

**SPECIAL ASPECTS OF PROFESSIONAL ACTIVITY OF MOTOR  
TRANSPORT PROFILE TEACHING ENGINEERS  
ОСОБЛИВОСТІ ПРОФЕСІЙНОЇ ДІЯЛЬНОСТІ ІНЖЕНЕРА-  
ПЕДАГОГА АВТОТРАНСПОРТНОГО ПРОФІЛЮ**

Received: **December 30, 2020** Accepted: **January 23, 2021**

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**Abstract.** The article characterizes the special features of the motor transport profile teaching engineers' professional activity in vocational institutions (teacher of vocational training, master of vocational training), higher education institutions (engineering teacher) and in manufacturing. The *purpose* - special aspects of the of motor transport profile teaching engineers professional training in higher education institutions of Ukraine are considered.

The *methodology* it is stated that engineering and pedagogical education involves the rational integration of psychological, pedagogical and engineering

components of professional training. It is noted that the professional training of teaching engineers is aimed at the formation of their professional engineering and professional pedagogical competencies. This integrated training includes two equivalent integrated components - engineering (technical and technological, manufacturing, special, industrial branch) and pedagogical (humanitarian and social).

The *results* successful professional activity of a teaching engineer of motor transport profile is connected with professional training in institutions of higher education and the content and organization of their self-education in the process of professional development. To ensure proper training of a teaching engineer for successful activities, it is necessary to keep a continuous connection between the engineering and technical awareness and pedagogical activities.

It is *concluded* that a teaching engineer of motor transport profile is a teacher with higher pedagogical and technical education, who performs educational-methodical, engineering-technical, scientific-innovative, communicative-psychological, organizational, managerial and legal activities.

Modern professional activity of a teaching engineer is characterized by their innovative activities, the specifics of them is caused by the peculiarities of professional-pedagogical education and conditions of engineering-pedagogical activities, which provide generation and transformation of new ideas into innovations and form the management system. The innovative activity of a teaching engineer is the basis of creative approach to professional responsibilities.

**Keywords:** teaching engineer, motor vehicle profile, professional activity, professional competence, professional training.

**Анотація.** У статті схарактеризовано особливості професійної діяльності інженерів-педагогів автотранспортного профілю у професійно-технічних закладах (викладач професійного навчання, майстер виробничого навчання), закладах вищої освіти (інженер-педагог) та на виробництві. Мета - визначили особливості професійної підготовки інженерів-педагогів автотранспортного профілю у закладах вищої освіти України.

Констатовано, що інженерно-педагогічна освіта передбачає раціональну інтеграцію психолого-педагогічну та інженерно-технічну складових професійної підготовки. Зазначено, що професійна підготовка інженерів-педагогів спрямована на формування та розвиток в них професійно-інженерної та професійно-педагогічної компетентностей. Ця інтегрована підготовка включає два рівноцінні інтегровані складники – інженерний (техніко-технологічний, виробничий, спеціальний, галузевий) і педагогічний (гуманітарно-соціальний).

Результат успішної професійної діяльності інженера-педагога автотранспортного профілю залежить від професійної підготовки в закладі вищої освіти та змісту і організації його самоосвіти в процесі підвищення кваліфікації. Щоб забезпечити відповідну підготовку інженера-педагога до успішної діяльності повинен існувати безперервний зв'язок між інженерно-технічною обізнаністю та педагогічною діяльністю.

Зроблено висновки про те, що інженер-педагог автотранспортного профілю – це викладач з вищою педагогічно-технічною освітою, який здійснює навчально-методичну, інженерно-технічну, науково-інноваційну, комунікативно-психологічну, організаційну, управлінську та правову діяльність.

Сучасна професійна діяльність інженера-педагога характеризує його інноваційна діяльність, специфіка якої позначена особливостями професійно-педагогічної освіти й умовами інженерно-педагогічної діяльності, які забезпечують генерацію та трансформацію нових ідей у нововведення, а також формують систему управління цим процесом. Інноваційна діяльність інженера-педагога слугує основою творчого підходу до професійних обов'язків.

