

The Use of Modern Technologies for the Formation of Professional Skills in the Field of Road Transport Operation

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The article deals with the organization of the formation of professional skills of bachelors in the field of road transport operation during practical classes, identifies the problems that arise in the planning of practical classes, justifies the use of training and case technologies in the course of practical classes, based on the use of modern diesel engine control systems, describes the stages of the process of forming professional skills.

Key words: *training technology; professional skills, practical skills, coach, case, training.*

Introduction

In modern conditions, specialists in various sectors of the economy have quite high requirements. Thus, according to the Federal State Standards for training specialists in higher education, the requirements for mastering the system of professional competencies within the framework of a competence-oriented paradigm are increasing, the purpose of which is to form a complex of professional knowledge and on this basis to master practical skills related to modern production technologies.

Changing the choice of educational process from traditional to personal-oriented leads to a transition from informational methods of training to active ones aimed at stimulating the creative activity of future specialists, including in the field of automobile transport operation. However, it should be noted that most teachers who teach technical subjects do not have sufficient methodological training, and therefore, it is difficult to choose rational forms and methods of training that affect the development of students' technical thinking, when conducting practical classes.

According to the great pedagogical encyclopedia, the concept of practical training is considered as "a type of educational activity of students, which involves the independent formation of practical skills on the basis of theoretical knowledge" (Rapatshevich, 2005).

In the practice of higher education, due to the almost annual transition to new curricula, and, consequently, the change in the number of hours for the study of special disciplines, the determination of the number of hours for lectures, practical and laboratory classes is at the discretion of the Department. Often, the practical classes are conducted by teachers who have insufficient pedagogical and practical experience. However, this is not the only problem facing teachers of technical disciplines who conduct practical classes. Taking the dynamic changes in the automotive industry into account, there is no modern didactic support for the educational process, which should reflect these changes. Consequently, proper attention is not given to the problem of forming professional skills in the field of road transport operation in higher education.

The purpose of the article is the theoretical and methodological basis for the formation of professional skills of bachelors in the field of road transport operation, taking into account the use of modern pedagogical and production technologies.

The main content of the article. The formation of skills for using knowledge in practice in typical situations provides for the deepening and consolidation of theoretical positions. In this case, the use of training technologies will be effective. In pedagogy, this technology is considered as a study of interaction processes in the process of a certain type of activity and as a process of collaborative creativity.

In psychology training is considered as an active learning method and as a multifunctional method of deliberate changes in the psychological, social and informational phenomena of the human group with the purpose of harmonization of professional and personal human existence; as a planned process which aims to modify attitude, knowledge or behaviour through learning experience, and which is aimed at developing skills for performing a certain activity or several activities (Doronina & Jagovets, 2018, 234-236).

It is considered that the main advantage of the training is to increase the level of independence of students, develop skills of analysis, self-analysis, technical and technological thinking. The inclusion of all participants in activities of this event contributes to a high level of subject-subject interaction in the course of practical training. The implementation of the goals will depend on the following requirements:

- creating certain conditions for the effective formation of students' skills in the training process;
- use of effective methods and methodological techniques for organizing and managing the training process;

- ensuring compliance with the time frame of each stage of the training;
- rational use of interactive links between theory and practice.

The term "training" has a number of meanings: teaching, training, development. In the literature the following signs of training are distinguished:

- student's activity;
- individual or group training during the training process;
- intensive nature of training when performing various tasks training exercises;
- formation of personal and professional skills (Doronina & Jagovets, 2018, 234-236; Raychenko, 2019, 416-423).

The organization of development and consolidation of skills is based on the mobilization of the self-assessment potential of each student, which leads to repeated training to achieve the desired level of assessment (Raychenko, 2019, 416-423).

In the practice of conducting practical classes on working out professional skills on simulators, including in higher schools, training sessions on modeling situations related to determining the effectiveness of individual car systems are used.

