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## Teacher Training for Masters Of Engineering: Didactic Analysis

Aleksey Dorofeev<sup>1\*</sup>, Galina Bukalova<sup>2</sup>

<sup>1</sup>*National Research University Higher School of Economics Financial University under the Government of the Russian Federation, 101000, Moscow (Russia), 11 Myasnitskaya street*

<sup>2</sup>*Orel State University, 302026, Orel (Russia), 95 Komsomolskaya street*

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### Abstract

Changes in the educational system of the Masters of Engineering degree program – second cycle technical higher education – are driven by the dynamic development of the post-industrial society. A new management culture based on the set of corporate values is being developed in the field of technical production. A multi-panel study identified a demand of major stakeholders for Masters of Engineering having competencies that reflect their willingness to organize the process of teaching corporate culture to production personnel. This competency type is implemented as a specific work-based educational activity. In this regard, the second cycle of engineering education shows an issue of teacher training for Master's students, which was previously not emphasized. Master's students are required to be trained to teach not only at higher educational institutions but also in a production management environment. This peculiarity determines the innovation of the above educational process component of the Master's Degree program. This paper analyzes the didactic specifics of the educational activity aimed at teaching corporate culture to production personnel. The paper also specifies the position of a facilitator that replaces that of an expert teacher and formulates the academic problem of teaching to Master's students of specific didactic tools appropriate for corporate culture development.

*Keywords:* educational research; corporate culture; didactics; production personnel training; educational innovations.

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\* Corresponding author. Tel.: + 79196415246; e-mail address: adorofeev@hse.ru

## **Introduction**

Under current conditions of post-industrial society formation, the old-fashioned hard hierarchical management of a technical production enterprise gives way to a new management culture based on the set of corporate values (Cardona, Malbašić, & Rey, 2018; Illes & Vogell, 2018). As a set of declared principles, values, and rules, corporate culture (Ehrenhard & Fiorito, 2018) serves to stimulate the consciousness of employees and guide their employment conduct. In this regard, significant emphasis is placed on the professional responsibility of service providers.

### **Purpose and objectives of the study**

The study's aim was to receive objective information for the design of educational standards based on medium-term personnel forecast revealing the needs of major vehicle maintenance employers in the Orel Region.

### **Literature review**

In the context of the post-industrial production process, centralization gives way to autonomy and the related responsibility (Kosfeld & Siemens, 2011; Bolton, Brunnermeier, & Veldkamp, 2013). Individualization is recognized as the major human factor characteristic of the post-industrial development society (Dempsey, 2015). The famous researcher of post-industrial society D. Bell forecasts an inevitable shift to the free and responsible actions of individuals. The individualization concept inherent in post-industrial society development (Price & Whiteley, 2014) determines the refocusing of engineering education to maximally align the competencies of higher educational institution graduates with the set of core corporate values. In the context of the post-industrial production process, it is required to build willingness in Masters of Engineering, as future line managers, to influence the development of values-based orientations of production unit employees in accordance with the declared corporate values. Corporate culture is a declared set of cultural values, principles, and codes of employment conduct that determine and regulate a labor enhancing conduct of organization employees in the course of employment (Zhao, Teng, & Wu, 2018). It is widely recognized in the field of engineering that corporate culture more than anything else stimulates the consciousness and high responsibility of employees. A new form of requirements for compliance of the production personnel employment conduct with organizational values is also developed in road transport production.

Training of road transport engineering personnel is closely related to the modern forms and methods of organizational and managerial activity. A study was conducted at the Polytechnic Institute of the Federal State Budgetary Institution of Higher Education I. S. Turgenev Orel State University – the region's flagship higher educational institution – to estimate the applicability of the competencies obtained by an engineering graduate majoring in Operation of Transport and Technological Machines and Systems. The study was preceded by a hypothesis regarding the need to apply a qualitative method of forecasting the applicability of competencies designed for future engineering personnel in road transport production.

### **Methodology**

A competency-based approach was chosen as the methodological basis for the study (Lester, 2014). The study method was a formal expert survey by modular questionnaires. The assessment object was the relevance of a set of graduate competencies as educational standards presented in the redesigned degree program for Operation of Transport and Technological Machines and Systems. The study framework defined the choice of the methodology for the interpretation of the obtained empirical data. It was obviously decided to use the sociological interpretation of information received during the study.

