

# Mentoring as a Form of Assistance to a Transport University Student in the “University-Enterprise” Networking Cooperation

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**Abstract** – The paper deals with mentor’s role and the requirements for improving the practical and professional skills of a transport university graduate. Effectiveness was estimated by increasing the formation level of their professional competence in accordance with the requirements of the Federal Educational Standard and the qualification profile of a graduate, the extended and established normative acts of networking cooperation parties through the implementation of practices while assisting mentors. The developed program for training mentors, and criteria for diagnosing the levels of skill formation, are quite universal and can be used at different universities.

**Keywords** – Open education, networking cooperation, mentoring, practical and professional skills, transport university.

## 1. Introduction

The solution of the tasks of Russia’s innovative development requires modernization of all spheres of the economy that highly skilled engineering personnel can implement. In the railway industry, the

most complex projects are realized; the future of the national transport system of Russia depends on them. Employers’ dissatisfaction with the training quality of graduates of technical and technological majors defines the problem of finding new approaches in the development of practical and professional skills in education, aimed at meeting the needs of the engineering innovation economy.

Proceeding from this, the level of tasks facing Russian Railways requires appropriate qualification of employees who should have not only theoretical knowledge but also some practical skills in solving professional problems. However, the basic enterprises manifest dissatisfaction with the quality of graduates’ training, which shows the gap between the labor market and the market of educational services and actualizes the problem of practical and professional orientation of engineering education. This determined the importance and necessity of networking cooperation between the university and the enterprise at all stages of organization and implementation of the educational process in the conditions of an open educational system.

The normative act that determined the relevance of the implementation of networking cooperation is the law “On Education in the Russian Federation“, paragraph 1 of Art. 15 [1], which notes the possibilities of a network form for the implementation of educational programs in the context of improving the quality of engineering education.

The experimental work on mentoring in the process of networking cooperation between the Far Eastern State Transport University and the enterprises of Russian Railways for 6 years has shown an increase in the level of practical and professional skills of graduates assisted in their on-the-job training by mentors, who learned a special program and passed competitive selection.

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## 2. Literature review

The problem of network cooperation between educational organizations with different social partners is the basis for upgrading Russian education in mutually beneficial relations between the university and the basic enterprises established by the relevant treaties [2],[3],[4],[5],[6]. The special significance and new content of networking cooperation are noted in the Doctrinal Concept of Engineers Training in Russia [7].

The approach of foreign scientists in determining the content of the training of prospective engineers is substantiated to a large extent taking into account the opinion of the social partners [8]. Networking cooperation with universities, consortia, various associations, etc., facilitates the employment of graduates of educational organizations that take into account the requirements of enterprises.

The upgrading of vocational education and training with the participation of experts in different fields is presented in the studies of Drewek [9]. The role of skills in maintaining business relations in the course of networking cooperation with social partners was explored in the works by Thiess and Gropler [10].

Some features of the formation of professional, labor, educational, and professionally oriented skills are presented in the works of Batyshev, Zeera, Lerner [11],[12],[13].

Adamsky, Vasilevskaya, Osipova [14],[15],[16] have considered the role of networking cooperation as a powerful innovative resource in education. They pointed to the need to find the most effective and mutually beneficial ways of integrating educational institutions and professional organizations.

The analysis of foreign scholars' studies on the problem of mentoring showed that mentoring was most often considered within the educational institution, in which teachers and students acted as subjects of interaction [17]. The study by Livingstone and Naismith [18] notes that mentoring is a common occurrence for a university based on combining pastoral, professional and educational models. It should be noted that such models of mentoring are quite common for Russian educational practice, in which the supervision of students is carried out by a curator, tutor, or class teacher. The experience of mentoring in the development of pupils' abilities within the robotics group at school is interesting; it makes it possible to implement the style of cooperation between mentors and students in providing them with self-management in activities [19],[20]; it presents a specific mentoring model based on interaction between mentors and graduates at Business School of the University of South Australia (UsiSa) and undergraduates. This model uses the experience of graduates for providing

support and exerting a positive influence on students. At the Higher School of Russia, the Alumni Senate has similar functions for almost every university.

