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FORMATION OF CONTENT OF UNIVERSITY PROFESSIONAL TRAINING BASED ON THE SYSTEM RESEARCH OF FUTURE PROFESSIONAL ACTIVITY

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The relevance of the paper is determined by the need to maximize the convergence of the results of vocational training of university students and the requirements of production to a representative of a particular profession. In this regard, the purpose of the paper is aimed at unification of the process of designing the content of training, which ensures the correlation of tasks and goals of university students' professional training. The authors presented an algorithm for the systematic study of professional activity, allowing formalizing the activities of a specialist and setting parameters for measuring its effectiveness. A step-by-step study of the professional activity of the future specialists-production managers, allowing identifying the criteria, boundaries and requirements for their professional training in modern production conditions, was carried out. Practical significance of the research lies in the possibility of applying the results obtained while designing the content of vocational training, the formation of the professional competencies of the future specialist, demanded by the labor market. The paper is intended for teachers, practitioners, managers and staff of higher education institutions, who carry out the design of vocational training.

Keywords: higher education, vocational training, professional activity, teaching content, design, formalization.

INTRODUCTION

Modernization of education, the implementation of competence education has identified a wide and comprehensive interest in the design of the content of education in the university in modern conditions, when the role of independence in training and mastering the foundations of professional activity is strengthened. The basic characteristic of competence is related to the way of its formation: it is formed and manifested only in the process of activity, and its quality is determined by the measure of involvement in the activity. Competence approach within the framework of the personality-oriented paradigm, according to E.V. Bondarevskaya (2003),

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sets a set of competences oriented on the semantic component of any kind of activity. The notion of competency includes not only cognitive and operational-technological components, but also motivational, ethical, social, behavioral. Consequently, it is always personally colored by the qualities of a particular person, manifested as a personally realized, entered into a subjective experience. In this aspect, the design of the content of training is based on the analysis of future professional activity, the construct of which determines pedagogical technologies, forms and means. V.P. Bespal'ko (1977) considering pedagogical design, interprets it as an independent poly-functional pedagogical activity, predetermining the creation of new or transformation of the existing conditions of the process of education and training.

The modern stage is characterized by innovative changes in the educational space, which are based on scientific research, goal-setting, forecasting, design, and simulation. In this regard, special importance belongs to the design of the content of education. Subjects of designing within the framework of the content are: concepts of the content of education, individual subjects and courses, educational and training curricula, teaching aids, didactic materials.

The highest level of design of the content of education is its concept, which determines the philosophy of education, the strategy of teaching and upbringing, the methodology of constructing the content and the basic principles of implementation.

At present, there are a lot of descriptions of the stages, stages of the periodization of the formation of professional activity. The problem of professional development is actively explored in social psychology, labor psychology, pedagogy, psychology and acme logy. All the theories and approaches allocate various factors and components for determining levels, stages, phases of human development in the course of labor, and also have certain similarities and differences, which will be further analyzed by us. The analysis of the stages of professional activity is described in the studies of B.G. Anan'yev (1984), L.I. Antsyferova (1981), B.V. Lomov (1984), Y.B. Gippenreiter (1988), M.A. Tchoshanov et al. (2017) who noted the complexity of the relationship between professional and personal development (Antsyferova, 1981).

Within the framework of professional training the question arises as to how the development of a person can determine the success in professional activity, how to train a professionally successful specialist. Obviously, significant changes in the pedagogical training organization, personal and practice-oriented content, methods, form, teaching technologies aimed at the professional development of the student's personality contribute to this.

At the present time we are talking about the formation in pedagogy of such a direction as didactic engineering - this is the methodology (theory, practice, diagnostics) of the organization of activities to solve didactic tasks (Choshanov,

1997; Nuriev, Krylov & Starigina, 2015; Kalimullin & Utemov, 2016; Sidelnikova, 2016; Rakhimova *et al.,* 2017), within which problems are solved to create new effective didactic systems, means (technologies) of training and diagnostics of the quality of training using engineering methods in order to form the professional competences of the future specialist (Nuriyev, Zhurbenko & Starigina, 2008).