Since the main purpose of the diesel engine control system is to regulate the operation of the injection system, when planning practical classes, it is necessary to take into account the relationship of this system with other engine systems, such as fuel, intake, turbocharging, exhaust gas recirculation, exhaust, cooling, pre-exhaust heating. Naturally, in the first practical lesson the results of the mechanical control system of the engine are examined. The next practical lesson the operation of the electronic system of the diesel engine is studied. And if the mechanical speed control system of the crankshaft with the help of various devices guarantees high quality of the fuel-air mixture preparation at different engine operating modes, then the electronic control system. The diesel engine is capable of processing a large number of parameters in real time.

In the process of practical training with the simulator the students worked out the value of cycle fuel supply, analyzed the results obtained and their dependence on the working condition of the diesel engine such as: the temperature of the coolant, the impact of other systems, the impact on the level of harmful emissions. The process of trainings is carried out by a trainer-coach. The term "coaching" means "training".

In psychological and pedagogical sources coaching is considered as: a method of personal development; a technique of individual's full capacity to increase efficiency and productivity of activity; a method of achieving high results of activity; a method of interaction between people (Naumenko, 2018, 330-334). Coaching in the educational sphere is also considered as a style of interaction based on equal partnership and respect, increasing accountability of results, which contributes to both personal and professional development.

It is believed that coaching contributes to the acquisition of the self-adjustment skill, and the coach, in turn, should adjust the rhythm and areas of learning, because it is the coach, according to the scientist, determines the rules, collects the necessary information, assesses and analyzes the situation, determines the optimal action plan, motivates and optimizes students for action (Raychenko, 2019, 416-423). Thus, the training method contributes to the formation of skills to work out actions in standard and in non-standard situations, to development of technical and technological thinking of trainees, to improve their professional qualities in the process of making constructive decisions.

Formation of professional skills and abilities in the process of practical training is also facilitated by CASE technologies, the purpose of which is: revitalization of cognitive activity; formation of skills in processing, systematization and generalization of technical and psychological and pedagogical information; making the right decision on the basis of group analysis of the proposed situation; formation of skill in defining personal point of view; providing creative development of students; improving the skill of self-analysis, self-control and self-assessment.

If the training aimed at practicing the skills and abilities of future specialists, with the simulators and special stands on a specific algorithm of action, case technologies contribute to independent decision-making concerning the operation of modern diesel engine control systems on the basis of the proposed scientific technical information, graphic part, as which are used various schemes of electronic control systems of diesel engines, as well as types of practical tasks that require a decision in unusual situations. Therefore, case technologies are also considered as a kind of project technology.

Case technology is aimed at solving a certain problem, but the problem is not given in a readily available, but it is formed by the teacher, based on the conditions of the real situation, that is, the students are invited to comprehend the real life situation, the description of which simultaneously reflects not only some practical problem, but also activates a specific set of knowledge necessary to solve the proposed problem, which has no unambiguous solutions (Gulakov & Kharchenko, 2017, 143-145).

Depending on the didactic goals the cases are divided into: teaching (training, learning), contributing to the cognition activity and the development of creative potential of the person; practical, aimed at solving real pedagogical or industrial situations; research cases, focused on the research activities of students.

Let us consider the content of the main steps of skills formation in the process of practical training, namely: motivational-target, information-containing, professional-technological, reflexive-evaluation (Fig. 1).

Thus, the motivational-target step (stage) determines the purposes, objectives and motives for forming professional competencies of future specialists in the field of motor transport operation. It is proved by practice that definition of goals is the basis of any activity. In this case, the pedagogical goal is considered to be the provision of the teacher the results of educational practice, which are achieved through an effective balance of different components.