A number of papers present experimental research on online mentoring and the creation of an online community [21],[22]. Undoubtedly, for some areas of professional training, this form of mentoring expands opportunities for students. At the same time, it is worth mentioning that mentoring should be personified; that is difficult to ensure even using some interactive properties of modern information technology. Online support of the educational process in the practice of Russian education is realized in the framework of remote e-learning. However, in this paper, the authors talk about the formation of practice-oriented skills of students in the conditions of on-the-job training assisted by a professional mentor, for whom online mentoring can perform only an auxiliary function, visually representing the experience of successful activity of professionals. The ability as an activity characteristic of a person can be formed in the activity. Considering that, practical and professional skills are formed in the conditions of on-the-job training; it is advisable to use the resource of mentoring as an assistance mechanism in the conditions of networking cooperation. At the same time, there is a task of choosing and training mentors who are able to teach other people.

The research concerning the university-enterprise networking cooperation on contractual terms is presented in publications of Russian and foreign scientists. However, the role and training of mentors for assisting students in their on-the-job training was not the subject of a special study. The procedure for choosing mentors who have a professional and personal readiness for mentoring stands out particularly.

## 3. Materials and methods

The particularity of the research problem and the system analysis of the tasks to be solved determined the need for using a set of methods: theoretical (contextual information search, analysis of scientific literature, content analysis of normative legal documents, Internet resources, systematization of comparison, modeling of pedagogical processes); empirical (lesson observation, questioning, assessment, pedagogical experiment, judgment-based statistics). To process the empirical data, some methods of mathematical statistics were used.

At the organizational and preparatory stage of the experimental work, the following methods were used:

- the method of immersing students in a professional environment through a specially developed program of on-the-job training;

- questioning of prospective mentors for the competitive selection of the most qualified in assessing their personal and professional characteristics and feedback of production managers.

To assess the motivation for the professional activity of students, they should write an essay, in which they imagine the way their professional career can be built.

Knowledge competencies of skills were assessed through the qualification examination, during which the knowledge of the algorithms of actions was revealed in accordance with the requirements of instructions and the regulation of actions in the conditions of different production situations.

When evaluating the activity component of skills, the judgemental method was used. The experts were those who hold a chair and representatives of the base enterprise; specially developed evaluation sheets were used. Valuation parameters: “formed“, “partially formed“, “not formed“ with an indication of the level of activity: reproductive or heuristic one.

#### 4. Results

##### *Organization of mentoring activities in a networking cooperation*

The complex approach to the university-enterprise networking cooperation determines the participation of the enterprise at all stages of the educational process for the training of professional personnel. At the stage of goal-setting, the university together with the base enterprise, taking into account the requirements of the Federal Educational Standard for Higher Education, determines the educational results of the formed competencies with the consideration of the importance of certain competencies for different types of professional activity of prospective specialists. At the stage of realization of the educational process, networking cooperation allows expanding the professional space with the possibility to use laboratories and production areas. Representatives of the enterprise take part in the educational process, give classes and conduct laboratory work.

An important component of networking cooperation is the organization and conduct of on-the-job training. The effectiveness of this process is enhanced if a contractual relationship is established between the university and the base enterprise with a clear determination of the functions and responsibilities of the university and basic enterprise teachers while maintaining a professional internship at the enterprise. The motivation for networking between the university and base enterprise is based on the mutual interest and benefit of the stakeholders of vocational education (the enterprise, university

and student). The importance of networking cooperation for an enterprise is determined by possibilities of training human resources that meet the needs of production. The on-the-job training, being an integral part of the educational process, helps to acquire primary professional skills and the skills of the corporate professional culture; all these shorten the period of adaptation to the conditions and content of the professional activity. In the framework of the student’s on-the-job training, some experts, the mentors, assist students, contributing to their professional development.

