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Development Principles of the Pedagogical System Aimed at Bachelor Training Based on Modern Information Technology

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ABSTRACT

Modern education is aimed at training competent specialists, which requires modernizing the training process by implementing innovative technologies, especially information technologies. Information technologies allow quickly accessing necessary data, which speeds up the training process. This paper deals with issues related to training bachelors of transport for using information technology. The study offers the system of bachelor training for using information technology. The authors analyzed and substantiated the information-related disciplines, identified their setbacks and the necessity of using IT tools in the academic process of the university. The results show that using information technologies improves the level of education significantly. Students were found to be more interested in learning. Information technologies allow holding online conferences, which gives students the opportunity to share experience, discuss relevant issues, and seek ways to solve them. The results of the experiment showed that the group that trained according to the suggested methodical complex based on information technologies improved its level of professional competence by 25%.

KEYWORDS
pedagogical system; information technology; organizational and technological activity; advanced technologies; abilities and skills (KAS).

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Introduction

Education and training are the two parallel and interconnected processes in the pedagogical activity. Pedagogical activity is a specific kind of socially useful activity of adults, deliberately aimed at preparing the younger generation for life in accordance with economic, political, moral, aesthetic and other societal objectives (Meirgul et al., 2016).

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The subject of pedagogical science is the process of upbringing and education of the entire person. As A.S. Makarenko notes, this process is carried out on each square meter of land. However, apart from pedagogy this object is relevant for many other sciences, both applied and basic, each of them finds its subject in this object: psychology - mental processes, physiology - physiological processes, and cybernetics – the control processes. Pedagogy is related to the study of strictly applied aspects of human education and training: the creation of man-made educational systems, which are called as pedagogical systems. Pedagogy is based on various scientific data, but it does not transform into these sciences, being based on its subject - the pedagogical system (Makarenko, 1978).

Different systems include their relevant elements, processes and their interactions; therefore, it is possible to speak about their structure and functions. The system, which is responsible for educational functions, is called the pedagogical system.

Conscious and purposeful creation and improvement of the pedagogical system is the main duty of a university teacher.

Today, the problem of the educational system is considered by many researchers involved in the pedagogical studies. The development of pedagogical systems (PS) was carried out by different scholars, such as V.P. Bespal'ko (2008), Y. G. Tatur (1989); structural components of their studies reflect all functional connections of the pedagogical process.

According to V.P. Bespal'ko "pedagogical system is a combination of factors, conditions and interactions in which the pedagogical process are carried out" (Bespal'ko and Tatur, 1989). He immediately offers the structure of the pedagogical system and highlights the interrelated elements:

1) The purpose of specialist training;

2) Student (students);

3) The content of training and education;

4) Didactic process as a means of fulfilling the pedagogical tasks;

5) Teachers or technical training means, which perform their pedagogical activity;

6) Organizational forms of pedagogical activity.

The authors interpret the pedagogical system in the following way: "The pedagogical system presents the socially determined complex of actively interacting participants of the pedagogical process, as well as the spiritual and material factors, aimed at the formation of personality capable of both self-development and the development of the surrounding reality".

The high-quality higher education is achieved through intensification and interactivity, which becomes possible by using information technology. The introduction of information technology in bachelor training greatly facilitates and speeds up the transfer of large amounts of rapidly changing knowledge-related information flow, previous and modern technological expertise. (Hamish Macleod, 2016; Hamilton, 2013; Boonen, 2014).

Modern higher education is defined as the process and the result of purposeful formation of specific knowledge, skills and methodological culture, as

well as as comprehensive training of specialists aimed at their preparation for innovative technological activities by means of relevant content, methods and teaching techniques. Speaking about the latest training technologies, their active search occurs in terms of educational system reforms in the developed countries of the world (Report to the European Commission, 2014; UNESCO, 2011).

Distance learning belongs to the present state-of-the-art computer-information technology. Distance learning (DL) is a set of educational services provided by a specialized educational environment at any distance from the students. The use of DL technology and tools in the training process of higher technical educational institutions is reflected in many research papers (Hamish et al., 2016; Hamilton, 2013). DL includes the elements of full-time, part-time, and night-school classes based on information technology and multimedia systems. Modern telecommunications and electronic media overcome the shortcomings of traditional forms of learning, while retaining all their advantages. Both domestic and foreign scientists were engaged in DL studies (Fry and Ketteridge, 2008; Laurillard, 2011; Simon and Pleschova, 2012).

New technologies and models also include the credit-modular system of educational process organization (Simon and Plescheva, 2012). Modular education successfully combines features of the problem, active and student-oriented education. The credit-modular system provides improved asseessment of student knowledge and skills, student research skills with due regard to the individual work component.