METHODOLOGICAL FRAMEWORK

From the standpoint of *system methodology*, a person's professional activity is a systemic object, which is an integrated, complex, multilevel, dynamic structure that includes two components: the subject of labor (person) and the object of labor, normatively interconnected by common social, technical and economic tasks.

Special value scientists give to the active subject of labor, highlighting in it the following directed characteristics (Ivanova, 2005; Ermolaeva, 2016; Borisova *et al.*, 2016): personal (interests, motives, values); psychological (cognitive, communicative, sensor-motor); psycho-physiological (working capacity, self-regulation, etc.); individual characteristics.

The subject of labor, in turn, includes: the subject and means of labor, the labor task, labor functions and operations, labor rights and duties, a professional environment. System analysis of any object must be implemented from the position of the principle of "level" (Bertalanffy, 1973; Hansen, 1984; Yudin, 1978), relying on its parametric, morphological and functional aspects.

The parametric level assumes empirical observations of the object to obtain a description of its properties, attributes and relationships. Morphological description includes spatially localized components of the object; its internal connections are highlighted with support for its integrity. Functional description implies the study of functional dependencies between parameters and the general structure of the object.

Thus, the subject-object interrelationships between the units of the structure of the subject of labor and the units of the structure of the labor object are considered on three levels of analysis: parametric, morphological and functional.

As part of our research, we rely on the approach of such authors as L.N. Zhurbenko, N.K. Nuriyev and S.D. Starygina (2008), who define the modern didactic training system (by the example of an engineer) through the implementation of the stages: the purpose of training; composition, content and forms of presentation of educational material; technology of training; monitoring techniques and criteria for assessing the quality of training; form of organization of training; focusing on the typed cyclic algorithm for solving problems:

1. The problem is formalized in the cognitive sphere. Moreover, the more complex the problem, the higher it should be developed formalization abilities (ability of A type).

2. The solution of the problem is constructed. Obviously, the more complex the problem, the higher the student's constructive abilities should be developed (abilities of type B).
3. The construct of the solution of the problem in a real (virtual) environment is executed. Of course, the more complex the problem, the higher the performance abilities (abilities of type C) should be developed (Starigina, Nuriev & Zhurbenko, 2005).

This algorithm is the basis of this study and implemented on the example of researching the professional activities of the production managers in order to form the most productive content of their training.

RESULTS

Step-by-step research of the professional activity of the production manager

Stage 1. Definition of essence, specificity and the main tasks of the production manager

The manager's activity is the adoption of managerial decisions based on continuously received information on the progress of processes aimed at transforming existing production and human resources into a finished product. The essence of the activity of the manager of production is expressed in the sequential cyclic passage of the stages: goal-setting, planning, organization, control / adjustment (Deming cycle (Deming, 1994). The end result of the activity is a market products (services) with a given quality that satisfies the potential customer. A permanent intermediate result is achievement of the set goals, stable condition (low variability) of the production cycle processes in the control and integration of resources.

Stage 2. Determination of the activity mechanisms of the manager in solving professional problems

The following spectrum of professional tasks of the production manager arises: the organization of production of competitive goods; improvement of the production process; introduction of new high technologies; improving the product's quality, improving of management. The main functions of the production manager are organization and management of production, organization of production activities of employees. The manager's activities are carried out in the organizational-economic and socio-psychological at each stage of the product life cycle through the impact on the managed production system (Mintsberg, 2011).

The mechanism of the manager's activity as a managerial influence on the successive change in the state of production processes is a systematic continuous control effect on the organizational, economic and social factors that ensure the viability of the enterprise.

Next, we will identify the factors that determine the efficiency of the production manager in the organizational, economic and socio-psychological aspects.

1. The effectiveness of the organizational and economic activities of the production manager can be determined on the basis of the following economic indicators: the economic efficiency of production (the quantitative ratio of the two quantities - the results of economic activity and the costs incurred, the relative value Efficiency (E) = (Result (R) / Cost (C)) * 100%); reduction of material consumption and production costs; costs for a ruble of commodity output; growth of profit and profitability; volume of production; improvement of product quality (number of reclamations).
2. The effectiveness of the socio-psychological direction of the activity of the production manager can be determined on the basis of labor indicators: the productivity of social labor; reduction of labor intensity; costs of living labor (hours worked, wages fund); turnover of staff; indicators of the quality of work; social indicators; labor safety indicators; employee satisfaction; professional growth of employees.

