2012 International Conference on Future Computer Supported Education

Electronic Support for Students Basic Training in Graphics with Black Board Environment

Elena Usanova, Aidar Khamzin*

Kazan National Research Technical University (KAI), 10, K.Marks str., Kazan, 420111, Russian Federation

Abstract

The description of the basic training process in graphics of engineering students in e-learning environment based on Black Board is given.

© 2012 Published by Elsevier B.V. Open access under CC BY-NC-ND license. Selection and peer review under responsibility of Information Engineering Research Institute

Keywords: basic training in graphics; CAD-systems; Black Board software; monitoring

1. Introduction

Active training information technology implementation in the educational process, aimed at creating a meaningful professional competence of the design activity, leads to changes in methodology, scientific-theoretical and technique aspects for preparing students in the graphics. Durable acquirement of design skills on the basis of 3D-modeling and ensuring the future accredited base training of specialists, in accordance of their specialization, required greater efficiency and effectiveness of the educational process by introduction of information technology with use of training info graphical representation (TIGR) based on multimedia and acquisition of designing experience with CAD-systems [1]. In this regard, the use of electronic means to training support to improve the quality of training in graphics, development and implementation of electronic educational resources (EER) is one of the most important areas of scientific and methodological activities of technical universities. At the same time, habitual text and graphic EER changes to interactive multimedia

* Elena Usanova. E-mail address: shateilko@mail.ru. Aidar Khamzin. Tel.: +7-9196221413. E-mail address: khamzin@kai.ru.
EER, requiring an adequate means of support and management of the educational process.

2. Organization of Training in Graphic in E-Learning Environment

The main innovative characteristics of training support electronic means are:

- interactivity, providing a significant expansion of self-learning work by the use of active-doing learning forms and allowing the monitoring of learning achievements of students;

- providing the educational process of electronic educational products, of declarative and procedural type for bachelor and master degree training.

Different types of electronic educational products make it possible to use the modern computer didactic tools, psychological and pedagogical developments in the educational process, allowing intensifying the learning process and improving its quality, by the learning process control by means of electronic support. The didactic potential of the integrated training in graphics with using TIGR and CAD-systems based on Black Board software allows us to create an information&communicative learning environment that forms the design and engineering competence, involving a significant amount of self-learning activities and allows to improve the quality and the intensity of the learning process.

Electronic means of the educational process support of Black Board software allows us to automate key steps in technical graphics training—from the presentation of educational information to the control of knowledge and pulling result marks, which makes it possible to optimize the learning process, both in qualitative and the quantitative criteria.

Black Board software provides a wide range of functions:

1. Interaction of students and teachers with the ability to:
   - work and track user activity on forums, blogs, journals, chat rooms;
   - have virtual classes with the use of audio and video data streams;
   - co-work with a virtual blackboard;
   - interact via mobile devices.

2. Recording and analysis of educational activities indicators with the ability to:
   - create of monitoring events to assess the knowledge, skills and experience of practical acquaintance with CAD-systems of students;
   - manage pools of ready monitoring events;
   - automatic and semiautomatic test results checking of learners’ monitoring events;
   - analysis of the individual trajectories of students within the discipline;
   - reporting on various areas of educational activity.

3. Control of the formation and structure of the training material, adjusting of methodologies and forms of its presentation, depending on the monitoring results, etc.

All this information allows us to create e-learning environment with the possibility of effective and quality remote learning, provided that the educational products will match both the traditional evaluation criteria and the quality criteria of the above mentioned functions. Core teaching tool for information & communicative learning environment of Black Board is interactivity.

CAD / CAM / CAE Center of Kazan National Research Technical University named after A.N. Tupolev together with teachers of the Descriptive Geometry & Machinery Drawing Department for support of training in graphics for students of all forms of education works in creation of e-support for the course of “Engineering Graphics” for the Black Board software. Stages of the electronic learning product creation are shown in Figure 1.
The content of the course of “Engineering Graphics”, forms of interactivity in the learning process and test forms are shown in Figure 2.

Fig. 1. Stages of creation of e-learning resource

Fig. 2. The content and interactive forms in the course of “Engineering Graphics”

The organization of the training modules (TM) structure for the course of “Engineering and Computer graphics” for the Black Board software in the study of the integrated use of GSPI and CAD-systems in base graphics preparation is shown in Figure 3.
Knowledge in descriptive geometry in the technical graphics, theoretical in essence and encyclopedic in width of coverage, was the main goal of the educational process for a long time, but now it becoming the means. Aiming at developing professional competencies of graduates of design activities, willingness to effectively organize their internal and external resources to develop the practical skills of theoretical material using and experience in CAD-systems use for a successful career dramatically enhances the role and practical importance of the training in graphics. The organization of the electronic support in Blackboard environment facilitates the implementation of this goal. In this paper, training materials and materials for monitoring of the design skills level are focused on the engineering profession. Work of the educational process model with electronic support in Blackboard environment can be illustrated with a key topic in the Engineering Graphics — “Projection Drawing” — TM "Images on the Drawing" (Fig. 4), which consists of the training elements (TE): TE no. 1 — Views; TE no. 2 – Sections; TE no. 3 — Sectional Views.
**Target indicators.** Rating — plan of the discipline gives a certain number of grades and defines types of tests for passing of this module in accordance with the quantitative and qualitative target indicators. Objective quantitative indicators of the level of theoretical material retention are the results of testing by graphical tests that are automatically recorded in the records system. Quality indicators, identified by the results of the graphic works, the degree of self-dependence for their making, etc., are also entered in the forms of reports. Total Grades are results of the target indicators achievement, which are components of the design and graphic skills. The level of their achievement is monitored, measured, estimated quantitatively and gives rise to the necessary correction.

