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Integration of Pedagogical and Technological Knowledge in Forming Meta-Competencies of a Modern Worker

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ABSTRACT

The relevance of the problem under study is based on the society, economy and job market's demand for workers who possess meta-competencies: comprehensive knowledge, free and critical thinking, readiness for using personal approach in work and establishing the strategy of professional and personal development, as well as capacity for self-actualization. The purpose of the article is to study the technology of forming future workers' meta-competencies by integrating pedagogical and production tasks. Leading method for studying this problem is modelling and integrating pedagogical and production processes allowing to fully consider the technology of modern worker's training as regards forming of meta-competencies. The article presents a model of forming meta-competencies in modern worker's training. The article can be useful for supervisors, mentors and teachers who participate in training modern workers.

KEYWORDS
Meta-competencies, mentor, pedagogical tasks, production tasks, process integration

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Introduction

The system of workers' training is relevant both in Russia and abroad. This is proven, for instance, by Worldskills Russia movement which is aimed at enhancing the prestige of blue-collar jobs and which shows the degree of competence maturity. When participating in competitions of such scale and level future workers have to show their professional competence, as well as such qualities as ability to adapt to sudden changes, instant motivation to look for new forms and quick, independent and critical thinking. It should be mentioned that such competencies are required not only for participating in the competition

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but also for working in modern production facilities with constantly changing technologies and clients' requests. To sum up, a modern worker needs several already formed meta-competencies. Meta-competencies are formed both during studying in an educational institution and when solving production tasks. Educational institutions successfully provide training in theoretical knowledge acquisition but in order to obtain quality practical training you need to have work experience in companies and to participate in various competitions. A mentor is in the center of this training. Training of a competitive worker requires a mentor's competence model which, as researchers believe, is based on personal, professional and mentoring competencies (Stashenko & Cheklakova, 2008; Kislov, 2014) based on forming additional competencies in response to regional job market's requirements (Shavaliev, 2015).

Today there is a contradiction between the requirements to mentor's personality and activity and the actual level of workers' readiness to perform professional functions as required by employers according to the society's needs. A mentor possessing integrative-pedagogical activity and having their ownway, their inimitable style of performing it is a key figure in training of qualified workers. High quality of a mentor's professional training can be ensured by innovative professional and pedagogical training system.

Training of a mentor who has a high degree of integrity includes forming professionally-relevant personal qualities, pedagogical skills, expert knowledge and competencies. A modern mentor must possess not only professional industry expertise corresponding to modern socio-economic conditions but also pedagogical, psychological and methodological knowledge. One of the main tasks is to form "extra-functional qualifications specific to both a teacher and an industrial specialist in job market conditions" (Romantsev, 2007; Ronzhina et al., 2016). According to V.S. Bezrukova (1996), a modern mentor is a person able to shift from the old "dying pedagogical thinking with its mono-objectivity" to new flexible analytical thinking.

Today a special integral type of a worker is being created – an agent of socio-professional activity, an original and active person. The today's job market "no longer demands the so-called work force but a well-educated, well-bred and well-trained employee" (Belyaeva, 2003).

Methodological Framework

Research methods

The following methods were used during the research: theoretical (analysis, synthesis, concretizing, generalization, modelling, thought experiment, specification method, analogue method); diagnostic (task method); and empirical (studying methodology documentation and classroom observation).

Experimental base of the study

The experimental base of the study was the Ural Business, Management and Beauty Technology College.

Stages of the study

The study was performed in three stages:

— The first stage included studying the methodological base of the problem and scientific, sociological and psychological literature;

— During the second stage we developed a model of integrating pedagogical and technological disciplines in training highly-qualified workers and developed and implemented a technology of integrating pedagogical and technological disciplines in training workers in order to form meta-competencies; we also performed initial processing of empirical data;

— The third stage included elaboration and compilation of received results.

Results

Model Structure and Content

Based on the influence of psychological and pedagogical, social and technological factors, the conceptual model of modern worker's readiness for integrated activity (Figure1) includes the following components: motivational, value-oriented, practical and reflective and allows to set goals for and develop own professional activity, as well as to predict results – acquisition of professional meta-competencies.