**Ключові слова:** автотранспортний профіль, інженер-педагог, професійна діяльність, професійна компетентність, професійна підготовка.

## **Introduction**

Successful professional activity of a teaching engineer depends on their professional training in educational institutions and organization of their self-education in the process of their professional development. To ensure proper training of a teaching engineer for successful activities, it is necessary to have a continuous connection between the pedagogical activity and the technical awareness. The practice of training of a teaching engineer shows that this connection is significantly complicated. The complexity of use lays in the structure of the professional activity, a wide variety of performed engineering and pedagogical functions and tasks, which are constantly changing under the influence of many external and internal factors. To find a way out of this situation, it is possible to determine the general features of the professional activity of a teaching engineer in the field of motor transport.

To determine the special features of the professional activity of a teaching engineer, it is necessary to begin with a scientific analysis of the concept of "teaching engineer ", because it represents the essence of their activities.

A teaching engineer is a specialist with the higher education, who performs pedagogical, educational-manufacturing and organizational-methodical activities for the training of students in one of the branches of manufacturing in the system of vocational education, as well as skilled workers in manufacturing. They are characterized by a broad pedagogical profile; they are able to combine the functions of a master of vocational training and a teacher of special technology, general technical subjects, as well as to organize professional training (Zeer, 1988, p. 10).

Modern scientists take a different approach to determining the types of engineering and pedagogical activities. The following structures of engineering and pedagogical activity are separated: pedagogical, engineering, technical, and manufacturing and technological (Zeer, 1988. 10); humanitarian and technical (Bezrukava 1996. p.344.); pedagogical and engineering (Tarkhan, 2005, p. 60); professional-engineering and professional-pedagogical (Kankovsky, 2014, p.132); pedagogical, educational-manufacturing and organizational-methodical (Krokoshenko, 2010, p.262); psychological-pedagogical, general-scientific, engineering and methodical (Sychavska, 2012, p. 41).

Kalinichenko claims that "engineering-pedagogical" activity consists of two independent and closely related components: engineering and pedagogical. Moreover, this connection should be reflected in the process of professional training of teaching engineers, because engineering-pedagogical education is an entire, holistic system (2005. p.76).

Engineering and pedagogical education (EPE) is unique in its essence and its very nature allows to form such a harmoniously developed teacher, who can possess engineering and pedagogical skills to solve technical problems, think systematically, project technical objects, be aware of special issues in logistics, marketing, labor protection of the motor transport industry and the skills of working with people, to organize the educational process in a technical institution of higher education, to be a leader and educator for young people.

Training of teaching engineers in engineering and pedagogical universities and faculties of technical, pedagogical universities has its own specifics, different educational environment and opportunities for the formation of specialists. Each of the options has its advantages and disadvantages.

In the case of studying in a vocational school, the pedagogical and psychological-pedagogical component of professional training may suffer. It may also be marked by the low professional adaptation of teachers who provide engineering training. These teachers are well acquainted with the subjects of the automotive industry that are taught, but, as a rule, do not have enough idea of the educational field for which engineers-teachers are trained. It is obvious that this fact contributes to reducing the quality of training.

In pedagogical universities, as a rule, a negative situation is created opposite to the previous one: the engineering and technical component of professional training suffers, but psychological and pedagogical components are poorly adapted to the motor transport industry.

We should note that the field of motor transport covers the organization of passenger and freight transport, logistics, transport management, transport safety,

environmental issues, intelligent transport systems, maintenance, repair and diagnostics of transport.

Against this background, specialized engineering and pedagogical universities look the most favorable. They have more opportunities to ensure parity and integrate engineering and teaching training. The need for a balanced inclusion in the content of education of these components is due to the professional nature of engineering and pedagogical activities, each side of which, as noted by Kubrushko, due to its unconditional functional obligation cannot be primary or secondary (2006, p. 97).

