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INFORMATION COMPETENCE FORMATION CHARACTERISTICS WHILE PREPARATION OF SPECIALISTS OF THE AUTOMOBILE PROFILE

Summary. Innovative approaches to formation of information competence while preparation of specialists of the automobile section are considered in this article: the content of information competence both basic and component part of professional competence, and also its value for the decision of professional problems on life cycle maintenance of automotive engineering is defined.

ОСОБЕННОСТИ ФОРМИРОВАНИЯ ИНФОРМАЦИОННОЙ КОМПЕТЕНТНОСТИ ПРИ ПОДГОТОВКЕ СПЕЦИАЛИСТОВ АВТОМОБИЛЬНОГО ПРОФИЛЯ

Аннотация. В статье рассмотрены инновационные подходы к формированию информационной компетентности при подготовке специалистов автомобильного профиля: определено содержание информационной компетентности как базовой и как составной части профессиональной компетентности, а также ее значение для решения профессиональных задач по обеспечению жизненного цикла автомобильной техники.

1. PROBLEMS OF VOCATIONAL EDUCATION

The present stage of social and economic development of Russia dictates necessity of preparation of competitive workers, and with this purpose - perfection of system of vocational education, achievement of interaction balance of labour markets and educational services. The enterprises are compelled to pay an increasing attention to questions of vocational training which becomes the strategic factor providing demanded structural changes. In a situation when a basis of country's social development is construction of the economy based on knowledge, requirements to a staff vocational training amplify, there is a modernization of national educational systems. Thus attitudes of a society and education at which the latter becomes a major factor of social and economic development essentially vary.

One of serious problems is imbalance of vocational structure of specialists graduation in establishments of vocational training of all levels with needs of a labour market. It concerns both quantitative parities, and qualitative characteristics of specialists. On the one hand, development of techniques and appearance of new technologies promotes economic well-being growth of a society, on

the other hand, especially sharp becomes a problem of specialist competence which should use new techniques and use high technologies. As the educational system is rather inert, its development should stay ahead the development of the economy, only in that case the prepared specialists will be really demanded by enterprises.

2. CHARACTERISTICS OF ENGINEERING EDUCATION

Engineering education has the features connected with specificity of those branches of economy for which preparation of specialists is conducted, and it creates additional problems in the organization of innovative system of education which would provide preparation of really competitive specialist corresponding the needs of both a labour market and the definite customer. The system of engineering education differs by resource-intensiveness: creation of laboratory base and its maintenance in a relevant condition with achievements of a science, techniques and technologies demands significant investments, that in itself is a problem in conditions of market economy, and furthermore during crisis. Moreover, the much faster branch develops, the more complex it is to organize preparation of competitive specialists. But it only is one of the problems.

The system of preparation of the highly skilled staff, as well as any educational system is inert enough: needs for specialists of the certain level and the directions dictated by employers, can be satisfied not instantly, in fact process of education is long enough. Besides, volumes of the information every year grows: recently it has been said that doubling of its volumes occurs each 5 years, now these figures are higher. The research made by corporation EMS, the world leader in the field of solutions for the information infrastructures, which received the name «the Growing digital environment: the forecast of the world growth of information volumes till 2010» [1] shows, that for the period from 2006 till 2010 the information volume will increase six times. Therefore, if the concept of an education system is formulated as «transfer of the information from the teacher to a trainee» even in case of transfer of actual knowledge for today, they will not be those by that moment when the trainee starts to a professional carrier. Prompt growth of information volumes, connected with accumulation of knowledge, cause the search of new ways of their transfer and formation of corporate culture.

The higher school traditionally is establishment where the resources providing preparation of the highly skilled staff for all branches of economy are concentrated. The quality assurance of preparation of specialists is availability of the teaching staff which has the advanced techniques and technologies of training, specialized auditoriums and the lab ware, library complexes, etc.

The main problem of high schools now is decrease in volumes of budgetary financing as a result of what technical colleges experience difficulties with maintenance of laboratories on a modern level. Besides, negativity commercialization of education consists not only in creation of the rigid competitive environment in the market of educational services and imbalance on a labour market (obvious discrepancy of seats in high schools of economic, social, legal directions to needs of a labour market), but also to falling prestige of engineering education in whole, caused by shifts in consciousness of youth.