The analysis of the studies concerning the problem of mentoring conducted by the Russian [11], [23],[24],[25] and foreign scientists [26],[27],[28],[29],[30] has shown that the researchers determine a high potential of the mentor’s activity in the context of professional adaptation and formation of recent graduates. Secondly, some scientists distinguish different functions of mentoring:

- the function of career development and the psychosocial function [26];
- professional, political, psychosocial [26];
- etalon [11];
- knowledge retrieval, educational, formative.

Taking into account the opinions of scientists about the functions of mentoring in this study and, according to the idea of Batyshev, the mentor is endowed with two main functions: training and educating functions adequately to his or her professional and personal readiness for mentoring.

The authors consider the opinion of Novikov [31] to be conclusive. They note that mentoring activities are oriented not only to sustainment training but also to accomplishing an educational function as well; they contribute to a feeling of professional pride, a pro-active attitude, and responsibility for the results of one’s activities.

The organization of mentoring requires the solution of a number of pedagogical tasks. They are, first and foremost, the selection system and special training of mentors, whose activity is actually an intensifying factor in professional orientation in the conditions of the working environment.

The system of choosing mentors included 2 stages: assessment of the mentors’ professional qualifications and improvement of their qualifications and competencies included evaluation of professional skills (knowledge of technological processes, normative documents, ability to use working methods, absence of errors and failures) and commitment to occupation (a feeling of pride of profession, emotional involvement in the production process, attitude to work as a mission). Some personal qualities of mentors were important:

- Normativeness (discipline, punctuality, abidance by rules and labour protection requirements, security advisory of railway traffic and other normative acts)
- The desire to impart experience, to help less experienced colleagues in mastering their skills
- Ability to transfer accumulated professional experience (ability to teach)
- Communicative skills (sociability, ability and desire to establish friendly relations, ability to clearly express one's thoughts in an accessible language)
- Leadership (credibility)
- Pro-active attitude, community involvement

Some motivational factors of the financial (wage increment, bonuses, additional days off, etc.) and intangible nature (honours board, the opportunity to participate in significant events, etc.) were determined.

The undertaken work contributed to the selection of mentors who have professional experience, who are indeed carriers of professional values and capable of assisting students in the course of their on-the-job training.

The professional development programme for mentors has included the following sections:

*1. Developmental psychology of a university student and his or her adaptation to the conditions of production during the on-the-job training.*

A student as a special subject of educational activity. The essence and problems of adaptation and self-determination. Successful adaptation as a sign of active activity and a necessary condition for its effectiveness.

Development of self-discipline and self-organization of the student in the process of the professional activity. Features of the behavior of students in a professional team, personality, and organization; personal and professional communications, the formation of group behavior in the team.

*2. Fundamentals of step-by-step formation of skills and their connection with the competence model of education at the university.*

Competence model of education at the university and its features. Stages of formation of skills: motivational (preliminary acquaintance with the action, forming in minds of the training target basis); performance of a real action in accordance with the training task; automatic execution of the action.

*3. Methods of motivating students, to-be specialists, to professional maturing and development, helping students form their personal vocational and educational development pathway.*

The peculiarity of educational and career motivation of students, to-be specialists, who are located at different stages of social and psychological development in the process of university education. Extrinsic and intrinsic motives. Motive related to the content of educational and professional activities and the process of its implementation, as well as social motive conditioned by various social relations of the student with other people. Cognitive and educational motives; motives of self-education. Strategies for a vocational-educational pathway, the phase of its implementation, as well as individual psychological characteristics of the student, which determine the specific educational pathway.

*4. Active methods in the activity of the mentor.*

Case method (analysis of specific situations), simulation games, method of complicated tasks.