The possibility of successful professional activity of a teaching engineer is directly dependent on the content and organization of their professional training in educational institutions. Accordingly, engineering and pedagogical education offers a rational integration of psychological-pedagogical and engineering-technical components of professional training. We must note that the professional training of engineers-teachers is aimed at the formation of their professional-engineering and professional-pedagogical competencies. This integrated training includes two main integrated components - engineering (technical and technological, manufacturing, special, industrial) and pedagogical (humanitarian and social).

Today, European countries follow the path of compulsory pedagogical education for not only humanitarian but also technical subjects' teachers. Engineering and pedagogical education (EPE) is unique in its essence, which combines engineering and pedagogical skills to solve technical problems, think systematically, design technical objects, understand the issues of logistics, marketing, labor protection of the motor transport industry and the ability to work with people, to organize the educational process in a technical institution of higher education, to educate young people, to be a leader and educator. In Europe, there is the International Society for Engineering Pedagogy («IGIP – Internationale Gesellschaft für Ingenieur pädagogik»), which unites the scientific and pedagogical community of 72 countries. As a result of the training, IGIP awards students the title of “European teacher of technical subjects”; it also documents the qualifications and competencies of teachers and adds them to the international register of pedagogical engineers.

As noted, some shortcomings of basic education can be corrected in the process of professional activity through training, self-development and self-education. Among the difficulties faced by a young teaching engineer at the beginning of his professional and pedagogical activity are: cooperation with colleagues and students; mastering the personal style of teaching, the implementation of ways and means of compliance with modern teaching requirements; formation and development of theoretical and practical knowledge of the latest achievements and problems of pedagogy, technology, psychology; formation and development of methods of teaching and educating students, taking into account innovative approaches; introduction of modern educational approaches and advanced pedagogical technologies; implementation of the principles of systematic acquisition of practice and experience in teaching, conducting seminars, practical and laboratory classes; preparation for the advanced training process.

Graduates of engineering and pedagogical specialties (015 Vocational Education (Transport)) receive several stages of professionalization - continuing education - with a bachelor's degree as a teaching engineer, who can work in the workshop of industrial training, education, dormitory education, industrial training instructor, training master class center, equipment and laboratory for equipment of workshops in vocational schools (vocational school, training and manufacturing center, training and manufacturing plant); with an educational degree of registration - a teacher of general technical and special subjects, head of industrial practice, methodologist, vocational training instructor, deputy head, head of an educational institution (college, academy, university).

In addition, the teaching engineer in manufacturing can hold the positions of specialists (technician-technologist, technician-designer), professionals (engineer, design engineer, engineer-technologist), scientists (researcher, graduate student, assistant, researcher), managers (master of the production site, head of the workshop, head of the section, head of the department, head of the laboratory or workshop, etc.) and civil servants (inspector, inspector-methodologist).

Taking into account, studying the results of scientific work, we determined the following interpretation of the professional activity of teaching engineers of motor transport profile - it is an integration activity that includes engineering, pedagogical and scientific components.

Modern engineering is becoming more complex and computerized, which can lead to non-standard tasks that require new innovative thinking.

The specialty of professional activity of teaching engineers of motor transport profile, who became scientific and pedagogical workers in a technical institution of higher education, is created by continuous development of professional competence, which implements its professional activity.

Scientists of the Ukrainian Engineering and Pedagogical Academy under the leadership of Kovalenko distinguish the following production functions in the professional-engineering and professional-pedagogical components in the professional activity of a teaching engineer: design, organizational, technological, educational and research (2005, p. 9). According to the developed concept of development of engineering and pedagogical education in Ukraine there are standard production functions of the teaching engineer which contain typical tasks of activity which are carried out by experts not only in education, but also on manufacturing (2004, p.9). These typical tasks contribute, in addition to improving the quality of training, also to the social protection of graduates of engineering and pedagogical specialties, giving them the opportunity to work as both engineers and teachers.