Psychological and pedagogical factors	**Social factors**	**Technological factors**	
Social need- a highly-qualified worker who meets the requirements of modern industry ***Aim:*to develop modern worker's readiness for acquiring professional competencies and meta-competencies**			
Components of the Model			
Motivational **developing positive professional attitude by involving trainees and their parents in the industrial training process; by success in studying academic disciplines**	**Value-oriented** - developing value-oriented attitude towards profession by increasing the level of activity (conducting trainings, attending workshops, benchmark study etc.)	**Practical** inter-subject integration in the education process; competence-oriented techniques using instruction maps; level-based evaluation of competencies	**Reflective** - Participating in competitions of various levels; - self-evaluation ability
Result: highly-qualified worker who possesses professional competencies and meta-competencies			

Figure 1. Model of modern worker's readiness for integrated activity

Motivational componentis based on the motivational sphere of a person and can influence the choice of profession and type of activity depending on the need (Maslow, 1954; Heckhausen, 1986); it includes the following:

motives, needs, goals;

ability for professional development and proficiency enhancement during professional activity.

Within this component the training for a blue-collar job includes conducting various lessons and events and involvement of each student and their parents in

the industrial training process, as well as involving in competitions in the beginning of training first as observer and then as participant. Motivational component is education that includes "basic" professional and cognitive motive (acquiring professional competencies) and "associative" motives (academic progress and relations among staff members) (Petukhova, 2010).

Value-oriented component includes understanding the values: value-oriented attitude towards production process; integrative thinking as value; interactive communication and behavior as value; acceptance and understanding of the importance of own professional activity.

Value-oriented component means being interested in professional activity by such criteria as a person's need in expertise, knowledge and skills, in implementing effective methods of organizing activity and professional interaction, and constant self-improvement (Zeer & Streltsov, 2016).

Practical component includes development of skills and abilities, as well as future worker's experience. During the industrial training process trainees can develop: a) professional expertise, knowledge, skills and abilities according to their qualification; b) professionally relevant personal traits and qualities during the involvement of trainees in different types of learning and extra-curricular activities (Dorozhkin, Zaitseva & Tatarskikh, 2016); c) creative activity of a person due to self-improvement during professional development (Romantsev et al., 2011). Such practical skills as team work and inter-activity can influence development of expertise which is acquired during one's lifetime (Zhukov, 2014).

Reflective component (reflection, from Late Latin reflexio). Reflective component means self-evaluation of professional training in accordance with types and functions of activity; it is a process of self-discovery and understanding one's own actions (Chupina, Pleshakova & Konovalova, 2016). Reflecting on one's activity makes it possible to understand methods and procedures of working with educational materials and choose the best applicable ones. This type of reflective activity can be used in checking home assignments or presenting project works. Using this type of reflection at the end of a lesson makes it possible to evaluate each student's activity at different stages of vocational training.

Reflective component is expressed by the ability to intentionally control the results of one's own activity and the level of one's own development and personal achievements. According to V.A. Chupina (2010), reflection is "the most important factor of developing complete professionalism which means a person's ability for constant self-improvement and creative growth". The model is based on using competence-oriented techniques.

Technique of developing meta-competencies in job training by integrating pedagogical and production tasks includes using instruction charts for various operations

Such charts must include setting a production task and a pedagogical task. For example, when performing an operation of shaping and tinting eyebrows a mentor sets both a production task (to master the technique of shaping and tinting eyebrows) and a pedagogical task – to develop accurateness, responsibility, meeting client's requirements, developing skills of

communication. Target characteristics of this integration contributes to development of meta-competencies.

Participation in competitions can also be considered as solving production tasks as a worker can show both professional skills in performing technique and meta-competencies (ability to concentrate, stamina and adaptivity) that help to participate in competitions and win.

Table 1 (see below) shows examples of integrating pedagogical and production tasks in developing BeautyTherapy competence of a make-up artist's profession.

Table 1. Integrative instruction chart "Integration of Pedagogical and Production Task"

Production task: to master the technique of shaping and tinting eyebrows, eyelashes	**Meta-competencies developed in integrating the tasks:**	**Pedagogical task:** to see achievement of work result and satisfying a client's needs when efficiently performing working practices
Operations for solving a production task	Responsibility; communicative skills; independent work; two-way communication; ability to deal with new and non-standard situations	Operations for solving a pedagogical task
1.1. To organize preliminary works for customer service		To plan and apply facial care
		To work in close contact with clients of different age and origin.
1.2. Eyebrows hapingandtinting		To select cosmetic treatment and products, determine the order of their application taking into account skin types and age specifics
1.3. Eyelash tinting		To select materials, instruments and equipment taking into account client's requests
		Reflection: to propose eyebrow and eyelash care rules

In order to effectively perform various operations expertise, knowledge and skills are required which are stipulated both by the educational and by the professional standard. Their integration contributes to developing communicative personal skills which is the basis for developing meta-competencies.