Assistance in the on-the-job training of students by a qualified specialist-tutor adapting them to the conditions, content, and results of professional activities in the specialty in accordance with the requirements of the basic enterprise was an important condition for the development of ideas for networking between the university and the base enterprise. Pedagogical support after Anokhina, Asmolov, Gazman [32],[33],[34], is understood by the authors of this paper as support in overcoming the problems and difficulties that appear during the on-the-job training. This was ensured by the fact that the assistance was carried out with the participation of a teacher, on the one hand, pursuing the goal of consolidating theoretical knowledge and, on the other hand, an expert – a mentor who focuses on the formation of professionally oriented skills. For this purpose, some practical training programs designed for these purposes have been developed, and competitive selection of qualified mentors has been carried out who are motivated to improve the quality of training of a specialist adapted to the conditions of real production.

Introduction in the education process of the assistance in the on-the-job training program of the student, to-be specialist in the field of study called "Railway Maintenance", by an expert, the mentor, as an organizational and pedagogical condition for the formation of professionally oriented skills has been implemented at Federal State Budgetary Educational Institution Far Eastern State Transport University in cooperation with the base enterprise – Far Eastern Railway of OAO "Russian Railways" (Far Eastern Railway) for 6 years. The experiment involved 292 people.

Based on the understanding of professionally-oriented skills as an activity characteristic of the subject, the authors have singled out the criteria for their evaluation: motivational, knowledge and active ones. In the experimental groups (EG), the students, to-be specialists, undertook an internship with acquiring a profession under the guidance of

mentors; in the control groups (CG) – without them. The evaluation based on the motivational criterion was carried out in the form of questionnaires and included such indicators as: readiness for professional activity and the desire to perform it qualitatively; self-image in the profession and building one’s own career; the idea of personal self-realization in the profession and the vision of one’s own professional development. The presentation of the results of the questionnaire is in Figure 1 according to the method of determining the readiness by Chernyavskaya [35].

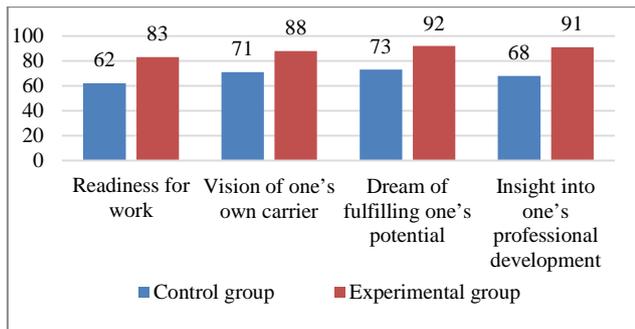


Figure 1. The results of the evaluation of the formation of professionally oriented skills using a motivational criterion with the methodology of determining the readiness by A.P. Chernyavskaya [35]

The results of evaluating the formation of professionally oriented skills of students, to-be specialists, based on the motivational criterion, are 91 per cent of EG students versus 68 per cent of KG students; it makes us possible to draw a conclusion about the expediency of implementing working specialties in the practical training of specialists in the field of “Railway Maintenance“, which was carried out with the participation of mentors.

Evaluation of the level of formation by a knowledge criterion was carried out after the completion of the station technology training during the qualifying examination for a working specialty. The results of evaluation of students, to-be specialists, on the knowledge of the action plan in accordance with the instructions and standard operating procedure of a shunting master and an acceptance/delivery inspector are presented in the percentage of KG and EG, respectively, in the diagrams of Figures 2. and 3.