**Preparation of educational material.** First of all we formulate learning objectives focused on achieving results, determined by the level of the design and graphic skills component retention, formed in the discipline. Then an adequate control is constructed. Only after this the training material is prepared to help students solve the problems raised in the module. For example, the declarative part of the training material for the module “Images on the Drawing” was prepared with the use of TIGR, rational methods of tasks solving in a graphical CAD-system COMPASS3D are illustrated with video, while working in the classroom — with the media board. It is important to represent gradual graphic images, oriented to the imagery memory (visual, auditory or motor, etc.) in the TIGR and showing its natural connections, with compliance of ergonomic and psycho-pedagogical standards and requirements.

The form of graphic representation of training information, technology and the quality of their performance are of great importance for the perception of information, retention and learning. Beginning in 1999/2000 with reprography, the authors together with information technologies development, used different options and forms of graphical tools— Power Point presentations, flash-animation, etc. Recently, CAD-systems have been used built-in software for animation. But over reliance on technical innovations, special effects, rich saturated colors on the screen should not detract from the main purposes of teaching and learning to switch attention to them.

**The activities in the learning process.** There is individually, in small groups, training with compulsory result — to be taught. The learner position: firstly, to learn with a teacher or self-dependently with the help of electronic support and then move on to the active independent work. In distance education, carried out by means of computer telecommunications, chat-classes and web-forums can be used.

**The role of the teacher.** The teacher acts as a consultant (tutor) and a source of information, as well as the organizer and the ‘controller’ the process of teaching and self-learning of students.

**The principle of individuation.** Modules can be customized for individual training, the student can choose the means of teaching, (slides, reading an electronic textbook, printed materials, etc.). Creation of the route map helps for the development of independent work of the module studying for individualization of a modular learning. An example of a route map sheet for studying of the module “Images on the Drawing” with TIGR is
presented in Table 1.

<table>
<thead>
<tr>
<th>Types of activity</th>
<th>Terms</th>
</tr>
</thead>
<tbody>
<tr>
<td>The study of educational material using e-learning product on the basis of media:</td>
<td></td>
</tr>
<tr>
<td>TE no. 1 – Views, TE no. 2 – Sections; TE no. 3 – Section views.</td>
<td></td>
</tr>
<tr>
<td>Training and testing on a computer on the TE:</td>
<td></td>
</tr>
<tr>
<td>TE no. 1 – Views, TE no. 2 – Sections; TE no. 3 – Section views.</td>
<td></td>
</tr>
<tr>
<td>Independent work:</td>
<td></td>
</tr>
<tr>
<td>Manually with the technical drawing making;</td>
<td></td>
</tr>
<tr>
<td>Execution of the drawing with the help of the teacher or independently in the CAD-system using videos and a pool of exercises (5–15 tasks) for training</td>
<td></td>
</tr>
<tr>
<td>Outcome monitoring: graphic works on the total module content</td>
<td></td>
</tr>
<tr>
<td>Creative tasks</td>
<td>On request</td>
</tr>
</tbody>
</table>

Retention of knowledge and testing. The estimate indicators for the level of retention of design competencies components are:

- self-test in the theory with the use of graphics tests;
- inspection tests;
- graphics tasks for self-fulfillment.

The volume and structure of the modules provide the control and correction of the level of retention. Control tasks are made to determine the level of learning, retention of knowledge and skills, diagnostic difficulties of assimilation. In this module, automated control of the theoretical part of the module “Images on the Drawing” is done using graphical tests. The proposed tasks are the tests of the first level (recognition, differentiation, classification), are a means of objective control of special knowledge on the TE and at the same time, perform the training function: student analyzes the technical graphics of engineering facilities. A distinctive feature of the tests is as follows [2]:

- tests use the graphical information;
- tests have no distracters. As the graphic information is a very replete, distracters should not overload and clog the operational (working) memory of the student with wrong graphical information. It is, moreover, should not clutter up the long-term memory of the student;
- it is asked to select the correct answers to the questions for all tests. When tracking on graphics tasks with the professional context, mental operations of analysis, synthesis, comparison, abstraction, generalization, classification, systematization are brought on.

Functional and substantive validity, certainty and unambiguity meets the tests of this type and allows us to check the degree of component of design and engineering skills formation in a particular TE. The completeness of coverage of all right decisions is estimated in processing.

Checking of the acquisition of practical experience in CAD-systems use is executed by fulfillment of the independent graphic works in the on-line mode.

3. Conclusion

The simultaneous large-scale testing of students of all branches of the University, held in early June, 2011 confirmed the high performance level of e-training support system in graphics in Black Board environment and the possibility of operational management of the educational process considering the monitoring results. The authors continue to work on further development of educational and information exchange opportunities for the implementation of didactic possibilities of information and communication technologies for training is
graphics.

References