Thus, production managers can be evaluated based on the indicators of the structure which are headed by them. Measurability of activity is based on variables that can be introduced into the measurement system: human resources; quality of the final products / services; indicators of production processes; indicators of financial and economic activity.

Stage 3. Formalization of the activity of the production manager through the function of quantitative, temporal and qualitative indicators of the enterprise

The field of activity of the production manager formally is a set of personnel resources K = {K1, K2 ... .. Km} interacting with each other and with the production means P = {P1, P2 ... ..Pl} in the production process L = {L1, L2 ... ..Ls}.

Moreover, the relations between the sets K and P can be determined by the relations:

- "One-to-one" $f_i(K_i) = f_j(P_j)$;
- "Many to one" $\psi_i(K) = f_j(P_j)$;
- "One to many" $f_i(K_i) = \varphi_j(P)$;
- "Many to many" $\psi_i(K) = \varphi_j(P)$.

The methodology of the activity of the production manager can be schematically described through the factor model (Figure 1).

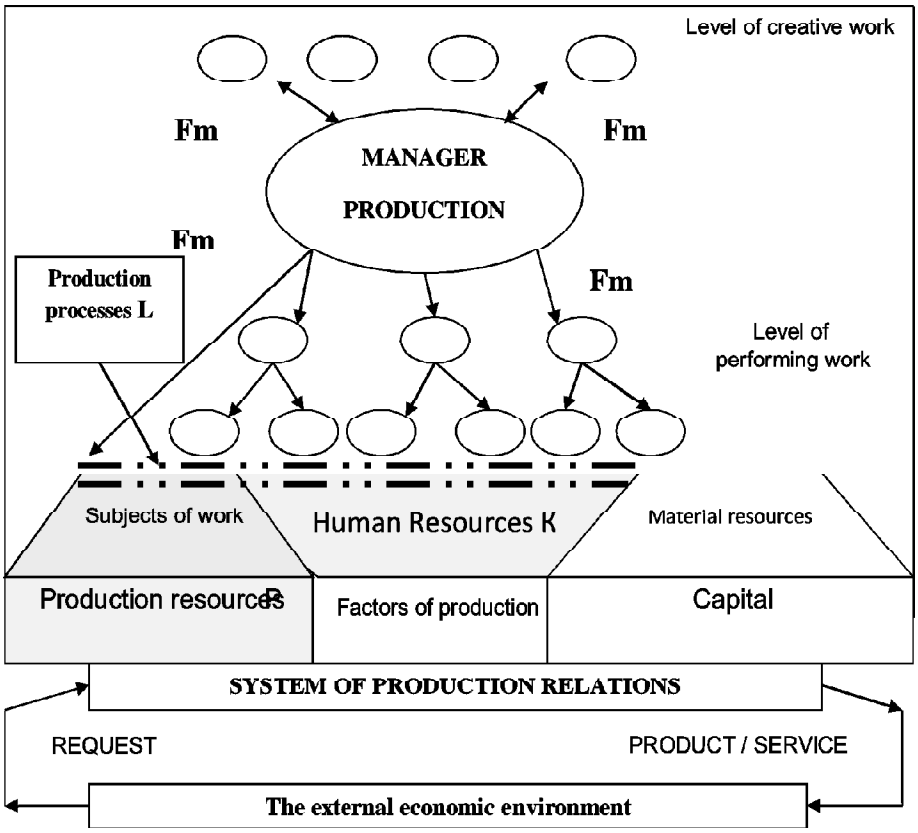

Figure 1: Factor model of activity of the production manager

Possessing this methodology and economic knowledge of the external and internal environment of the enterprise, the manager carries out the transformation of the flow of management tasks into a stream of effective managerial decisions.