During the last decade, worldwide requirements to the higher professional education are formulated exclusively in terms of competencies (Fry and Ketteridge, 2008; Simon and Pleschova, 2012). The competence-based approach presents a set of general principles related to the goals of education, selection of its content, organization of educational process and result assessment Brown and Bimrose, 2014). Development of competencies becomes the direct result of educational activity in terms of the competence-based approach. Competence presents a set of interrelated personal qualities (knowledge, skills, work methods), defined with respect to a certain range of objects and processes, required for effective and productive activities in relation to them (Savvides, 2014).

The use of computer technology provides instant student-teacher and teacher-student feedback, generates positive learning motivation. The use of information technology and artificial intelligence with a view to automate management of education systems is the most expedient tool, as evidenced by research works provided both by the domestic and by foreign scientists (Sergeev, 2013).

In particular, certain studies consider issues related to the introduction of smart components into the learning management systems (Gabitova et al., 2015; Sergeev, 2013). The introduction of information and telecommunication technology is considered in a number of papers (Hamish et al., 2016; Hamilton et al., 2013; Bayne, 2015). Cutting-edge information technologies increase the students' interest in education significantly (Boonen, 2014).

In developed countries, such as the USA, Germany, and Great Britain, education actively uses Internet-based technologies and multimedia training programs to optimize the learning process (Savvides, 2014; Brown and Bimrose, 2014). Multimedia conference are held to improve the professional competence of students, which allows sharing experience and involving young specialists in professional activities (Gabitova et al., 2015). In addition, interactive technologies made cooperative education more accessible thanks to websites, which enables students to share opinions, engage in dialogs, and discuss relevant problems. This procedure has become a new form of self-education and self-organization (Macdonald, 2009). The problem is that post-Soviet countries, such as Kazakhstan, have an outdated insufficiently reformed educational system, which makes it so that students learn with scientific and applied tools that are irrelevant nowadays. Therefore, the implementation of information technologies will improve the competence of prospective specialists significantly.

Thus, the use of information technology in the learning process is an important direction in the development of modern educational system.

Aim of the Study

To develop an IT-based pedagogical system.

Research questions

How does an IT-based pedagogical system affect the educational process?

Method

The methodological framework of this research included the postulates of the dialectical-materialistic philosophy regarding the theory of knowledge, the leading role of activity in personal development, and the dialectic unity of theory and practice, as well as methodological concepts of competence development in the educational system.

The purpose of the research necessitated the use of a set of complementary methods, including:

- Theoretical methods: study and analysis of special philosophical, psychological, pedagogical, scientific, and methodological literature on the studied problems; analysis of academic documents, general theoretical methods of analysis and synthesis.
- General logical methods. Study and generalization of pedagogical experience on the studied problem, conceptualization of educational practice. Application of methodological provisions, determined by the information paradigm and the theory of self-organization.

The experimental program was implemented at the E.A. Buketov Karaganda State University. The program included 103 students.

Data, Analysis, and Results

Generally, the task of training can be viewed as a sequence of the following tasks: diagnosis, interpretation, planning, and design. In order to solve these problems, one needs to develop a set of models, which should include the teaching

model, the student model and the explanation model. The teaching model provides solution to such problems as teaching strategy planning, training design, and adaptation to the needs of a particular student. The student model taken together with the teaching model forms the basis of the training systems adapted to the needs of each student. The explanation model is used to explain solution of interpretation problems in the learning process. Providing detailed explanations, it reflects the logical connections between the training modules, etc.

With regard to the theoretical model of readiness, the authors of this study developed a pedagogical system aiming at the development of bachelor readiness for using information technology. (Figure 1).

The objectives of individual stages of the proposed pedagogical system are interconnected and have a common goal - training bachelors of transport for using information technology in the organizational and technological activity (hereinafter OTA).

The tasks of the proposed pedagogical system are:

- Development of basic knowledge and skills related to bachelor readiness to use the IT tools;
- Creation of a theoretical database of specialized knowledge and skills;
- Realization of scientific and creative potential of students in the area being under consideration.

Stages of the pedagogical system:

Stage 1 (basic) aims at the formation of the initial interest of bachelors of transport in the professional activity subject, as well as basic knowledge and skills required for using the information technology.

Stage 2 (integrative), which implies creating the theoretical database of specialized knowledge and skills, formation and development of students' personal motivational basis, constituting motivational, informative and activity components related to training bachelors of transport for using the IT tools in OTA.

Stage 3 (creative), which aims at the implementation of scientific and creative potential of students in this area of activity; deepening motivational attitude to activities related to the use of IT tools; improving general and applied skills in working with students; acquisition and understanding of professional experience.

Analysis of the teachers' experience of teachers draws attention to the problems associated with the selection and systematization of relevant information for the students in the context of transition to a competence-based approach in education as well as with regard to the student-centered training of the future specialists (Benassi et al., 2014). Modern information technologies offer a wide range of options in relation to this approach to education: electronic distribution of educational material, real-time communication between students and their teachers, on-line libraries and other educational resources.