The second problem is connected with maintenance of teacher competences at a modern level. As a rule, rejuvenation of high schools personnel structure restrains with a low level of wages, and mature teachers having an experience and possessing developed techniques of teaching, have difficulties to master modern educational technologies with the years. Unresolved problems of educational establishments, namely, «ageing of teaching staff», insufficient financing, formation of a plenty of high schools, branches and the representations, having led to education quality decrease [2,3], will serve as a handicap in realization even the most qualitative and ingenious ideas. Therefore, while elaborating a strategy of high school development, it is necessary to provide also the mechanisms providing its realization, including system of stimulation, retraining and improvement of the teaching staff professional skills.

3. CHARACTERISTICS OF SPECIALISTS PREPARATION FOR AUTOMOBILE BRANCH

3.1. Influence of branch characteristics on formation of educational system

The general problems, common to technical high schools, are aggravated with problems of automobile branch. Entering the world economic space has led to structural shifts in economy and it was inevitably reflected in growth of an automobilization level. Though in total amount of transportations the share of road transportations cannot be compared, say, to railway volume, but only the motor transport provides delivery of a cargo «from door to door», therefore development of the industry inevitably conducts to a growth of road transportations volume, thus, development of economy in whole directly depends on a condition of a transport and road complex. Besides growth of a well-being standard leads to increase in quantity of automobile owners of personal transport.

The need for competitive and competent specialists is felt especially sharply in connection with high dynamics of automobile branch development: in extending the range of some cars, high rates of growth of the service enterprises and change of the brand service concept, discrepancy of automobilization growth rates to rates of infrastructure development, creating complexities in the organization of transportation process and its safety.

The situation becomes complicated by the fact that the automobile branch differs both by material capacity (it demands greater expenses for creation and maintenance at a modern level of laboratory base, and also at carrying out of the experiments), and by science linkage (it demands greater expenses at carrying out design development and the engineering analysis with use of modern software, development of high technologies and uses of new materials).

One of possible strategy of innovative system construction of qualified personnel preparation on the basis of competent innovative approach to training, for realization of the concept «education through all life», consists in creation of uniform educational space: construction of continuous system of training, allowing to realize an individualization of a choice of an educational trajectory (fig.1).

Creating the system of continuous training which provides also opportunities for advanced training and retraining of the pedagogical staff and the teaching staff it cannot be forgotten what world we live in: development of global process of a society informatization conducts to formation not only a new information inhabitancy of people, but also new information way of their life and professional work [4].

3.2. An information component of educational process

The education system in new conditions should solve essentially new global problem connected with preparation of millions of people by life and activity in absolutely new conditions in the information world. The problem of informatization of the education demands essentially new approaches not only as strategically important direction of system development itself, but also as a fundamental scientific problem.

From the point of view of modern condition and prospects of education information process development it is possible to allocate two basic directions: instrumental and technological, connected with use of new opportunities of computer science and information technologies means for an increase of education system effectiveness; and substantial, connected with formation of the new maintenance of educational process itself. [5].

Use of computer science and information technologies means allows to raise efficiency of the pedagogical tool, allowing to receive new quality of educational process at smaller expenses of forces and time both teachers, and trainees. There are developments, such as Intel program «Training for the future» representing a training course constructed according to directions of education information process development. The main aim of such projects is to show, how technologies can be effectively used for improvement of quality of training. Didactic aspect of the given program is the training based on practical and research methods, directed on creative application of knowledge (a so-called method of projects).

Unfortunately, similar projects now actively covers a system of general education and preparation of teachers for a secondary school. However, in our opinion, problems of engineering education cannot be solved without introduction of such innovative systems and techniques of training. As there is a positive experience of different high schools on use of electronic learning (e-learning) among which there are also engineering (particularly, Penza state technological academy).