The questionnaire of production professionals yielded unexpected results. The highest relevance score was received not in the least by the graduate competencies reflecting the operational engineering training, but by the Production Communications competency unit. The Teamwork competency group showed the highest relevance (98.46 out of 100).

Specific statistics are 'stubborn figures'. However, in educational research problems, "... the logic of interpretation cannot be narrowed down to that of empiricism" (Vakhshain, 2011, p. 33). Acceptance of this argument of the famous sociology theorist Vakhshain made it possible to follow the below thesis during the interpretation of study results: "...different sociological explanations are possible exactly because they are narratively expressed and recorded in invariant explanatory schemes, narrative constructions" (Vakhshain, 2011, p. 37). Based on the acceptance of the above line of reasoning and apart from a questionnaire-based survey, discussions were held with the major industry stakeholders regarding the applicability level of the planned educational goals (graduate competencies) (Fowler & Tietze, 1996). Senior officers and lead specialists of the most competitive vehicle maintenance stations in the Orel Region participated in the discussions. During the discussions, respondents specified the ability to influence production personnel in regard to the development of their commitment to labor enhancing codes of conduct, practices, and values of the company as one of the most relevant competencies for graduates holding the positions of line managers. In other words, the competency reflecting the ability to ensure the functioning of corporate culture was specified as relevant (Muñoz, Guerra, & Mosey, 2019).

Therefore, a need was identified to add learning of methods for developing corporate culture through the pedagogical impact on the production personnel employment conduct to the list of educational goals of the Masters of Engineering degree program in regard to personnel management. This unit of competency of a modern engineer is objectively relevant as it is a major component of the implementation of the modern widely accepted methodology for technical production organization, systems engineering.

### **Results and Discussions**

The educational process for the Masters of Engineering degree program includes the prescribed academic training component. However, it is focused on training Master's students to participate in higher educational activity only. It is unjustified to a priori consider the learning result standard of the Masters of Engineering degree program as an educational phenomenon only and neglect that the rationale for such learning result standard is closely related to production performance standards.

The teaching practicum in the Master's degree program shows a clear lack of educational models focused on training to influence the production personnel employment conduct (Mogensen & Schnack, 2010). Educational activity in the above degree program is complicated by the dynamic modern post-industrial development of technical production (Støren & Wiers-Jenssen, 2016). In this regard, the traditional didactic teaching/training relationship cannot be narrowed down to the cognitive activity of Master's students only. Training is emphasized to be a subject of didactics that represents the unity of training and nurture (corporate culture teaching). The understanding by Master's students of the in-demand willingness to participate in corporate culture development changes the direction of the traditional didactic teaching/training relationship from learning activity to teaching activity. Such an interpretation of the subject of didactics ensures catering to the needs of engineering job training identified by the study (Nilsson, 2010). Under conditions of the post-industrial society, training in the field of production "requires the adoption of not merely information technology, but also a new methodological basis of education" (Nilsson, 2010, p. 541). Thus, in accordance with the proposed methodological basis, the traditional didactic relationship in the future teaching activity of Master of Engineering students is transformed into

the following triad: "learning activity/teaching activity/industry corporate culture" (Ornellas, Kajsa, & Stålbrandt, 2019).

Training of Master of Engineering students in regard to influencing the production personnel's attitude to corporate culture learning has certain didactic specifics. This determines the innovation of the above educational process component of the Master's Degree program. The innovation is in the increase of production organizational and managerial activities learned by Master's students and the addition of a subjectively new activity model to the learning results (Bjornali & Støren, 2012). Masters degree program providers must thereby be aware of the Master's students learning the result, the model of their future teaching activity.

The peculiarity of training Master's students for work-based educational activity is determined by the fact that the subject of the educational process (production personnel) has hands-on experience in production and industrial relations, as well as personal experience (Bravenboer & Lester, 2016). Alternatively to the traditional educational process involving the development of new professional experience, training of production personnel is meant to transform their previously accumulated experience. For this reason, the problem of achievement of the desired learning result in subjects of the educational process cannot be resolved on the basis of traditional didactics. Accordingly, Master's students must be informed about the peculiarity of work-based education that lies in the requirement to include in the process the trainees' (production personnel's) own diverse experience. Therefore, the peculiarity and complexity of production personnel training, as compared to traditional training, consists of its transforming nature.

