

## Structurally Functional Model of Formation Transprofessional Competences of the Future Experts an Average Link

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### ABSTRACT

The relevance of the problem declared in article is caused by the fact that modern development of production demands from specialists of the enterprises not only the high level of formation of the professional competences, but also the additional, the transprofessional competences, conforming to the requirements problems of the production cluster. The purpose of the article consists in development of a structural-functional model of formation transprofessional competences of the future experts an average link. The leading method to research of this problem is the modeling method allowing to consider this problem as purposeful and organized process on improvement professional and to forming of the transprofessional competences necessary for specialists for implementation of labor functions of the profession. The structure of the model of forming transprofessional competences of the future specialists an average link includes a preparatory, analytical and research implementation stages and components - result and strategic partners. The model allows to organize process of training of students in professional educational institution and allows to improve forming of the professional and transprofessional competences of the future specialists an average link. The article can be useful in the practical terms for teachers of the professional educational organizations and the industrial practice centers of the enterprises at training of the specialists; for training centers and retraining of the personnel at selection and structuring content of the professional training of the specialists.

### KEYWORDS

The structurally functional model, the transprofessional competences, the specialist of an average link, the production oriented pedagogical conditions

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## Introduction

### *Relevance of research*

The dynamic development of the economy and industrial automation change requirements to specialists. (Tkachenko, 2007) The management of the industrial enterprises is forced to expand labor functions of the workers because innovative technologies implement into production. The modern expert has to own the adjacent profession and competences allowing to perform key labor operations of related professions. (Markova, 1996) The specialist of high technology manufacturing except professional needs to own also additional, transprofessional, competences. (Malinovsky, 2007) The expert of high-technical production have to own additional transprofessional competences.

Training of the student will be more effective if the transprofessional competences necessary for adjacent and related professions are formed. Such approach will allow not only to increase quality of the professional education in the college, but also will create conditions for further self-improvement, self-development of the graduate thanks to assimilation by it of the mechanisms, methods integration of the competences. The aspiration to be a competitive specialist orients the young man to mastering of adjacent professions, motivates a self-assessment of compliance of the opportunities to requirements of a profession. (Fatykhova, 2002) The modern quality of professional education is connected with forming of transprofessional competences of future specialist. (Vakhidova & Gabitova, 2016)

### *Materials and Methods*

#### *Research techniques*

In the research were used: the analysis of the regulating documents and the products of activity, the content analysis, the synthesis of the pedagogical experience, the modeling, the design, the method of expert evaluations, the analysis of results activity of the listeners of the students, studying and synthesis of experience of professional training of specialists an average link to execution of the labor actions of the adjacent and the related professions, the diagnostic techniques, the pedagogical experiment.

#### *Experimental base of research*

The experienced and the experimental work was carried out in the professional educational organizations «Sterlitamak chemical technology college», «Ufa fuel and energy college», «Ufa machine-building college», in the training center of the personnel department PAO "Ufa Engine Industrial Association".

#### *Investigation phases*

The research was carried out in three steps:

- at the first stage - a preparatory stage - the condition of the studied problem in the pedagogical theory and the practice was analyzed; the structure of a technique of the research was developed;

- at the second stage – the milestone - the structurally functional process model of forming of the transprofessional competences of future specialists an average link of the professional educational institution was developed and implemented;

experienced and experimental work on check of the efficiency this model was carried out;

- at the third stage - the final stage – the systematization, the judgment and the generalization results of the research were performed; the theoretical outputs were specified; processing and registration of the received results of the research were performed.

## Results

### *Structure and maintenance of model*

We developed the structurally functional model of the forming transprofessional competences of the future specialists an average link. It includes blocks - strategic partners, a preparatory and analytical stage (a perspective of a production cluster, significant factors, components of transprofessional competences), a research and reliable stage (approaches, the principles, the production oriented pedagogical conditions) and result.