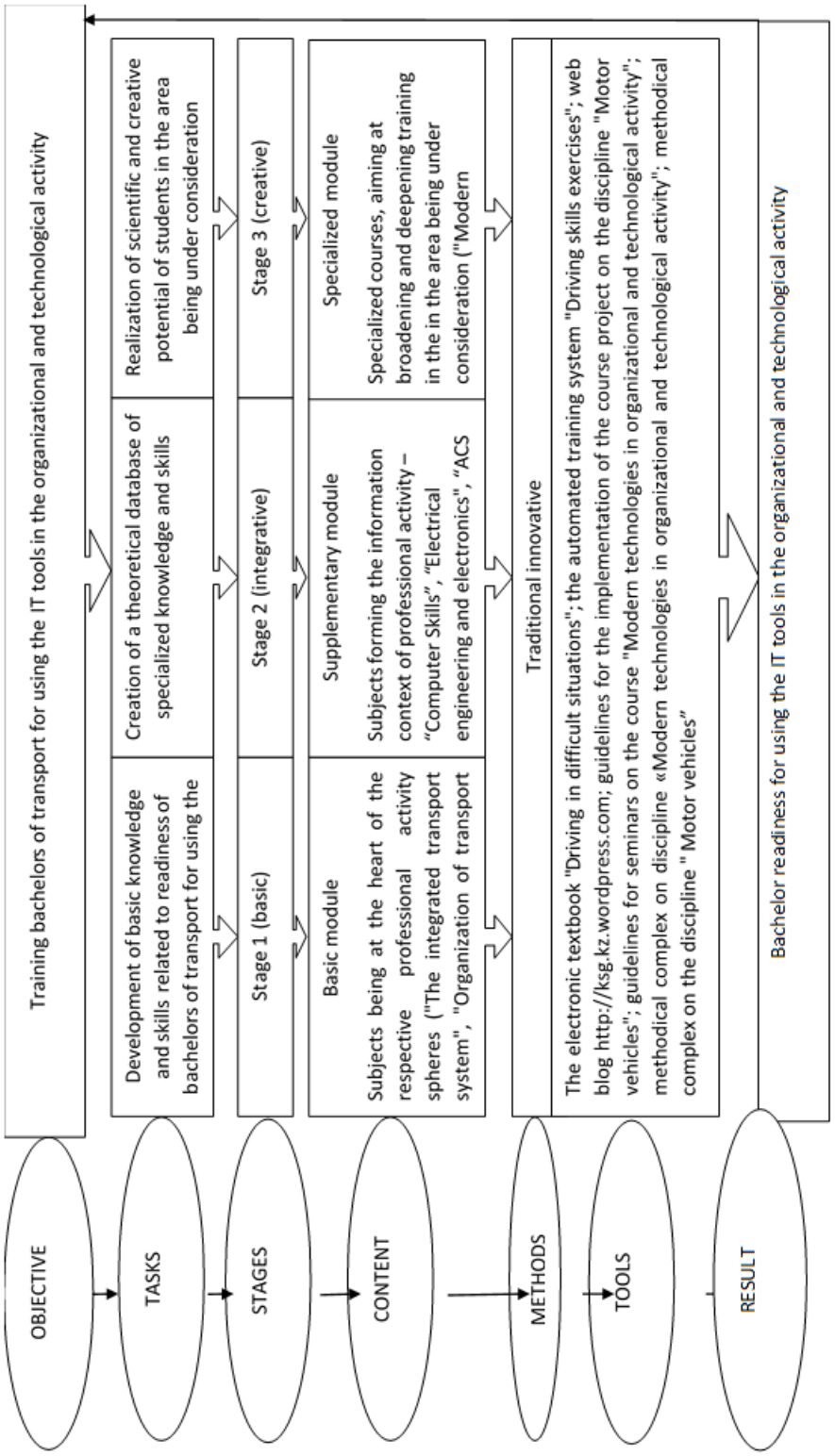

Figure 1. Pedagogical system aimed at the development of bachelor readiness for using the IT tools

Discussing the IT support of the educational process, one should note some of the most used software tools:

- Electronic textbooks, reference books, encyclopedias, manuals;

- Computer presentations. These products facilitate teachers' work, especially when dealing with extensive lecture material;

- Video materials. These tools are used as video tasks, situational problems or their solutions;

- Applications. Using mathematical techniques required for solving problems in the field of computing expertise is a cumbersome and time-consuming process. The use of appropriate computer applications reduces the computation time by 10-15 times;

- Training programs and systems. Their use in the academic process implies computer simulation of real processes, along with increase in the number of training tasks;

- Simulation software. These tools can substantially facilitate improvement of human abilities within the relevant areas;

- Virtual reality systems (virtual laboratories). Their advantages imply the ability to model specific processes, which appears fundamentally impossible in vitro;

- Testing (verification) programs. Their advantages include saving time during current academic performance rating, objective assessment, the possibility to perform individual time planning for each answer, along with the improved teacher's work in terms of analysis and correction of errors.