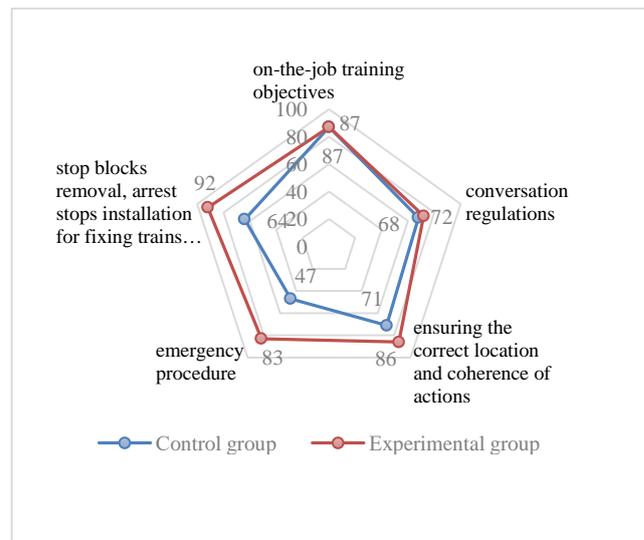


Figure 2. Comparative evaluation of the formation of professionally oriented skills based on the knowledge criterion with the use of texts on the knowledge of algorithms for performing professional actions in accordance with the qualification characteristic. Authors’ development

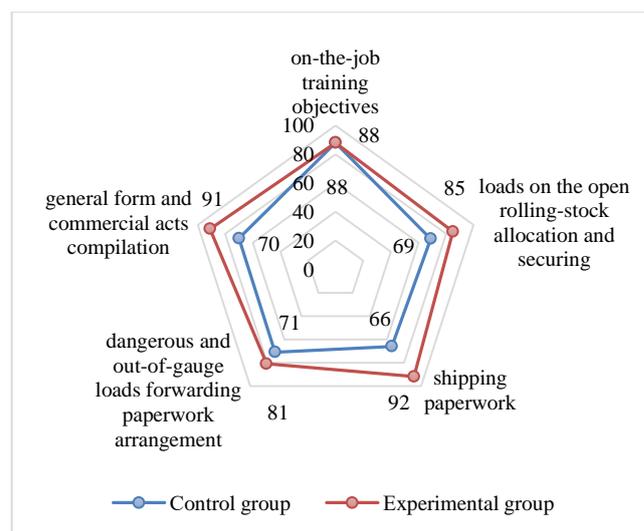


Figure 3. Comparative evaluation of the formation of professionally oriented skills of a student training as “Acceptance/delivery inspector“ and the students from the control group. Authors’ development

### Evaluation according to the activity criterion

The activity criterion for assessing the formation of professionally oriented skills of students, to-be specialists, is an indicator of insistence and independence in solving problems of a vocationally-orientated nature. The activity criterion makes it possible to evaluate the application by students of the types of activity in the formation of professionally oriented skills.

Evaluation of the formation of professionally oriented skills of students, to-be specialists, according to the activity criterion was conducted among the students of the experimental group while trade qualification testing, and for the students of the control group – after the end of their on-the-job training. The evaluation was carried out according to the levels of activity:

- reproductive – evaluation of abidance by the requirements of instructions, regulations, and technological maps in the process of on-the-job-training of students.
- heuristic – students, to-be specialists, take into account the peculiarities of the work of stations in winter, the action plan in case of service interruption, noncompliance with a plan of loading/unloading and non-observance of the service speed of train movements.

Assessment of the formation of professionally oriented skills of students by the activity criterion (per cent) is summarized in the diagram in Figure 4.

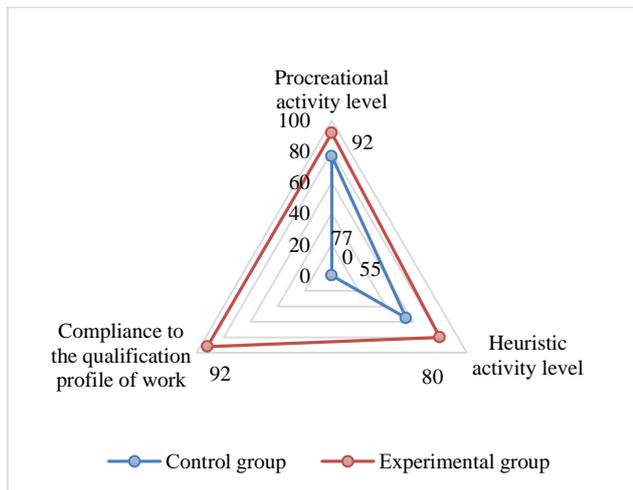


Figure 4. The results of evaluating the formation of professionally oriented skills of students by the activity criterion on the basis of expert estimation. Authors' development

Assessment of the level of formation according to the activity criterion was carried out by the examination board consisting of the responsible executives of the graduating departments and representatives of the basic enterprise. In assessing the activities, the parameters were considered such as fullness of executing actions, convolution, automatism, action speed, generalization, and endurance. For the members of the examination board, an evaluation sheet was developed which contains the types of activity to be assessed representing some professionally oriented skills and parameters of evaluation: “formed“, “partially formed“, “not formed“.