This model is directed to selection of additional transprofessional competences of the future specialists an average link and represents. The research was carried out in two steps. We analyzed the performance of the industrial enterprises in order to identify the requirements of the employers. The objects of the analysis were made by enterprises of the machine-building and the chemical industries. The analysis of development industry has identified the problems of the manufacturing cluster that hinder the development of industry in the region. Most urgent are the following challenges of batch type:

- the necessity of introducing energy-efficient equipment;
- the necessity for constant training of the personnel;
- decrease in the investments due to the difficult economic situation;
- shortage of skilled workers;
- low productivity;
- the necessity of modern equipment;
- low competitiveness of products;
- complexity in providing the enterprise with raw materials;
- difficulties in the implementation of energy-saving technologies.

We ranked the chosen tasks of the batch type by the frequency of existence of the enterprises of the region and the degree of their influence on the economic development of the organization. We have analyzed compliance of problems of a production cluster to types of professional activity by means of multidimensional and matrix means. The problems of a production cluster affect activity of the professional educational institutions and teachers. The tasks of the batch type connect experts, professional educational institutions, teachers and employers. The problems of a production cluster demand use of the approach focused on requirements of the enterprise which is characterized as the focused production.

The employers are not interested compliance of preparation to requirements of the federal state educational standard, he is interested in professional competence of the expert. To be a professional is not enough. The modern expert on production has to own an adjacent profession. He has to own multifunctional competences which allow the expert to perform labor operations of an adjacent profession. The



multifunctional competence of the expert is set of motivational and target, organizational and administrative and communicative competences. These competences are complementary at execution of variable functions of professional activity of the specialist.

The tasks of the batch type possess interprofessional character. The employee of the modern enterprise has to be guided in a production situation, solve non-standard problems and in the team with colleagues to cope with production problems. He has to own additional – transprofessional competences. The professional competences promote mastering any one specialty. The multifunctional competences are necessary for performance of labor actions of adjacent professions of the specialty. The transprofessional competences help the expert to join quickly in interprofessional interaction with development of the necessary labor functions of the group of the related professions

The problems of a production cluster select the significant factors, the content of the education, the technology of training, the personal professional development of students. Significant factors promote selection of components of transprofessional competences. The transprofessional competences - the professional abilities of the expert including the technological, the information, the standard and legal and the communicative and the interprofessional components meeting the requirements of the federal state educational, the professional standards and the production clusters allowing him to participate in the solution the tasks of the batch type. We have allocated the following groups of transprofessional competences: the technological, the information, the communicative and the interprofessional, the standard and the legal. The ability to work with technical devices in allied professional industries, participation under repair, installation of the equipment in allied professional industries, the monitoring procedure behind works on installation and repair of the equipment in allied professional industries with use of the instrumentations are united in the technological group of competences. The graduate will be able easily to resolve the arising issues connected with the equipment, the technologies of the allied professional industries. The competences allowing to work with information on related professions are united in information group: development of the documentation on the solution of the standard problems package character; data collection and processing for the solution of the standard tasks related professions; decision-making and exchange of the information at the solution the tasks of the batch type on related professions.

The communicative and interprofessional transprofessional competences give the chance to the specialist to communicate in group and with certain specialists, using professional terms of allied industries of the industry. This group of transprofessional competences includes such competences as use of the professional thesaurus of related professions and adjacent professional areas; observance of rules of work in groups; use of rules at communication in adjacent professional areas. The normative and legal competency group allows the graduate to be "legally grounded", to be guided in regulating documents of related professions. The following competences are united in this group: knowledge and observance of the legislative regulating documents concerning attended operations in the allied professional industries; knowledge and observance of bases of the ecological, the economic legislation.

The results of the first stage initiate and prove a research and realizable study phase. The definition of approaches, the principles of process formation of

transprofessional competences of the future experts an average link is carried out at this stage. The process of forming of transprofessional competences is based on system, activity, the personal oriented and competence approaches. The integration of approaches yields positive result and influences the choice of the principles and pedagogical conditions.