The content of training was developed by using modular approach, which is widespread in domestic and foreign practice. The authors intend to clarify their understanding of the module "organizational and methodical interdisciplinary structure, which represents a set of themes (sections) from various disciplines required for mastering one specialty, and provides interdisciplinary connections of the academic process" (Yegorov et al., 2005).

Modular organization of the professional training content is based on the consistency principle, involving systematic content, i.e. the required and sufficient knowledge (thesaurus), which is vitally important for the existence of the training system being under consideration.

The structure of the pedagogical training system includes substantial groups of modules corresponding to the three successive stages related to development of readiness for using the IT tools.

The model structure is formed by the following groups of modules:

- Basic module, which includes subjects being at the heart of the respective professional activity spheres ("Vehicles", "Integrated transport system", "Transport and traffic management", "Industrial organization and enterprise management", "Technology and mechanization of loading and unloading" "Transport logistics", "Licensing and certification basics", "Transport systems and structures design", "Cargo and commercial work basics";

- Supplementary module, which includes subjects forming information context of professional activity - “Computer skills”, “Electrical engineering and electronics", “ACS (transport)”.

- Specialized module, which includes specialized courses "Modern technologies in the organizational and technological activity", "Motor vehicles" that broaden and deepen training in the area being under consideration.

After passing this module, the student should have:

knowledge of the origin of innovative technologies; distinctive features of various technologies; interaction specifics of information technology; theoretical foundations of the information technology; the main types of the IT tools; the means of study, etc.

Skills: good command of information technologies; use modern technologies in OTA.

The core element of the considered approach related to the model of readiness formation is presented by a group of modules corresponding to the third training stage of bachelors of transport related to the use of IT tools. Its structure is presented by the specialized courses "Modern technologies in organizational and technological activity", "Motor vehicles".

This module should be viewed as a supplementary scientific and theoretical basis of relevant special knowledge and skills that make up the substantive and procedural components as regards training bachelors of transport in using information technologies. The implementation of course content in a common training model creates conditions for formation and development of student personal motivational basis for the formation of readiness to the relevant type of pedagogical activity.

The specialized course "Modern technologies in the organizational and technological activity" provides the possibility to supplement the list of the required organizational and technological knowledge in the field of modern information technology, to search for the most appropriate forms, methods and techniques of training, to form knowledge and skills required for using the IT tools.

This discipline is represented in the structure of the working curriculum as the specialty “5B090100 – Organization of transport, traffic and transport operation", as a discipline and course chosen by students, set by the university in a series of subject-oriented disciplines. In accordance with the above curriculum, the length of the course "Modern technologies in the organizational and technological activity" made 45 academic hours (1 credit), out of which class exercises, made 30 hours and 15 hours were allocated for student independent work under the teacher’s guidance. Exam is the final form of control. The discipline is included in the fifth semester of the third year of study.

The distribution of hours between different forms of academic activities is presented in the course schedule of this project.

Table 1 provides a course schedule of the specialized course "Modern technologies in the organizational and technological activity."

Table 1. Course schedule of the specialized course "Modern technologies in the organizational and technological activity"

Item No.	Topics	Academic hours		
		Lectures	Seminars	Independent work
1	2	3	4	5
1	Introduction. Course objectives and tasks. Course content.	1	1	1
2	Modern transport technologies: laser, impulse, diaphragm, rotary, information and nano-technologies. Robotics. Fields of application.	2	2	2
3	Transport information technologies.	1	1	1
4	Information flows in transport systems and their interconnection with the global system of information transfer, storage and processing	1	1	1
5	Transport communication systems	2	2	2
6	Algorithms for efficient operational decision-making.	1	1	1
7	Hardware-software systems, devices and equipment	1	1	1
8	Automated control systems (ACS) in transport	1	1	1
9	Information Security. The use of hardware and software protection in the organizational and technological activity.	1	1	1
10	Automated training systems and programs in the field of road safety	2	2	2
11	Defensive driving as the road safety basis	2	2	2
	Overall:	15	15	15
	Total:	45 hours (1 credit)		

The content of the specialized course is determined by lectures, practical classes and independent work of students with their teachers. Lectures form the knowledge required for designing the technological process at an early stage, and practical classes form the system of technological skills.

The general system objective is presented in detail on the object level in the following way:

Complex objectives of studying the specialized course "Modern technologies in the organizational and technological activity":

1. Formation of comprehensive perception of modern technologies in students.

2. Formation of the system of knowledge in the field of theoretical foundations of modern technology and the information theory in students.

3. Development of student skills required for using modern IT tools and techniques related to the technological activity.

The authors specified the subject-oriented objectives of the specialized course «Modern technologies in the organizational and technological activities» as follows:

1. Promoting the development of student practical skills in using the IT tools in training bachelors of transport.

2. Development of the student abilities of planning, modelling and adjusting the learning process related to training bachelors of transport taking into account individual features of students; search for the most appropriate forms, methods and techniques of training bachelors of transport in terms of their professional duties.