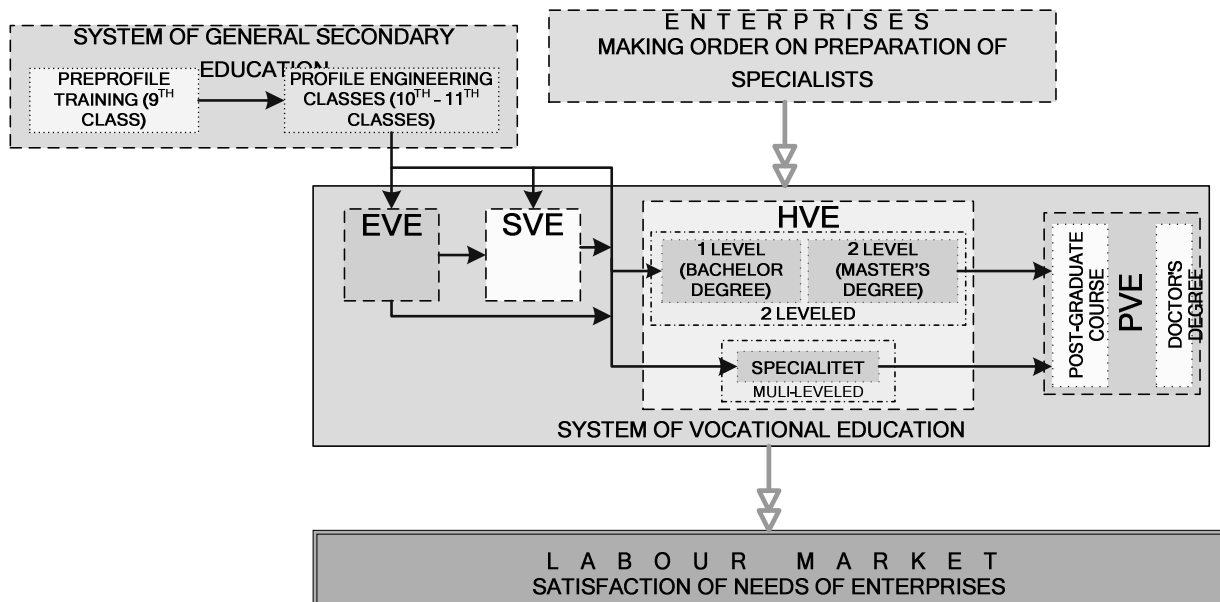


Fig. 1. A choice of an individual educational trajectory

Рис. 1. Выбор индивидуального плана обучения

3.3. Competence approach to education and its realization in system of specialists preparation of an automobile profile

Standards of high vocational education developed now are focused on realization of competent approach to system of training. There is a set of definitions of what is put in concepts of "competence", "competentness". So, A.V.Khutorskoj defines the competence as some set requirement to educational preparation of the pupil, and competentness - as its personal quality which has already taken place [6]. As professional competentness of the student - the quality shown in realization of activity taking into account qualification requirements (system, technological, information and organizational competentness), it cannot be formed without participation of employers. Here formation of social partnership institute is necessary within the limits of which requirements to specialist competentnesses are created, and also definition of the mechanism and conditions in which students professional competentness in educational process will be formed.

Numerous researches in the field of development of competentness approach to education, construction of multilevel system of a professional training, and also to management of profile training system testifies of necessity for changes in the educational system. The competentness oriented education is a unique way of satisfaction of employers needs in qualified personnel in conditions of dynamically developing economy. The main is not the set of the information which the graduate of educational establishment has received and acquired, but his/her ability to solve the problems, using the acquired skills.

Now certain actions on change of the developed position in system of vocational training are undertaken. Such documents as «Priority directions of development of educational system of the Russian Federation (2004)» [7] and «the Concept of modernization of the Russian education for the period up to 2010» [8], defined transition to the competentness oriented education the task of which in the field of vocational training is: improvement of interaction with a labour market, increase of

competitiveness of specialists, updating of the maintenance, methodology and the corresponding environment of training.

As it is marked in L.D.Davydov's researches [9], an educational situation developing now in Russia defines necessity of reconsideration of key methodological approaches to practice of acceptance and realization of the decisions connected with training and vocational training of youth to dynamically changing market conditions. During preparation of specialists the predominating role orientation to the person and the competence received allowing essentially to facilitate process of adaptation of youth to the professional environment and to raise its competitiveness. Today competent specialists are more and more demanded capable effectively to function in new dynamical social and economic conditions. The purpose of vocational education consists not only in teaching the person something to do and getting professional qualification, but also in enabling him to cope with various vital and professional situations.