Stage 4. Determination of productivity factors of the professional activities of the production manager

A necessary condition for the productive activity of the production manager is the availability of his general and professional knowledge, as well as the attitudes and abilities of the cognitive sphere, realized in the inner mental activity. In particular, the productivity of the managerial decision taken in a certain field of activity depends on knowledge and skills ("knowledge - learning", Kl, "knowledge-skill", Ks), competency, as ability to apply knowledge in solving production problems in the professional sphere ("knowledge - Professional activities ", Kpa) and abilities in

this sphere, experience, allowing to carry out modification and innovation of knowledge (“ knowledge-modification “, Km,” knowledge-innovation “Ki).

Fig. 2 shows the correspondence of the units of activity (phases of work) and managerial abilities.

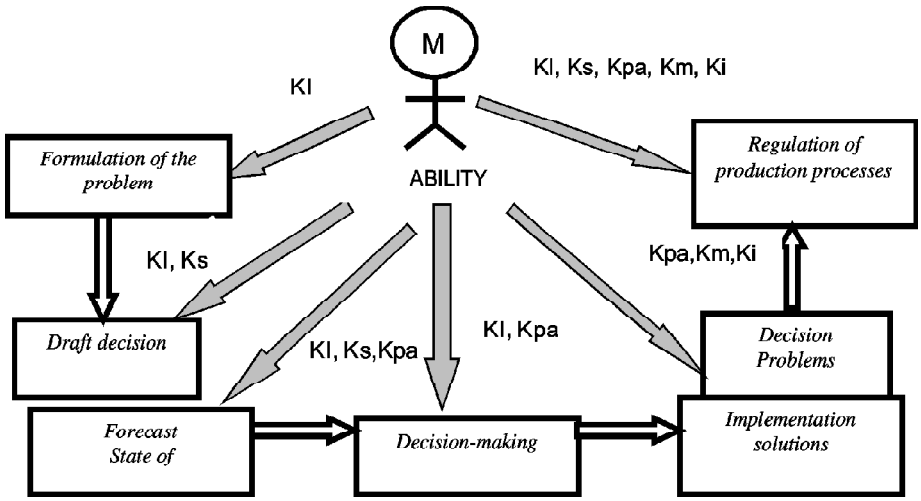

Figure 2: The mechanism of making managerial decisions of the production manager in determining the factors of its productivity

Thus, in case of decomposition, managerial activity (MA) when making a managerial decision (MD) can be described as a function of abilities S (A, B, C) with arguments of the level of preparation Kl, Ks, Kpa, Km, Ki:

$$MA = S < Kl, Ks, Kpa, Km, Ki > \quad (1)$$

where: A - the manager’s ability to formalize the task posed, which requires a MD;

B - the manager’s ability to build a draft decision with a satisfactory forecast of the results;

C - the ability to implement and carry out control solutions in the internal environment of the enterprise.

Thus, in terms of the efficiency of production activities, production managers differ in the level of development of the abilities of the MA, competence in the professional and general sphere, and experience in solving problems.

Therefore, for the productive activity of the production manager, it is necessary to have:

1. A high level of development of MA capabilities (ABC-abilities, personal potential) in all operations of production activities;

2. Experience (knowledge + competence + innovation, productively realized during a certain time interval).

Stage 5. Interaction of the manager with information flows in the framework of professional activity

Features of the manager's work consist in the aggregate ownership of ways to solve a group of tasks of the management cycle, only in this case, its activities will be effective for the organization. Information in the form of a formal managerial decision is the main tool of the manager's activity aimed at organizing the performance of work by subordinates, taking into account his abilities, the possibility of their implementation and career growth based on knowledge of management technologies and performance of production activities. The variety of managerial behavior is threefold: direct action, impact on people and information management.

To describe the mechanism of the MA of the production manager according to units of operations, we consider the interaction model of the manager as the subject of activity M with a problem requiring a MD (information object I) of a certain level of complexity (z). The complexity of the problem is an invariant property of the information object, determined by the need to resolve the contradiction between production and human resources (Fig. 3).