After studying the specialized course, students should:

- be familiarized with the course tasks, the role of the subject in the system of specialist training for the upcoming activities, scientific and theoretical foundations related to training bachelors of transport by means of the IT tools and modern technologies as an equal component in training bachelors of transport.

- know: tasks, stages and logic related to training bachelors of transport based on using the IT tools in their professional activity; requirements to the selection of technologies, taking into account individual characteristics of students; forms, methods, techniques and tools used in training bachelors of transport for their further professional activity through the application of IT tools; pedagogical conditions of student interest to the profession; set of abilities related to professional activity.

- be able to: use the educational content and IT tools in training bachelors of transport for their professional activity; modify the techniques and operations in accordance with the objectives of training bachelors of transport for their professional activities as well as the individual abilities of students.

Here is a brief summary of the developed lectures:

1. “Introduction. Course objectives and tasks. Course content”. This lecture deals with the state of modern technologies, theory of information, and with the use of information technology in the training process.

2. “Modern transport technologies: laser, impulse, diaphragm, rotary, information and nano-technologies. Robotics. Fields of application”. The objective is to familiarize bachelors of transport with the existing modern transport technologies and fields of their application.

3. "Transport information technologies". This lecture deals with application and role of IT tools in the organization of transport services, systems and types of transport communications.

4. "Information support in transport". This lecture deals with collection and use of information related to traffic flows.

5. "Information flows in transport systems and their interconnection with the global system of information transfer, storage and processing". This lecture deals with improving transport efficiency by automating monitoring and management of vehicles by means of global navigation satellite systems NAVSTAR and GLONASS.

6. "Communication systems in transport." This lecture discusses issues of transport management systems, monitoring of moving objects, alarm systems, control systems of specialized transport using digital communication networks and cable TV.

7. "Algorithms for efficient operational decision-making". The objective of this lecture is to expand the understanding regarding the use of computer programs in OTA.

8. “Hardware-software systems, devices and equipment”. This lecture aims at the development of skills related to working with computer systems used in the organizational and technological activity.

9. “Automated control systems (ACS) in transport”. This lecture deals with the structure and the ACS basics.

10. “Information Security. The use of hardware and software protection in the organizational and technological activity”. Main tasks: learning basic components of information security, traditional and non-traditional methods of information protection; development of skills related to information security in OTA.

11. "Automated training systems and programs in the field of road safety”. The main objective of this topic is to explore the automated training systems, and to develop skills related to work with automated training systems and programs.

Specialized course "Motor vehicles". This course provides the possibility to supplement the required knowledge, skills and abilities related to the mechanisms, components and assemblies of modern motor vehicles.

The specialized course "Motor vehicles" is presented as a basic discipline in the structure of the working curriculum in the specialty 050901 – “Organization of transport, traffic and transport operation”. According to the working curriculum, 90 hours (2 credits) were allocated for the course "Motor vehicles", out of which 45 hours – for classroom work and 45 hours – for independent work of students under the teacher’s guidance. Exam was determined as the final form of control. This discipline is included in the fourth semester of the second academic year.

Course schedule of the specialized course "Motor vehicles" is provided in Table 2.

Lectures, practical classes and independent work of students with their teachers determine the content of the specialized course. Lectures form the required theoretical knowledge as well as high requirements for manufacturability, reliability and efficiency, aesthetic qualities, and more specifically - road safety provision in different operational conditions. Practical classes form a system of technological knowledge and skills of vehicle design and the ability to use conventional methods of detecting malfunctions and methods of their removal.

Table 2. Course schedule of the specialized course "Motor vehicles"

Name of the topic	Lectures	Seminars	Independent work
Introduction	1		
1. ICE theory	5	2	4
2. ICE construction:	6	3	12
- crank mechanism	1		2
- gas-distributing mechanism	1	1	2
- cooling system	1		2
- lubrication system	1	1	2
- feed system of carburetor ICE	1		2
- feed system of diesel ICE	1	1	2
3. Vehicle electrical	4	2	3
4. Transmission mechanism	5	3	16
- clutch	1	1	4
- gear box	1	1	4
- cardan drive	1		4
- rear axle	1	1	4
5. Steering	2	2	2
6. Brake arrangement	4	2	2
7. Frame, body and mounting	4	1	6
Total	30	15	45

Complex objectives of the specialized course "Motor vehicles":

1. Development of comprehensive perception of modern motor vehicles in students.

2. Development of the system of knowledge in the field of road safety under different conditions of their operation in students.

3. Development of student skills related to working with units and systems during movement within a wide range of operating conditions and processes occurring in the engine.

After studying the specialized course, the students should:

- be familiarized with manufacturability, reliability and efficiency, aesthetic qualities and requirements and especially - of the road safety provision in different conditions of vehicle operation.

- know: the basic data and specifications of cars; the principal features of the gasoline and diesel internal combustion engines and autogas internal combustion engines; the purpose and design of the main instruments, appliances and car parts; ways of detecting malfunctions and methods of their removal.

- have: specific skills for dismantling and assembling the main vehicle components and assemblies; make calculations and determine the traction force components and to make calculations related to basic car units.

