] R. Kurdiel *Podstawy elektrotechniki*, WSiP, Warszawa 1997; H. Rawa, M. Siwiński, *Zbiór zadań z podstaw elektrotechniki*, WSiP, Kraków 1995; K. Jaracz, J. Zielińska, *Laboratorium podstaw elektrotechniki*, Wydawnictwo Naukowe WSP, Kraków 1995.

czyciela platformą kształcenia wymaga wsparcia nauczycieli w ich pracy wiedzą i umiejętnościami związanymi z odpowiednią reakcją i zachowaniem w tym systemie nauczania. W artykule przedstawiono nowy typ sprzężeń zwrotnych między studentów i platformą Moodle, która zarządza studencką działalnością edukacyjną. Opracowana technologia pedagogiczna została wdrożona za pomocą nowych zasobów elektronicznych pod nazwą „Elektrotechnika z Podstawami Elektroniki Przemysłowej", który jest rekomendowany przez Ministerstwo Edukacji Ukrainy (№ 1/11-8959 z 26 czerwca 2015 roku).

Słowa kluczowe: *elektrotechnika, zasoby elektroniczne, kształcenie na odległość, zarządzania działalności edukacyjnej*

Tłumaczenie na język polski Paula Wiażewicz-Wójtowicz