Within the framework of this information object, the contradiction between objects of production of the cognitive property Az (at the first stage) is considered. Objectively, the technology for solving the existing contradiction exists and is determined by the complexity level Az, but it requires transformation taking into account available resource limitations of production, decision terms, manager's

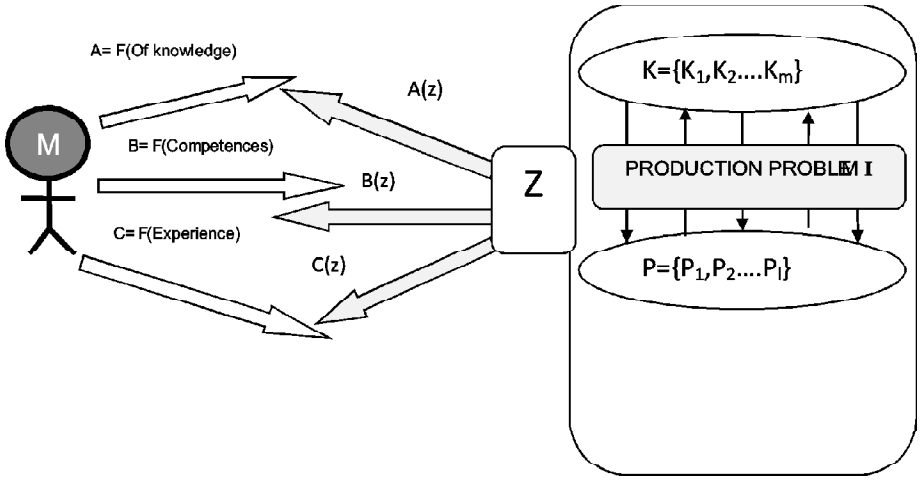

Figure 3: The integration model of the task of making an administrative decision as information object I with the production manager M

competence. When exposed to production objects in a real environment through other objects of complexity Bz the production (conflict) situation of complexity Cz can be resolved.

In general, the information situation I has an objective complexity of types Z (z_1,z_2….z_n). Then, for each production situation, we can match its complexity, i.e.

$$\text{Object I} \leftrightarrow \text{is the complexity of the object zj.} \quad (2)$$

Let's consider the manager M which should accept the administrative decision of complexity Z j, object I, that is to transform a problem into the effective decision of a problem.

To this end, he begins production activities from Operation A to transform the problem through its formalization in the cognitive sphere. Taking into account personal characteristics (having knowledge of the complexity of z), the manager can transform the problem, that is, the formalization abilities are related to the knowledge A = F (knowledge), the decision is related to the competence B = F (knowledge), and the implementation of the solution is related to the experience B = F (Knowledge), which, on the whole, make it possible to implement MD.

In the context of the foregoing, the productive interaction (solution) of the problem of a certain complexity I (Az, Bz, Cz) of the production manager with the competence and experience levels of M (A, B, C) can occur when the system of conditions is implemented:

1. The level of knowledge of type A exceeds the complexity of the problem of a MD of type Az of object I.
2. The level of competence development of type B exceeds the complexity level Bz of the objects' interaction of production I.
3. The level of development of type C experience exceeds the level of complexity of type Cz of problem I (Az, Bz, Cz).

In general, the manager (object M) takes a productive managerial decision if his personal potential M (A, B, C) is above the complexity level of problem I (Az, Bz, Cz).

Stage 6. Development of a professional-activity model of the production manager

Based on the theory of systems, the organization (enterprise) can be represented as a complex, open, dynamic system that engages in internal and external activities. The functional model of the enterprise as a system can be represented through a description of the set of invariants E, where E = (input flow, resources, control, mechanism of action, final product), and the effect of the system is neither the sum of the elements themselves nor the sum of their potentials.

In the framework of this model, let us consider the professional activity of the manager, which we will present as an invariant professional-activity model of the specialist (Fig. 4).