Bryukhanova proposed a list of typical tasks (2007, pp. 153-156), corresponding to each of these functions, in fact, is the sum of the typical tasks of a teacher and an engineer.

Among the large number of typical tasks that constitute the essence of the content of the activities of a teaching engineer of motor transport profile, we highlight the following main typical tasks: the organization of the pedagogical or production process; development of various programs, projects and plans; analysis of technical and regulatory documentation, regulations and rules; development and training of workers or technical systems of the automotive industry; conclusion of



methodical recommendations, development of plans of works, schedules, explanatory notes, drawings, technological maps, schemes, instructions, didactic materials; possession of best practices in the field of motor transport; control over the implementation of established requirements, current norms, rules and standards; structuring the professional training of the worker and subsequent training; management of professional development of the worker; analysis, adaptation, generalization and systematization of pedagogical and technical information in the field of motor transport; development of technologies and control systems of pedagogical and production process; ensuring safe effective training or production; commissioning of new equipment or facilities; creating a comfortable learning or production atmosphere; motivation, stimulation, coordination and regulation of activities, mastery of relevant professional competencies; development of creativity, innovation and the desire to improve their professional skills.

Highly qualified professional activity of a teaching engineer, consists in integration of functions of a master of industrial training and a teacher of general-professional and professional-practical disciplines, generates ideas from various branches of knowledge, operates interdisciplinary categories, comprehensively perceives innovative processes in pedagogical and technical systems design tools using fundamental knowledge of pedagogical science and technology.

In the process of pedagogical activity the object of study is a set of pedagogical actions, pedagogical skills and abilities, skills of professional self-education and self-development; ability to implement and develop their own pedagogical abilities; the ability to manage their own emotional states; make the most of your creative potential, and the object of study in engineering is the object of study is transport vehicles and technology.

To determine the features of professional activity and the development of professional competence of teaching engineers of motor transport profile, we conducted a series of surveys among teachers of free economic education to clarify their professional needs. This will give us the opportunity to make responsible

management decisions on this basis to apply and improve the training of teaching engineers of motor transport.

### **Methodology**

To find answers to the research questions, we reproduce the initial state of development of the professional competence of a teaching engineer of motor transport profile for the purpose of conducting a pedagogical experiment. With this support, use the following research methods: observation, description through individual interviews, observation, expert evaluation method and questionnaire.

The method of observation was also used to collect materials for the study of the topic. The object of observation was the teaching engineers of motor transport profile at the higher education technical institutions. To increase the reliability and quality of the observation, we use the rules of systematization and diversity of observation of professional activities, for professional and career development, self-realization.

The survey was conducted with the help of individual interviews of a motor vehicle teaching engineers to check and supplement the experimental data. The information meets the requirements of validity, reliability and objectivity. The developed questions allowed studying the degree of message communication of the motor transport profile teaching engineers, the need to increase professional competence in continuous self-awareness and self-improvement.

Questionnaire survey for teaching engineers was created on the problems of development of professional competence of motor transport profile teaching engineers with the help of pilot research. For this purpose, a survey was conducted, which was attended by 180 teachers from the Ukrainian Engineering Pedagogics Academy, Kharkiv National Automobile and Road University, Kharkiv State Automobile College, Kharkiv State Automobile and Road College, Kharkiv State Polytechnical College, Kharkiv College of Transport Vehicles of Sumy State University, Engineering College of O. Honchar Dnipropetrovsk National University.

Representativeness of the sample was achieved both in terms of staff (evenly included both masters of industrial training and teachers of professional and

theoretical training) and experience of pedagogical work (the sample evenly represents those who have experience up to 5 years and those who work from 6 to 15 years, and those with more than 15 years of experience).

An important method of research was the method of expert evaluations. When selecting experts, we paid attention to such objective data as their positions, practical experience, scientific qualifications and education. Such experts were teachers of engineering and pedagogical departments, leading specialists in the practice of engineering and pedagogical sphere, scientists, experienced psychologists. During the research work, research interviews were conducted with experts, meetings, scientific and methodological seminars with the participation of these experts were attended. This made it possible to exchange information, develop and coordinate plans, fully understand the problem of developing the professional competence of teaching engineer of motor transport profile, more clearly define the concept, structure, levels and main areas of research.