The integration processes in education cover the purposes and contents, forms and methods, technologies and a training aid and education, and integration processes in education differ in special intensity and variety. Such specifics of pedagogical science especially are considerably shown at the level of its conceptual framework and objectively become the reason of its "blur", "illegibility", "uncertainty", "ambiguity". The integration in various forms of synthesis of interdisciplinary researches matters as for process of forming of professional competence of future engineers of training process, and in professional follow-up activity (Ivanov, 1999).

The principle of interdisciplinarity, as well as any other principle of training, possesses property of generality, being implemented in each subject. Need and expediency of its use is confirmed by the best pedagogical practices and numerous all-pedagogical and methodical researches.

The problem of polytechnical training which is closely tightly interconnected with all-professional training is rather investigated in relation to comprehensive school, primary professional education, in a smaller measure - to secondary professional and higher education. In recent years, questions of polytechnic education, training remained practically in the shadow that did not reduce actually their importance. Consideration of the separate moments of this is important at this stage also because in federal state educational standards of secondary professional education there was a return to a politekhnizm at the level of the so-called "professional modules" including interdisciplinary courses. These modules contain the training material which is a theoretical and practical basis for group of the related specialties which are a part of the List of the specialties of secondary professional education selected within the industry or at the cross-industry level.

The polytechnical training is treated "as the training which is providing acquaintance of pupils to philosophy of all production processes and at the same time creating skills of the address with instruments of production; provides mastering all-professional, polytechnical special knowledge" (Atutov, 1986). Acquaintance to high technology manufacturing has to be based so that to provide training in such production bases which are the most widespread and the general (or related) for the majority of industries. The principle of a politekhnizm as objective pattern reflects bonds between science and production, and its implementation in training process provides adaptation of workers to the work changing according to the contents and conditions. Principle of continuity allows to receive different education level; however it is possible only during creation of system of life-long education within new types of educational institutions. So at training of specialists as a mechanic this process can go from the assistant to the master or the foreman.

There are defined the pedagogical conditions following from problems of a production cluster. The expert has to solve also together with colleagues the problems of package type arising on production. The professional educational institution needs to create pedagogical conditions of forming of transprofessional competences of future specialists an average link. The external factors influencing



selection of transprofessional competences and pedagogical conditions are requirements of the federal state educational standard and the employer. Contents and technologies of training, personal professional development of students will be the internal factors which are exposed to change. These components allowed to select structure of transprofessional competences, and on their basis - pedagogical conditions of forming of transprofessional competences of future specialists an average link:

- development and implementation of organizational model of context and environmental providing in college;
- formation of core competencies at students and their further selection in system of training of specialists of an average link;
- preparation of pedagogical personnel for implementation of requirements of the federal state educational and professional standards of technical specialties;
- availability of scientific and methodical ensuring the educational process promoting forming of transprofessional competences of future specialists of an average link.

Availability in educational institution of context and environmental providing means creation of the context environment of training. In context training are modelled the subject and social content of professional work, conditions of transformation of educational activity of the student in professional activity of the specialist thereby are provided. Integration into educational process of methods of human activity, the creative potential which is trained of experience of manifestation of a personal position, i.e. those components of educational process which create competences is performed in an application process of methods of active training, such as discussion, the analysis of specific situations, "the designer of tasks", role plays, projects.

Availability at students of core competencies - imposes requirements to the entrants coming for training to professional educational institution. In the absence of the created core competencies at students forming of professional, polyprofessional and transprofessional competences is impossible. Students of colleges are teenagers with average school knowledge, not at all from them capabilities to independent knowledge acquisition, abilities to independently look for, analyze and select necessary information, to organize, transform, save and transfer her, capabilities to create different texts (compositions, messages), a public statement, productive group communication, creation of dialogs, work in groups are created. Availability of the created core competencies allows the graduate to solve at the enterprise such standard problems of package character as needs for permanent personnel training, shortage of skilled workers of personnel, low product competitiveness, difficulties when providing with raw materials.