To be competitive for a specialist after finishing training, knowledge received by him within the precincts of high school, should correspond to requirements of the customer: the young specialist should own that set of knowledge and skills which will allow him to create a car which is meeting the requirements of today, and to serve it at all stages of his life cycle.

Bozadzhiev V.L. defines the competence as the integrated quality of the person shown in the general ability and his readiness for independent and successful activity in conditions of a real specific situation, based on knowledge, skills, experience, values and the tendencies got during training. Thus, competence is a situational category as it is expressed in readiness for realization of any activity in specific professional situations [10]. The competence cannot be considered outside of specific real (instead of imagined) conditions of activity, therefore a close interaction with employers is a pressing question who should designate a set of competences which a graduate of high school should possess.

Considering structure of information competentness, the majority of researchers consider, that it assumes skill to work with computer techniques, to use modern software products, to involve means of information technologies for making mathematical calculations, data processing of experiments, search of the necessary information, providing business correspondence and communications, and also means rational activity in the field of development and use of information technologies means. Information competentness is, on the one hand, a base (key), on the other hand, it is considered as the important component in structure of professional competence.

Base information competentness, being overprofessional, oversubject, includes uniform for all categories of users a circle of questions in the field of base technical and software computer facilities, by knowledge and experience of which the expert of any structure should possess. Base information competentness is one of components of specialist information culture and assumes not only the generated skills of information technologies use, but also understanding of information processes nature, penetration into an essence of information processing operations, the reflective attitude, criticality, systemity and the responsibility in use of the information, creativity in information behaviour, social and information activity and innovation.

Information competentness as a component of a professional includes a circle of the specific questions corresponding to a level and content of a computerization in a framework of the concrete professional environment, knowledge and experience in which a specialist of the given profile should possess. Besides it is supposed, that a specialist should be able to improve the knowledge and experience in professional and adjacent areas. Formation of the information constituent of professional competence should be provided with the certain set of disciplines, educational situations and an practical works, simulating real professional problems.

Preparation of specialists in technical high schools, particularly for automobile branch, has the features connected with specificity of branch. It is one of the most rapid developing branches where firms-producers are anxious by increase of competitiveness of production not in a smaller degree, than in other branches. But an automobile is a complex technical system which differs both by material capacity, and science linkage, and its creation (from development up to an embodiment of the project) demands from designers, technologists and other specialists involved in this process, knowledge and use of the advanced achievements of a science, techniques and technologies. As requirements of employers now assume knowledge of IT-technologies, in developing of training courses, in our

opinion, it should be assumed acquiring by students skills of use of those software products and mathematical models which are applied to the decision of the problems, similar to which he can come across in a professional work. Competentness of the specialist will be expressed in his skill find his bearings in all variety of the information, to choose a necessary one, to analyse and draw corresponding conclusions. At all stages of work with the information - gathering, processing, analyzing - the software are used connected with specificity of branch and a specific workplace.

For all engineering specialities connected with the motor industry and as a whole with automobile branch, the necessary minimum of knowledge and competences in the field of IT-technologies can be provided with a following set of the software, providing base information competence:

1. At studying disciplines of common mathematics and a natural-science cycle:
 - *Computer science* - the spectrum of studied base software products, except for Windows and office appendices (in expanded variant Word, Excel, PowerPoint) extends;
 - *Mathematics* - use of specialized software products, such as Maple, Mathematica, MATLAB, MathCAD, STATISTICA, SPSS extends;
 - *Physics* - use of the virtual laboratory practical works developed for technical high schools by Physicon company is supposed;
 - *Chemistry* - use of ChemOffice - a complex of applications for chemists;
 - *Ecology* - use of LOGOS software products for ecologists, including the program «Waste of motor transport».
2. At studying disciplines of general professional cycle:
 - *Descriptive geometry and engineering graphics* - use of packages of 3D graphics "COMPASS", AutoCAD, SolidEdge;
 - *Theoretical mechanics, resistance of materials, the theory of machines and mechanisms, details of machines* - software products of PLM-technologies, in particular CAD/CAE-systems, such as PRO/Engineer, APM WinMachine, Unigraphics Solutions, Ansys;
 - *Hydraulics, hydro-pneumatics, heating engineering* - CosmosFloWorks, EFD.Lab (aerohydrodynamics, hydrodynamics and a heat transfer);
 - *Electrical engineering and electronics* - Multisim - the system intended for designing of electronic schemes; EMK «Analog and digital electronics» by hps System Technik;
 - *Material science and the theory of constructional materials* - analyzers of images with the software "Videotest-structure", a hardware-software complex of M-structure;
 - *Information technologies* - the expanded studying of processing and the analysis of the information means and survey studying of program development according to professional line in a framework of a speciality.