Methods are the next element of the pedagogical system. The authors of this study used both traditional and innovative methods.

Means of the pedagogical system include:

1. Electronic textbook (hereinafter ET) "Driving techniques in difficult situations" (Hamish et al, 2016);

2. Automated Training System (hereinafter ATS) "Exercises for driving skills practice" (Hamilton et al., 2013);

3. Internet blog http://ksg.kz.wordpress.com (Kuvshinov, 2013);

4. Resource materials for the course project on the discipline "Motor vehicles" (Report to the European Commission, 2014; UNESCO, 2011);

5. Resource materials for seminars on the course "Modern technologies in the organizational and technological activity";

6. Teaching materials on the discipline «Modern technologies in the organizational and technological activity";

7. Teaching materials on the discipline "Motor vehicles" (Hamish et al., 2016).

The first ET element is "Driving techniques in difficult situations". (Kuvshinov, 2013)

The suggested electronic manual is based on the didactic principles that give the possibility to generate technological knowledge and skills related to:

- Scientific character and availability, which implies a clear, concrete and accessible form of knowledge delivered to students in the process of their technological training - the latest achievements of scientific and technological progress in the R&D field;

- Systematic character and interrelation between theories with practice. This principle is implemented in a more systematic and logical outline of theory, the development of the system algorithmic knowledge aimed at its practical application in their professional activity. While training students solve algorithmic problems typical for the information society, thus, students realize the need to get the required algorithmic knowledge, abilities and skills;

- Visibility, which reflects unity of the abstract and the concrete, and requires visual reproduction in the form of a visual image at each stage of theoretical knowledge assimilation. This requirement implies the use of charts, tables, and sample assignments;

- Strength of the obtained knowledge and its links with the comprehensive development of student cognitive abilities, based on the fact that confident use of algorithmic knowledge, skills and abilities is possible provided all cognitive powers and abilities are used in this process: imagination (reproductive or creative), memory (mainly logical), active logical thinking and the ability to mobilize knowledge required to solve relevant problems.

Compliance with these principles makes it possible to introduce the developed ATS into the technological training of bachelors of transport, provides its effective functioning.

During training ET acts as a means of pedagogical activity related to both teachers and students. This textbook implies the entire training process - from its objective to the results.

Presently, ET is considered as a form of indirect learning given the computer-based training process.

ET is based on the general didactic requirements, applicable to a textbook. Therefore, its structure is similar to the structure of a traditional textbook.

During training ET acts as a means of training activities related to both teachers and students. ET provides integral training on several course sections, or even on different disciplines, providing the integral perception; it implements the entire learning process - from its objective to the results.

From the technological viewpoint this textbook contains a list of all course sections; hypertext; illustration; terms, index search engine; the most important rules, displayed by font or highlighted with a view to facilitate visual search in the text and data storage.

ET provides dynamic generation of contents; intuitive course navigation; the opportunity to return to the previously opened paragraph; change in the visual size of a textbook on the screen in the user-friendly way, etc.

The value of the proposed electronic textbook "Driving techniques in difficult situations" (Sergeev, 2013) is determined by its thematic content. Whereas this subject implies exam, the content of the course consists of the following elements: title page, table of contents, list of references, and the text representation of the textbook content, which provides understanding of the structure of the training material. The text part is the basic information material on the relevant topics; figures present complex sample methods used in driving; questions for self-control include the training material, presented in the form of questions.

The ET contents provides access to training materials, to the list of references, to the self-control section; it also has control panels providing access to any part of the textbook; return to the cover page.

Cover page contains the name of the course, its contents and information about the author. The hyperlinks to various terms and definitions make the ET a convenient asset for the training process. The hyperlinks provide additional on-screen or explanatory information.

The next element is the ATS “Exercises for driving skills practice” (Gabitova et al., 2015).

The use of ATS in the training process leads to significant changes in all its components, from the training content to the ongoing forms and methods of training. The effective use of ATS depends on the solution of a number of pedagogical problems related to the introduction of new training technologies.

Presently, ATS is one of the main tools that are widely used in experiments.

ATS is a data processing system designed to implement specific functions in the dialogue "man-computer" that take place during teaching different, preassigned academic disciplines.

ATS is a functionally interrelated set of training subsystems related to methodological, information, mathematical and technical computer-based support: the theory of activity; "The concept of theoretical generalizations” and cyclicality of the learning process; the theory associative links in mind, and their

use in the classroom; the theory of staged development of mental actions; the concept of logical and psychological foundations of computer learning tools in the training process; the theory of problem-based learning; the concept of educational informatization; the theory of programmed instruction; the theory of information support.

The ATS core contains the authors' systems, which provide the possibility for teachers to put their training material into the database and to program its training algorithm by using special languages or other means.

The ATS includes the subject, program and methodological components. The subject component includes the discipline content of its specific section, which should be studied by using the ATS tools. It is designed to provide information support to achieving didactic goals in teaching relevant subject (knowledge, skills, etc.).