The process of forming of transprofessional competences at students is impossible in the absence of these competences at teachers of all-professional disciplines and professional modules therefore one of pedagogical conditions is preparation of pedagogical personnel. For implementation of this condition the professional educational institution needs to conduct professional development course, training of teachers of special disciplines at the enterprises bases the practitioner, to train the best graduates for future teaching activity in college.

The requirements to scientific methodically ensuring educational process are regulated by the state documents. Scientific and methodical providing includes

federal state educational standards of education, curricula, training programs on all disciplines, professional modules; programs educational, production and other types practician, textbooks and education guidances; instructive-methodological materials for seminar, practical and laboratory researches, individual tasks for independent work of students on training courses; examinations on subject matters for check of level of assimilation of a training material, methodical materials for students on independent work, professional literature, for preparation of academic year and degree projects. Within our research of process of forming of transprofessional competences, scientific and methodical providing has to correspond to this process and promote problem solving of package type of production enterprise.

At the second stage practical implementation of process of research (by results of which the formation of transprofessional competences is evaluated) and programs for forming of transprofessional competences of future specialists of an average link is executed. (Figure 1).

### ***Stages of implementation of model***

Implementation of this model assumed carrying out the following stages of experimental work:

- implementation of diagnostics of levels of formation of core competencies of future specialists an average link, the identification of problems of a production cluster and selection of problems of package type to which solution graduates of college have to be ready. At this stage comparison of requirements of federal state educational, professional standards in the specialty and requirements of employers for the purpose of determination of components of transprofessional competences was carried out.

- development and deployment of pedagogical conditions of forming of transprofessional competences of future specialists of an average link. At this stage experimental check of levels of formation of components transprofessional competences of future specialists of an average link who passed and not being trained according to was performed by the oriented pedagogical conditions selected production.

### ***The stating stage***

At the stating experiment stage, we have carried out diagnostics of level of formation of key competences of students. Results of the analysis of formation of key competences of students have been shared by us into three levels: low, average and high. (Table 1).

**Table 1.** The results of diagnostics of levels of formation of core competencies of students, %

Competences	Valuable and semantic	Common cultural	Educational and cognitive	Information	Communi cative	Social and labor
Levels						
Low	45,4	30,2	14,1	20,2	23,3	18,7
Average	30,4	50,5	62,3	52,3	51,4	53,2
High	24,2	19,3	23,6	27,5	25,3	28,1