## 5. Discussion

The paper presents the theoretical grounds and implementation of the ideas of openness in the practice of education of the transport university, the transfer of the practical and professional part of the training of prospective bachelors of the transport industry to the professional environment as part of the practical training in the conditions of networking cooperation of the university-enterprise collaborative subjects.

Now, university-enterprise networking cooperation focused on bridging the gap between the requirements of production and the level of training graduates of the university cannot be recognized as established efficient practice. Validating the importance of employers' participation at all stages of the educational process, the authors emphasize the role of mentors in increasing the level of necessary professional skills of students in terms of on-the-job training programs.

The implementation of mentoring in the framework of networking cooperation with the base enterprise required the solution of the following tasks:

- determination of requirements for mentors for educational and training functions during the period of students' practical work;
- organization of competitive selection of mentors;
- training mentors with basics of pedagogical interaction and conscious use of psychological characteristics of the student age.

The educational function of mentors focuses on the formation of students' personal qualities and professional skills. The personality of a student in a professional environment is enriched, first of all, by appropriating the values of professional activity, which are manifested through the formation of a feeling of belonging to the professional environment, professional pride and responsibility for the results of the professional activity. In this case, the educational function of mentors takes the student to a new level of professional orientation. The performance of the educational function is based on the personal qualities of the mentor, which is considered in this case as a model for imitation. There are some requirements to the personal qualities of the mentor: trustworthiness among colleagues; discipline and punctuality while observing the normative documents, first of all, the rules and labour protection requirements, security advisory for trains movement; the pedagogical orientation of the personality manifested in the desire and ability to transfer one's experience; communicative skills and the ability to give information in an accessible language while establishing benevolent relations with students.

The mentor can perform the teaching function if he or she is a seasoned professional, whose consummate professionalism is confirmed by external assessments of the principal and his/her colleagues. The professional skill of the mentor is recorded through the knowledge of technological processes, normative documents relating to the production sphere, ability to use the methods of performing professional tasks, the absence of mistakes and failures in his/her work. Personal qualities of the mentor should demonstrate a commitment to the profession, attitude to work as a mission, emotional involvement in the production process. A sufficiently high competition between prospective mentors was explained by an understanding of the importance of mentoring by the management of the base enterprise in the context of increasing the level of practical and professional readiness of graduates to production activities, the motivation of mentors to their activities. In the course of the study, the expediency of the system of selection of mentors by means of expert evaluation is shown, with an emphasis on the aspects of their personal and professional readiness. The developed program of psychological and pedagogical training of mentors who passed competitive selection showed its feasibility. This manifested itself at the level of the formation of professional skills of students in terms of motivational, knowledge and activity criteria.

The experience of networking cooperation of the Far Eastern State Transport University with the enterprises of OAO Russian Railways can be realized for other collective entities in Russia and abroad. Some specific features of the training of mentors are determined by the content of case-tasks, simulation games depending on the specialties of training specialists.

## 6. Conclusion

The conducted Practice of Education in the implementation of networking cooperation between the Far Eastern State Transport University and the enterprises of OAO Russian Railways in the context of improving the quality of engineering education through a pronounced vocational orientation with the participation of representatives of the company as mentors in the course of practical experience showed the effectiveness of such cooperation. Combining the theoretical classes with the development of professionally oriented skills in real production conditions will provide an opportunity for the graduate to engage in the performance of his or her direct duties without additional training and adaptation to the conditions of real production.

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