Traditional didactics is focused on the educational needs of a subject of the educational process. Production personnel training is, however, based on practical needs – workplace issue resolution (Priksha, Kumar, & Nankervis, 2019). For this reason, a production employee has the position of a subject of training who acquires practical skills, rather than of a student gaining knowledge. The didactic specifics of corporate training imply the change of the trainer's position as well (Kottke, Olson, & Shultz, 2016). It seems most expedient to change the traditional position of an expert teacher to that of a facilitator who, through a dialog, organizes the efficient development of trainees' new experience (Wang & Bloodworth, 2016). A facilitator creates a favorable atmosphere of dialog interaction with trainees and a positive mindset for participation in corporate training. When maintaining the training direction, a facilitator helps trainees concentrate on the material being studied and restricts discussions not related to the learning objectives. A facilitator summarizes and analyzes training session results and presents their possible application by trainees. Therefore, facilitator forms and supports the efficient learning activity of the group of employees being trained (Cao, Chuah, Chau, Kwong & Law, 2012).

To achieve the efficient organization of work-based training, it is important to consider the significant awareness by production personnel of their involvement in the industry community of practice (Reed & Pabernethy, 2018). For this reason, it is essential for Master's students – future education providers – to understand that corporate culture learning is relevant to company's employees (Becuwe, Tondeur, Roblin, Thys, & Castelein, 2016; Margalef & Roblin, 2016). Culture translation is known to be a concept of traditional didactics. Learning by Master's students of methods for teaching corporate culture fundamentals to production personnel implies the generation of new social experience concurrent with its transformation into the cultural form.

Traditional didactics is generally focused on an individual subject of training. In contrast, the didactic peculiarity of corporate culture development may lie in the fact that an individual subject of

training is replaced by a collective subject of training. This may be a working team learning the labor enhancing methods of social and industrial relations necessary for professional collective actions. Another option is the formation by a working team of a specific style of industrial relations.

One of the major didactic specifics of training Master's students to teach production personnel is educational design in the context of real-life workplace issues. This is due to the fact that workplace issues constitute the major source of needs for work-based training. Accordingly, the didactic peculiarity of work-based training lies in the achievement of a balance between real-life workplace objectives and educational activity.

It is expedient to inform Master's students during their teacher training about the necessity to transform the trainees' (production employees') own accumulated production and personal experience. In this regard, the generation of new experience is based on the continuously emerging changes in the technical and technological, as well as social and organizational environment for production processes. Master's students must also be aware of the fact that the generation of a new experience of trainees will also require their own readiness for interactive self-education. The interactive self-education curriculum for an engineering employee organizing production personnel training may comprise the following components:

- analysis of the technical and technological and/or social and organizational changes in the production process;
- learning of production activities in the changing production process according to the engineer's own position;
- didactic conceptualization of the substance of production changes as regards corporate culture;
- inclusion into education practice of learning by production personnel of corporate culture changes.

### **Conclusion**

Corporate culture teaching under conditions of post-industrial technical production serves to prevent workplace crises. Viewing from such perspective of teacher training for Master of Engineering students to participate in the process of personnel's corporate culture learning identifies specific development areas of didactic theory within the educational paradigm of the post-industrial society.

The presented training program for Masters of Engineering mainstreams the academic problem of identifying didactic tools for teaching corporate culture to production personnel. When resolving this academic problem, one should take into consideration that traditional didactics fails to account for the specifics of production personnel training, such as:

- discussion of the managerial impact on trainees (production personnel) for the purpose of production performance improvement, change of the attitude to labor as the major educational goal;
- refocus from learning and cognition to cognition and transformation; transformation of the accumulated professional experience, rather than generation of knowledge and skills typical of traditional professional training;
- a mismatch between the subject that initiates training (corporate management) and the subject of the educational process – trainee (company employee);
- dialogic educational process; change of the trainer's position in education practice to the subject-subject interaction;

– learning result assessment in accordance with the level of impact on trainees' employment conduct and work achievements, rather than the assessment of knowledge and skills.

Engineering education is a diverse sphere. Development of competencies in Master's students reflecting their readiness for work-based educational activity is but one component of the above field. However, the study results explicitly specify the relevance of this problem in engineering pedagogy. The reviewed problem of training for Master's students was identified by the authors based on the survey results of key stakeholders, i.e. the industry's competitive enterprises with a sufficiently high corporate culture level. Less competitive enterprises may experience this problem on an even larger scale. Thus, the authors consider the article to be aimed at introducing the identified problem of training Master of Engineering students for educational activity into the contemporary research discourse on engineering education problems.

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