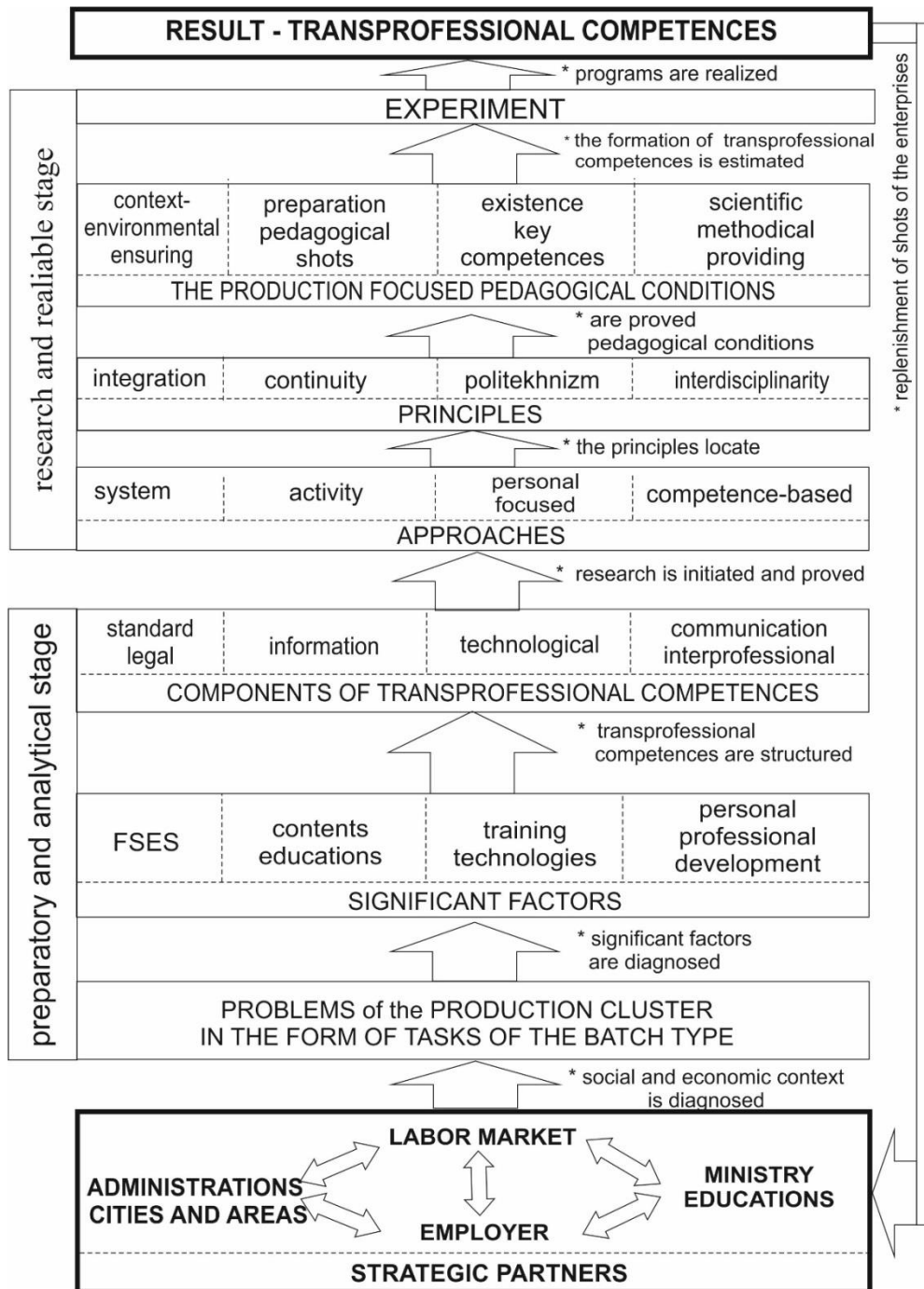


Figure 1. Structurally functional model of formation transprofessional competences

The result of the diagnosis has led to the conclusion that the key competencies required for the formation transprofessional competencies are not fully developed. At this stage the problems arising at the enterprises of the chemical and machine-building are selected and analyzed; questioning of representatives of the enterprises - the employers, young specialists graduates of college, for the purpose of detection



of difficulties arising on a work area is carried out; capabilities which specialists of an average link have to possess, for problem solving of package type, arising on production enterprises are defined; levels of formation of core competencies of students are revealed, groups of transprofessional competences of specialists of an average link are defined (technology, information, communicative and interprofessional, normative and legal) by results of the stating experiment the analysis of curricula in the specialty which is corrected afterwards is carried out and variable all-professional disciplines, educational practitioners are entered into it, the maintenance of professional modules and work practice is changed.

### ***The creating stage***

The creating stage of experiment included approbation of results in experimental groups on the basis of the developed didactic, context and environmental ensuring process of forming of transprofessional competences at students of college (and scientific and methodical for teachers). The research was performed during creation in educational institution of the certain production oriented pedagogical conditions.

### ***Content of process of forming of transprofessional competences of future specialists of an average link***

The research was performed during creation in educational institution of the production oriented pedagogical conditions:

- development and implementation of organizational model of context and environmental providing on average professional educational institution;
- formation of core competencies at students and their further selection in system of training of specialists of an average link;
- preparation of pedagogical personnel for implementation of requirements of FSES and professional standards of technical specialties;
- availability of scientific and methodical ensuring the educational process promoting forming of transprofessional competences of future specialists of an average link.