The program component is a component of an automated system that implements educational communication (teacher - computer, student - computer teacher - computer - student, student – teacher-computer).

The methodological component includes course description (pedagogical objective, structure, expected results as well as recommendations to the teacher related to training organization and conduct, and working instructions for students).

ATS provides assessment of the following training performance indicators: the volume of acquired knowledge, list of skills provided by the system being analyzed, and their development level, training intensity, the forgetting intensity, grade histogram estimates (relative number of high, medium and low grades).

ATS should have clearly computed teaching effectiveness; otherwise, it will be impossible to determine which ATS version is the best. The didactic effectiveness of ATS depends on intensification of student work, skills refreshment of teachers and their work optimization, the adaptation of training, new training objectives and tasks.

The suggested ATS "Exercises for driving skills practice" (Gabitova et al., 2015) consists of a title page, and a table of contents. The text part is the basic information material on the relevant topics; figures present complex sample methods used in driving; questions for self-control include the training material, presented in the form of questions.

The ATS content provides access to training materials, to the list of references, to the self-control section; it also has control panels providing access to any part of the textbook; return to the cover page.

It should be noted that the ATS "Exercises for driving skills practice" and the ET "Driving techniques in difficult situations" play a special role in the general model of training bachelors of transport for using information technology. Their dominant role is determined by their specificity aiming to train students for using the IT tools. They present the products of information technologies per se. The considered ATS and ET provide unity of the common and private, allow fixing general provisions of the theory and technique related to training drivers based

on the application of information technologies and the concrete material. The course contents is extended and includes pedagogical element in establishing links between the professional and private pedagogic methods.

The blog http://ksgkz.wordpress.com (Kuvshinov, 2013), created by the authors of this paper is designed to post and to discuss online lectures and practical materials, article materials and abstracts. The blog provides information for its further discussion by the Internet community; the information posted on the Internet blog is periodically updated or changed and it looks as in Figure 2.

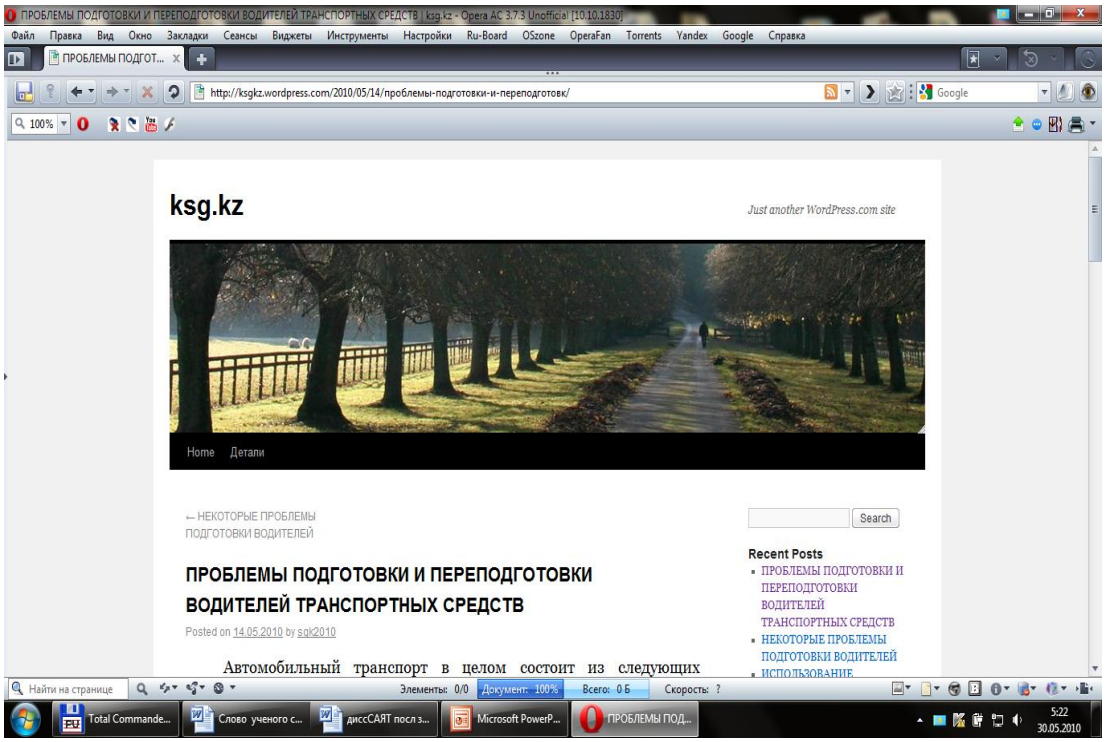

Figure 2. Blog title page

Another training tool is presented by the methodical guidelines for a course project on the discipline "Motor vehicles" and guidelines for seminars on the course "Modern technologies in the organizational and technological activity."