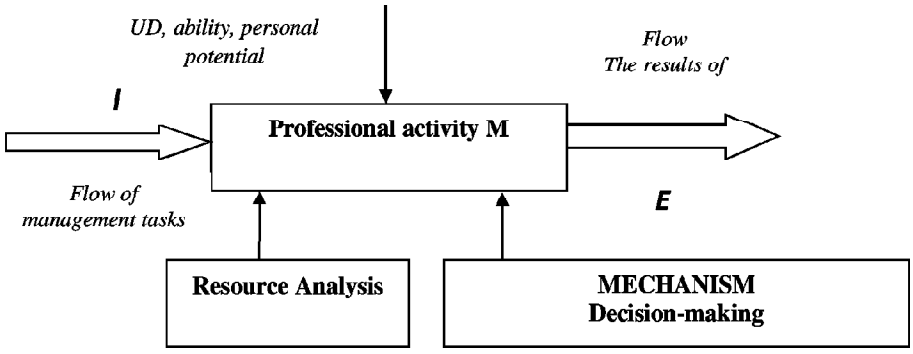

Figure 4: Invariant model of Professional activity of production manager

The professional-activity model operates as follows: the input receives a stream of professional tasks I from the subject area, which, depending on the state of the CA factors and decision-making and resource constraints, is transformed into a result stream with different efficiency values:

$$E = L\,[PA\,(MA, P, K)] \quad (3)$$

The essence of the control impact - the function of management Fm is determined by the resulting reaction of the action (production process) and the interaction of personnel, production environments under the optimization (lean) use of resources). The purpose of the enterprise is to achieve the most acceptable (optimal) result at any given time.

Then the target function of the manager can be written in the following form:

$$Fm = L + \psi\,(K) + \varphi\,(P) \rightarrow opt \quad (4)$$

Where: L is the set of production processes;

$\psi(K)$ - cadres interaction;

$\varphi\,(P)$ - the interaction of the means of production.

The optimal value of the objective function can be considered the one in which the variability of production processes is minimal, and the process quality indicators are growing.

So, we described how each manager property (production potential) manifests itself when it interacts with other objects under certain conditions. The production activity of the manager, as a process, is aimed at: studying the properties of the aggregate of human resources (the set K); the study of the properties of the aggregate of productive resources within the framework of the realization of production processes; creation, organization, maintenance of consistent parallel-consecutive production processes in order to obtain the final product / service through the synthesis of technologies for the organization, introduction of resources for mutual

exchange between the object; management of production processes in order to eliminate the contradictions that arise between the interacting objects that form these processes.

The practical significance of the formalization carried out by the authors lies in the possibility of applying the results obtained in organizing the professional training of future production managers in the conditions of the university; the formation of such didactic conditions, the design of the optimal content of vocational training contributing to the development of personal abilities and the formation of the necessary professional competences for the selected type of professional activity.

DISCUSSION

The study formalized the activity of the production manager through the function of quantitative, temporal and qualitative indicators of the enterprise developed a number of models of the manager's activity systematically representing his professional activity from functional, social cognitive-personal positions (Kirilova, 2008; Levina, 2013; Levina, 2016). Understanding of professional activity is reflected in the standard of training and in the professional standard, often not too correlating with each other. The proposed quality-metric vision contributes to their successful rapprochement, describing in detail each stage of activity and basic functions, then focusing on them, as the goal of pedagogical activity.

The condition for the optimal design of the content of professional disciplines based on the competence approach is the development of a model for training a specialist (for example, a manager) whose quality of training depends on the quality of training for many professional disciplines and determining the parameters for creating an educational environment (Nuriev, Krylov & Starigina, 2015). The definition of a set of parameters and their metrics as components of the engineer's competence makes the diagnostic goal of such training - a student's achievement of academic competence, bringing him closer to mastering the necessary competences to some extent (Bukarova & Alekseeva, 2016; Serikov, 1994; Gilyazova & Zaripova, 2011; Kononova, Oleshkevich & Sadon, 2006; Yuzhaninova & Katasheva, 2015).

CONCLUSION

The goal is a system-forming factor for the design of the content and technology of instruction in any professional discipline, the introduction of a metric measurable system determines the form of presentation of content and the means that provide training, as well as monitoring the formation of professional competency.

Designing the content of education is aimed at improving its quality of education in the context of optimally defined programs and curricula of disciplines, increasing their innovative component. The quality of the knowledge gained by students in the design of the content of education is characterized by fundamental nature,

depth and relevance in the work after graduation. The development of this research is seen in the design of the content of learning in the form of a knowledge base for each direction of learning on the basis of a systemic vision of the subject and the object of professional activity.

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