In the course of forming of transprofessional competences of students the content of education is changed, the current technologies of training were used, personal professional development of students was performed.

### ***Experimental check of efficiency rate of the offered content of process of forming of transprofessional competences***

The levels of formation of groups of transprofessional competences have been diagnosed after forming experiment stage for determination of efficiency of the offered content of process of formation of transprofessional competences (177 people) (Table 2).

On the basis of the given summarized data it is possible to draw a conclusion that the applied technique is rather effective. It allowed to reach to most of students of experimental groups of the mean and high level of formation of transprofessional competences. The number of the students having the low level of formation transprofessional competences in experimental groups are much less, in comparison with check groups. Having analyzed these tables 1, it is possible to draw a conclusion that the communicative interprofessional group of transprofessional



competences the easiest forms, it is the most difficult - technology group of transprofessional competences. Thus implementation of the pedagogical conditions of the production oriented character selected in the course of research allowed to increase at a stage of the creating experiment productivity of educational process in experimental groups from positions of formation of transprofessional competences at the high and average levels.

**Table 2.** Results of diagnostics of levels of formation transprofessional competences, %

criteria	levels	KG in %			EG in %		
		high	average	low	high	average	low
<b>Technology group of transprofessional competences</b>							
	cognitive	25,0	55,0	20,0	12,0	68,0	20,0
	operational and activity	6,0	69,0	25,0	10,0	69,0	21,0
	motivational	11,0	59,0	30,0	8,0	68,0	24,0
<b>Information group of transprofessional competences</b>							
	cognitive	10,0	65,0	25,0	14,0	70,0	16,0
	operational and activity	14,0	65,0	21,0	14,0	72,0	14,0
	motivational	12,0	58,0	30,0	12,0	68,0	20,0
<b>Communicative interprofessional group of transprofessional competences</b>							
	cognitive	5,0	70,0	25,0	16,0	70,0	14,0
	operational and activity	8,0	72,0	20,0	17,0	69,0	14,0
	motivational	8,0	72,0	20,0	13,0	70,0	17,0
<b>Standard and legal group of transprofessional competences</b>							
	cognitive	14,0	66,0	20,0	15,0	75,0	10,0
	operational and activity	12,0	64,0	24,0	13,0	76,0	11,0
	motivational	18,0	60,0	22,0	13,0	67,0	20,0

## Discussion and Conclusion

The previous researches, which were made by E.F. Zeer, S.A. Morozova & E.E. Cimanuk, (2011), J. Raven (1984), A.V. Farm (2003) are devoted to process of selection and forming of competences. Features of training of specialists in the professional educational organizations are devoted works, made by A.P. Belyaeva (1991), G.V. Mukhametzyanova (2010). Features of forming of different professional competences are unveiled in researches A.S. Gayazov (2011), E.V. Dubinets (2011), L.V. Vakhidova, E.M. Gabitova & V. E. Steinberg (2015).

However, it is not enough scientific works devoted to a problem of process of forming of additional professional competences and they have only debatable character.

It is established that the developed structurally functional model of forming of transprofessional competences of future specialists of an average link allows to organize the process of training of students in professional educational institution directed to identification of the problems of a production cluster presented in the form of problems of package type both systematic improvement professional and forming of groups of transprofessional competences for mastering labor actions of adjacent and related professions.

## Implications and Recommendations

The materials of article can be useful on the practical level to teachers of the professional educational organizations and the industrial practice centers of

the enterprises at training of specialists; for training centers and retraining of personnel at selection and structuring content of professional training of specialists.

Taking into account the received results of this research it is possible to select a number of the scientific problems and the perspective directions demanding further review: deepening and expansion of some provisions stated in article, connected with forming of additional professional competences of specialists; development of scientific and methodical ensuring process of forming of additional professional competences of specialists of different industries.

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No potential conflict of interest was reported by the authors.

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