The experts were teachers of the Ukrainian Engineering and Pedagogical Academy and Kharkiv National Automobile and Road University.

Experts assessed the importance of professional development by types of professional activity of engineers of pedagogical motor transport profile such as: educational-methodical, engineering-technical, scientific-innovative, communicative-psychological, organizational, managerial and legal activity.

### **Instruments for data collection**

A standardized questionnaire including 8 questions was developed. The questionnaire consisted of the following questions:

1. Your basic education
  - A. pedagogical education;
  - B. technical;
  - C. engineering and pedagogical.
2. The presence of pedagogical education.
  - A. Yes
  - B. No

3. How do you understand the concept of "professional competence"?

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4. What is the level of the program on the methodology of scientific and methodological competence, which would satisfy your professional and pedagogical needs during advanced training courses?

- A. initial (reconstructive);
- B. sufficient (variable);
- C. high (creative).

5. What professional competence do you want to develop in the intercourse period of professional development?

- A. pedagogical and methodical;
- B. engineering;
- C. scientific and innovative.

6. Do you voluntarily and constantly participate in various professional seminars, trainings, conferences, etc.?

- A. Yes
- B. No

7. If you need to use new computer technologies (such as MathCad, Solidworks and TechnoPro) in the engineering field, you:

- A. perform independently;
- B. ask someone to help.

8. Which types of professional activity of the teaching engineer of motor transport profile in your opinion are important in the development of professional competence? Rate a 7-point scale: where 7 points is the best quality, 1 point is the highest quality. The results are to be filled in the table 1 of the survey.

Table 1

Type of professional activity	Rating
Educational and methodical activity	

Engineering and technical activities	
Scientific and innovative activity	
Communicative and psychological activity	
Organizational activities	
Management activities	
Legal activity	

## Results

Interviews with the professors of these universities showed that the level of professional competence increases with the experience of teaching. The maximum values, in their opinion, pedagogical skill is reached in the period from 15 to 25 years of work in Technical Institutions of Higher Education (TIHE).

Answering the questions of the questionnaire, the representatives of the experimental audience report what their basic education is: pedagogical education in 16% of respondents, technical 56% or engineering and pedagogical education 28%. This fact indicates that the vast majority of pedagogical workers of TIHE do not have pedagogical education and need to improve scientific and methodological and other components of professional and pedagogical competence.

The question was asked about the levels of programs in the methodology of vocational training, which provided the satisfaction of professional and pedagogical records in advanced training courses: primary (reconstructive), sufficient (variable) and high (creative). It is not unusual that more than half of the responsibilities are responsible for a sufficient level of 45% and a high level of 24%, but it is noteworthy that 31% of teachers form the initial level. This will indicate that most teachers of TIHE have no pedagogical education, and have the need to develop basic components through scientific and methodological competence.

Representatives of the experimental audience when answering questions about the development of professional competence of motor transport teaching engineers in the intercultural period of training provide the answer: 38% of respondents want to gain pedagogical and methodological competence, 32% say that before they wanted

to get relevant information about the latest people of technology and equipment and 30% of the answers wanted to get scientific and innovative competence from the representatives of the teaching staff of TIHE and teachers of the Educational and Methodical Center of Professional Technical Education (EMC PTE).

The results of the survey revealed that teachers do not always clearly use the message about the change in the concept of "professional competence". A certain part of respondents (29%) recognized professional competence as a set of knowledge of the discipline and methodological and organizational and pedagogical changes. The majority of the described 58% do not participate in professional trainings, seminars, forums, unless required by the administration of the educational institution, so it is concluded as the nominative response of unorganized professional competence of this group of teachers.