Such approach will allow to provide the general level of preparation in the field of IT-technologies and an opportunity of special cycles disciplines studying at a modern level.

Information competence as a component of professional competentness of a specialist of an automobile profile is formed at studying disciplines of a special cycle and inseparably connected with the subject-oriented information technologies used for the decision of research, design, industrial-technological and organizational-administrative problems.

If to try to classify software products according to solved problems the scheme will look as it is reflected on fig.2. Thus, at studying disciplines of a special cycle an orientation is provided to a specific kind of professional work [11]:

- Research and design - performance of course and degree projects with use of modern software products for carrying out of the engineering analysis - CALS-technologies (CAD/CAM/CAE-systems, for example, APM WinMachine, Unigraphics Solutions, Ansys, etc.) is provided;
- Production and technical - performance of course and degree projects with use of software of management by life cycle of production PLM (Production Life cycle Management), including both CAD/CAM/CAE-systems, and control systems of production data - PDM (Production Data Management) and control systems of enterprise resources ERP (Enterprise Resource Planning) is provided;

- Operational, including maintenance of the rational organization of traffic, safety of traffic, reliable operation of automobile vehicles, observance of ecological requirements. Studying and practical use of optimization and imitating modelling (system of imitating modelling GPSS, AnyLogic), studying of GIS-systems (ArcView GIS, «GeoDraw» and MapInfo, Network Engine (NetEngine) for creation of functions of network modelling, for finding a way (a route), including Network Analyst, for definition of the shortest way (a route), software products for carrying out of ecological monitoring is provided;
- Service, including research of commodity markets, the organization of sales, maintenance service and repair (a choice of the equipment for maintenance service and repair, definition of optimum quantity of service posts, etc.), supplying with spare parts and accessories. . Studying and practical use of optimization and imitating modelling (system of imitating modelling GPSS, AnyLogic - for realization of mass service models) is provided; systems of the statistical analysis (SPSS, STATISTICA), the software of KonSi - for carrying out the SWOT-analysis, benchmarking, segmentation of the market, efficiency analysis and increase of enterprise competitiveness, carrying out of cluster and the factor analysis (KonSi-Data Envelopment Analysis for Benchmarking, KonSi-Segmentation&Positioning, Brand Price Trade Off, etc.).

Such approach in a combination to development and introduction of individual programs of training under contracts with employers and carrying out of industrial practice work on places of the future industrial activity will allow to reduce terms of adaptation of a specialist on a specific workplace, will raise its competences both in a professional sphere, and in the field of high technologies that will provide its competitiveness on a labour market.

INEKA relates to that category of young high schools which were created in the beginning of 80s (years) for solving problems of preparation of qualified personnel according to needs of corresponding branches of a national economy and regions in which they settled down. The main task facing high school during the moment of its creation, was preparation of specialists for a city under construction in fast rates and a motorcar giant «KAMAZ». The high school developed with a glance of needs of Zakamskij region and now it is the largest high school in the region both by quantity of students, and on a spectrum of directions and specialities, and also on levels of preparation.

The wide spectrum of the specialities being implemented in high school, covers all stages of automobile life cycle and includes preparation of specialists in the following directions: research of existing and perspective commodity markets, design development, designing, manufacture, sales, operation, service, renovation and recycling of automobile vehicles. INEKA has a wide experience on organization of cooperation with strategic partners, such as KAMAZ inc., Severstal-авто inc., TransTechService joint stock company, Naberezhnochelninskij car center KAMAZ ltd. in a direction of individual trajectories development of students training with an opportunity of further employment and orientation to the decision of particular professional problems.