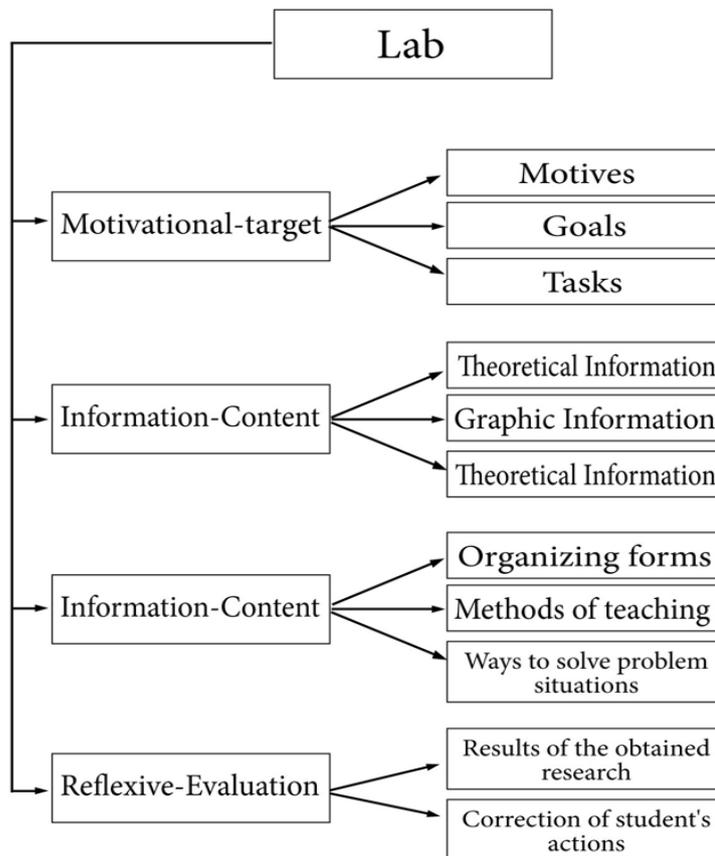


Figure 1: Steps for building professional skills in case studies

In V.I. Zagvyazinsky's opinion, pedagogical goals provide mastering of the system of fundamental and applied knowledge and corresponding ways of activity to achieve general and special development of personality (Zagwazinsky, 2001, 192). Consequently, the main pedagogical goal of practical training is the formation of professional skills and abilities of students.

Pedagogical goals are inextricably linked with the concept of "objective", which arises in the process of distributing goals to sub-goals. Therefore, the objectives of practical classes envisage a certain sequence of specific actions aimed at the achievement of the set goal.

In order to achieve the expected results, an important aspect is the motivation of the forthcoming learning activity. In the encyclopedia of education, motivation is considered as "a



system of ideas and beliefs, feelings and experiences, in which material, spiritual, natural and cultural needs of a person are expressed" (Kremenj, 2008). Motivation is also considered as a set of personal motives and needs. In our study, we considered motivation to be the achievement of goals through the need to develop professional skills and abilities, taking into account the need to use the knowledge gained for self-assertion in practice.

According to our stated educational problem, the motivation for the upcoming activities of students is the importance of environmental requirements for environmental protection, including in the engine industry, which is manifested in the improvement of fuel equipment and methods of fuel management. Therefore, the improvement in the ecology of diesel engines has been made possible by the use of ever-evolving engine control systems aimed at reducing fuel consumption and emissions of waste gases, while increasing the efficiency of the engine as power and torque. Thus, the rational definition of the goals, objectives and content of the motivation for the forthcoming training activities depends on the effectiveness of organizing the further stages of the students' practical activities and the quality of the practical actions performed in general.

The information - content phase involves introducing future specialists in the field of road transport to scientific and educational information on the principle of mechanical and electronic diesel engine systems. Given that information about electronic diesel engine control systems requires generalization and justification for performance of practical activities, we offer traditional and modern schemes of diesel engines that require analysis, comparison, generalization and justification.

The professionally- technological stage of the formation of professional skills and skills related to the operation of electronic diesel engine systems is considered by us from the position as a method of organizing the training process to solve problem situations, using modern organizational forms and training methods, and from the position of technological sequence of performance of practical actions, when practicing exercises on special stands. According to R. Ien, case technology should be considered from research, explanatory and describing positions. Case-type research technology is seen as a pilot work in view of the development of a research plan; an explanatory type of situational analysis is used to identify the causes of a problem situation, and a descriptive approach requires the researcher to study a theoretical description of the various causes that may arise while studying situations (Polyat, 2002).

Psychological and educational theory and practice uses different types of case situations, namely:

- standard situations that manifest themselves under the same circumstances;
- non-standard situations involving unforeseen conditions or circumstances;
- a problematic situation to address, which uses alternative points of view;

- problems related to the analysis of analytical data and the justification of how to use them, taking into account the technical characteristics of the mechanisms, equipment, specific features of the relevant processes (Andronic & Bibik, 2017, 144-146; Gulakov & Kharchenko, 2017, 143-145).