Legislative data were obtained on the management of collections of modern computer programs at the beginning: modeling of technological processes (3D modeling of MathCad, Solidworks, TechnoPro and others), which helps to increase efficiency and self-design. About 56% (mostly seniors) need outside help when it comes to creating a computer product (presentation) or membership in design and drawing programs.

Table 2 shows the results of processing questionnaires to determine the importance of professional activities through expert evaluation. As you can see, the experts gave the largest share of educational and methodological and engineering activities. Given that this decision was simultaneous, that the share of these factors is combined, while the engineer-teacher plays the role of teacher and master, and is equal to - 57%. The third need of the constituent development of professional activity of teaching engineers of motor transport profile is engaged in scientific-innovative activity - 20%; fourth place is engaged in communicative and psychological activities (level of foreign language management, ability to productive pedagogical communication (conflict prevention, authority), culture, etc.) - 9%; organizational and managerial activity for 6%, legal activity (knowledge of laws, regulatory framework) - 2%.

Table2

Expert assessment of the importance of professional activities according to the level of development of professional competence of teaching engineers of motor transport profile

Type of professional activity	Rating
Educational and methodical activity	0,3
Engineering and technical activities	0,27
Scientific and innovative activity	0,2
Communicative and psychological activity	0,09
Organizational activities	0,06
Management activities	0,06
Legal activity	0,02
Total	1

### **Discussion**

Teaching engineers of motor transport profile, who began their teaching activities in a technical institution of higher education, as a rule, do not have pedagogical education, they work intuitively, based on their own limited experience of educational activities. Given that they are highly qualified specialists in the field of motor transport, updating and improving special professional knowledge and skills are commonplace for them. An inexperienced teacher quickly reports the lack of psychological and pedagogical knowledge and skills, lack of pedagogical equipment, which cannot ensure the effectiveness of the educational process, introducing the latest educational technologies. For these young teachers, first of all, it is advisable to organize psychological and pedagogical training such as "teacher training", for example, in the Center for Postgraduate Education of V. N. Karazin Kharkiv National University, there are special pedagogical training courses (100 hours) or Educational and Methodical Center of Professional Technical Education (EMC PTE) in the Kharkiv region, which provide primary pedagogical education to employees of TIHE. After graduation, they master the basics of pedagogy and psychology and achieve an

adaptive (reference) level of pedagogical training as the basis for future pedagogical skills. The leading feature is the development of motivation for its formation and development (conscious independent activity of professional, pedagogical and personal improvement).

The complication of engineering and pedagogical activities is in a combination of humanitarian and technical types of work. The practice of proving that graduates of engineering and pedagogical specialties in the field of transport lack professionalism and practice in creating methods for analyzing the performance of vehicles and transport systems, lack experience in using modern computer technology in specialized consumer environments to solve technical enterprises and model processes.

### **Conclusions**

The generalization of the results of scientific research of students, legal documents, and the educational process of TIHE made it possible to define the features of professional activity and the requirements for professional competence of teaching engineers of motor transport profile. On the basis of comparing the activities of the engineering industry of motor transport, on the one hand, and the activities of the teacher in the context of TIHE professional tasks, on the other, stated that engineering and pedagogical education involves rational integration of psychological and pedagogical and engineering components.

Thus, it can be determined that a teaching engineer of motor transport profile is a teacher with higher pedagogical and technical education, who carries out educational-methodical, engineering-technical, scientific-innovative, communicative-psychological, organizational, managerial and legal activities.

Successful professional activity of a teaching engineers of motor transport profile is connected with professional training in institutions of higher education and the organization of his self-education in the process of professional development. To ensure proper training of a teaching engineer for successful activities, it is necessary to have a continuous connection between the engineering awareness and pedagogical activities. In the process of pedagogical activity the object of study is a set of



pedagogical actions, pedagogical skills, strengthening of professional self-education and self-development; ability to realize and develop own pedagogical abilities, to manage their own emotional states, to make the most of the creative potential, the combined studying in engineering activity; the object of studying appears to be motor transport vehicles and technologies.

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