Thus, in this paper the authors propose a theoretically grounded and practically tested approach to the bachelor curriculum with regard to using modern IT tools. Modular design of the curriculum provides improvement and development of its individual units; the stage-by-stage approach to the educational process provides the most efficient way of obtaining knowledge and the use of modern IT tools provides the possibility to adapt the curriculum to the needs of the present-day labor market.

Discussion and Conclusion

The guidelines for seminars on the course "Modern technologies in the organizational and technological activity" deal with information technology in the organizational and technological activity: ability to work with Microsoft Windows XP, the basics of working in Microsoft Offices, Internet Explorer, the basics of

working in Photoshop, Corel Draw, AutoCad, Basics KOMPAS- 3D LT V8, ATS and software, information security foundations, identification and authentication, access control, the use of methods of hardware and software protection in the organizational and technological activity.

The developed courses are accompanied by relevant teaching materials (TM). TM improve training efficiency by promoting the establishment of a pedagogical system for assured assimilation of organizational and technological knowledge and skills by bachelors of transport.

Preparation and use of teaching materials is aimed at solving the following tasks:

- Determination of the place and role of the discipline in the curriculum designed for a particular specialty;
- Implementation of interdisciplinary logical links within the training program;
- The distribution of training time with regard to the topics and types of training sessions;
- The organization of independent work of students during class and extracurricular exercises;
- Activation of cognitive and creative activity of students;
- Providing interconnection between training and research activities.

The TM related to all special courses, developed by the authors, include:

- Objectives and tasks of the course;
- Syllabus;
- Course schedule;
- The list of basic and additional literature (textbooks, manuals);
- Summaries of lectures, practical work description;
- The system of tasks for student independent work along with the methodological guidelines for their implementation;
- Schedule for progress reports on the discipline, tests for self-control;
- List of topics for written works and a list of test questions.

The final element of the pedagogical system is the result. The result – implies the bachelor's willingness to use the IT tools in their OTA.

In order to compare training results with respect to the classical parameters of the educational process and with respect to the proposed TM, the authors carried out relevant experiment, which involved 103 students. Half of the students (control groups) studied pursuant to the standard syllabi, and the other (the experimental groups) – used of the materials of the proposed TM. The competence level was assessed with regard to the training results, which was then compared with the training level requirements.

The comparison of expert assessments of the training results confirmed the existence of substantial differences among them with regard to all indicators.

Keeping in mind almost the same number of students in groups, who studied according to different systems, the obtained competence level of students trained by means of the developed information technology was significantly higher than

in students, who were taught pursuant to the classical training system. This indicates that the use of mechanisms based on IT tools can significantly improve the student training quality. Upon assessment of the statistical expectation and confidence intervals for the expert opinion values, the authors determined that the average level of competence in the experimental groups exceeded the existing level of competence in the control groups by 19%. Generally, one can be 95% sure that minimum improvement of results provided application of the proposed educational technology as compared with classical training could make 9% and maximum - 35% (Table 3).

Table 3. Comparison of the existing levels of competence

	Compliance of the existing level of competence with relevant requirements			
Group types	**C1**	**C2**	**C3**	**C4**
Experimental	77%	83%	72%	88%
Control	42%	63%	60%	77%
Improvement of results	35%	20%	12%	9%

The analysis of training results indicated that application of the proposed TM based on information technology makes it possible to increase the current level of competence by 20-25%.

Keeping in mind current trends in the world of science related to higher education (UNESCO, 2011; Brown & Bimrose, 2014), aimed at the active use of various IT aspects, the authors believe that the proposed pedagogical system aimed at bachelor training based on modern information technology can be adapted to training bachelors of other technical specialties. The main feature of this approach is system unification of modern concepts of higher education, namely, modularity, competence-based approach, information technology-based original theoretical model.

Implications and Recommendations

The concept of this study is based on the need to match the psychological structure of the personality, involved in certain activities, and the structure of this activity. This leads to the assumption that training of the future Bachelor of Transport aiming at the development of his personality should be adequate to the structure of the future professional activity. Therefore, it is advisable that training of Bachelors of Transport to use the information technologies be considered as a process of practical mastering this activity in the context of their theoretical training. The involvement of students in the solution of specific problems of pedagogical training by using the information technologies in specialized institutions can be realized through active professional practice and course design. This unit is aimed at systematizing, strengthening, deepening and broadening of theoretical knowledge and practical skills of students, extending their personal motivational activity basis, confidence in their own pedagogical experience. In addition, information technologies increase students' interest in education, improve their self-organization, and optimize the learning process.

Thus, each subsequent stage of training Bachelors of Transport to use information technologies is based on the previous one, broadens and deepens its contents in accordance with the defined objectives.

Experimental studies proved the efficiency of the proposed approaches and technologies.

The pedagogical system aimed at training bachelors of transport for using modern information technology in the organizational and technological activity is used in the teaching and learning process of the E.A. Buketov Karaganda State University and does not require large material costs.

Disclosure statement

No potential conflict of interest was reported by the authors.

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