Consequently, the formation of problems and situations, as well as practical ways of solving them conducted on the basis of a case, which is both a technical task and a source of information, provides not only a conscious perception of different solutions, but also contributes to the development of technical and technological thinking of students in the process of performing practical tasks.

As an example, we can offer the contents of the case of the formation of professional knowledge and skills on the electronically regulated injection systems *Common Rail* for diesel engines with piezoforsunki.

Basic information involves that students should be acquainted with technical characteristics of the systems; instructions for maintenance operations and safe methods of performing tasks; table of comparative quantities of the system; table of basic settings; approximate parameters at idle run, partial, high and full loadings; an overview of the fuel system. Graphic information includes: structural schemes of the main components of the injection system; process flow scheme of electrical equipment; electrical input circuitry; list of quantities to be measured.

One of the exercises on the training stand system can be development of management skills of the injection process through the electrical connector of the diesel system; direct fuel injection based on a piezoelectric drive arrangement, including preliminary, main and additional fuel injection; adjustment the amount of fuel, including: reduction its consumption, reducing emissions, ensuring uninterrupted operation of the engine.

From the point of view of practical training organization methodology case method consists of the following stages: firstly, students should get acquainted with the content of the case by their own; then they work out a collective solution for the case; discussion of the proposed solution of the learning task (Andronic & Bibik, 2017, 144-146).

Thereby, the usage of case method during practical classes in higher school allows to develop the skills of creative solution of complex situations, to form the skills of subject-subject interaction and to improve the skill of students' self-educational activity.

Stage of Reflection and Assessment

The modern humanistic paradigm of professional education raises the need of training specialists capable of personal self-development and the implementation of reflective processes. It is believed that reflection is not only knowledge or understanding of yourself, but

also realizing how other individuals know and understand you, your personal qualities (Kremenj, 2008).

According to results of the analysis of the study, it can be stated that pedagogical reflection helps to justify the results and determine the purpose of the educational activity, to realize your individuality and uniqueness; provide analysis and research of completed activity in order to fix its results and implement its further improvement (Khutorskij, 2001).

Taking into account the specifics of the discipline, as well as the types of skills that need to be formed during the practical class, we can determine the final result using the following types of reflection:

- technical, which is aimed at understanding the essence of technical phenomena connected with the operation of diesel engines;
- research reflection, including recognition and analysis of processes associated with economic indicators of reducing fuel consumption and the level of emission of harmful substances in exhaust gases and in the same time increasing engine power, mixture formation and reducing fuel consumption;
- technological reflection, which determines the cognition of the essence and content of technological processes, the determination of correctness of assessing your capabilities in unforeseen situations, and a creative approach for solving these situations.

Special attention in pedagogical reflection is given to the organization, introspection and self-assessment of the performed actions, including: self-analysis, which is carried out by means of comparing the actions performed with the sample, as well as self-analysis, which includes comparing the obtained results with previous ones, analysis of positive aspects and disadvantages that have negative influence on formation of practical skills of students.

The Results of the Study

As a result of the analysis of students survey connected with the effectiveness of the proposed sources of information for formation of practical skills, it was found out that: the teacher is the priority source of information for 30.25% of students; about 23% of respondents chose case information; 28% of students considered the guidelines for the training to be important instructive information; 18.8% of the students voted for the Internet, which helps students in performing a number of practical tasks.

The obtained results allow us to conclude that the complex integrated use of information support is necessary for the effective formation of practical skills of students. At the same time, the level of formation of professional skills of bachelors in the field of operation of automobile transport based on the use of modern laboratory equipment in the form of simulators in our case for diesel engine control systems was analyzed. The results showed that 16.9% of students



completed educational tasks with the help of proposed methodological recommendations; 70.1% of students used creative approach to performing of professional actions, and about 10% found it difficult to fulfill the task without the help of a teacher.

Findings. All in all, the usage of modern pedagogical and production technologies during practical classes helps to create such conditions which make it possible to form and improve skills in developing complex technological processes and developing the skill in making independent right decisions by students, aimed at the development of technical and technological thinking of students in general.



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