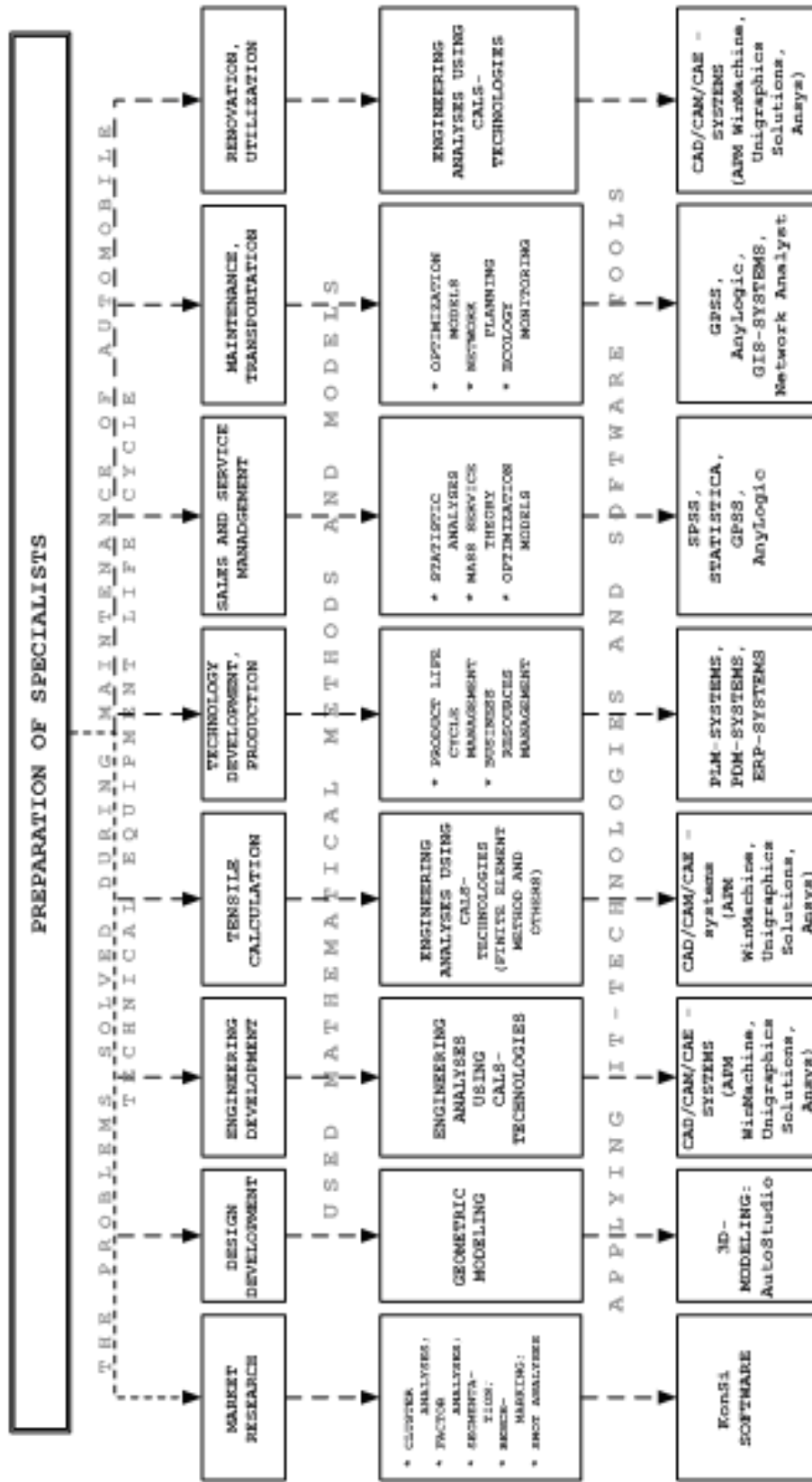


Fig. 2. Application of IT-technologies in specialists preparation of automobile profile
 Рис. 2. Приложение информационных технологий для подготовки специалистов автомобильного профиля

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