Based on analyzing and generalizing the research experience regarding the problem highly-qualified workers training systems are found and proposed (dual system, mentoring system), as well as elements of competence-oriented techniques (competence-oriented tasks, level-based competence evaluation) for developing meta-competencies in modern worker's training

During the webinar "Training of regular labour force that meet the requirements of high-tech industries on the basis of dual education" that was

held at the VIth International Industrial Exhibition INNOPROM-2015 the participants discussed the problems of developing methodological recommendations on implementing the practice-oriented (dual) model of highly-qualified workers' training, as well as the issues of dual education's advantages (Shavaliev, 2015).

A mentor is a key figure in the dual education system. Researchers continue studying the pedagogical potential of this phenomenon and the innovative path of mentorship development within the competency-based approach. According to L.S. Rogachevskaya (1982), "a mentor is a specialist who possesses both special and professional competencies". Researchers of the mentorship's scientific foundations (Batyshev, 1985; Talanchuk, 1996; Zhukov, 2013; 2015) consider mentorship as transfer of knowledge and experience. Modern pedagogy states the necessity to form a competency package: special competencies, psychological and pedagogical competencies, methodological and coach-competencies. The German education model considers mentorship as a way of individual development. This is a kind of "guardianship of a less experienced person by someone more experienced".

In modern conditions a highly-qualified worker must possess such communicative elements of the pedagogical component as face-to-face meetings, reciprocal learning, confidentiality, partnership, friendship, building trust relations and other communicative elements of the pedagogical component.

Which competences of a mentor should be main ones: pedagogical or special? Today there is no unambiguous answer. Also, according to D.H. Schunk (2014), the mentoring process is a self-regulating one. C.A. Mullen (2008) places an emphasis on the fact that mentoring processes will improve if a mentor him- or herself regulates the formation of skills, career and application of scientific research. These processes take place inside a mentor which contributes to motivating towards further education.

Formation of meta-competencies is possible if production and pedagogical tasks are integrated, when pedagogical operations are involved in performing production ones. Thus, in order to solve a production task a mentor should have pedagogical knowledge, in particular, knowledge regarding pedagogical skills. Formation of pedagogical skills and their integration into special disciplines is the main objective in modern worker's training.

Special competencies required for performing a production task are acquisition of experience and possession of knowledge in a certain production area. Pedagogical competencies necessary for solving a pedagogical task include the ability to pass on knowledge and experience. A component of this competence is communicative.

Competency-oriented technologies which the model is based on aim at forming general and professional competencies and are the basis for forming a competitive person. This technology is based on generating trainees' interest by forming knowledge, receiving new information to the ability to apply this knowledge, that is, through competencies.

Interest is generated due to involvement of each student using the following methods: participating in competitions of different level, involving parents in the education process, their involvement in learning and cognitive activity; learning information transfers to personal significant knowledge of students and the

working methods to personal experience. Testing and assessment materials based on the competency-based approach are developed for formation of meta-competencies.

Maturity of the competencies (general, professional and meta-competencies) can be assessed by the level and connections that are shown in Table 2.

Table 2. Competence Maturity Levels

Level	Assessment Criteria	Connections
Reproductive	Qualitative or quantitative	intrasubject
Partially-productive		intersubject
Productive (creativelevel)		meta-subject

This scheme allows to define the dynamics of students' development based on separating the activity type (reproductive, partially-productive and productive), as well as predicting the possibility for students to acquire competencies that correspond to this type of connection. Acquisition of professional competencies is possible at all levels, using all kinds of connections, while the level of meta-competency maturity can be assessed by presence of productivity and creativity. Assessment is performed using questionnaire and "portfolio" methods.

The meta-subject approach ensures transition from the existing practice of dividing knowledge into subjects to the holistic image perception of the world, to meta-activity. Competencies are meta-subject as they are beyond the scope of school subjects (Slastenin, 2007). According to A.A. Kuznetsov (2008), meta-subject (competency-based) results of thelearning activity are work methods that are applicable both within the learning process and in solving problems in real-life situations and that are acquired by students on the basis of several disciplines combined into modules. Meta-subjectivity as a principle of integrating the learning content, as a way of forming theoretical thinking and universal work methods ensures forming a holistic view of the world in students' conscience. This approach requires a system of knowledge about one's professional activity expressed in principles, methods and ways (pedagogy), in organization of technological process (management), in knowledge on the psychological structure of a person (psychology) and in knowledge about production process (professional education technique) etc. Wide range of workers activity means that they should be prepared for carrying out different types of activity – to perform work in a quality manner (professional competencies), to be in demand at job market and constantly improve their competencies (meta-competencies).

The most important factor in training workers must be flexible training models: at the initial stage – studying the fundamentals of psychology and pedagogy and at further stages – both psychological and pedagogical modules. Such programs are few yet, it is necessary to search for them by selecting best practices and test at pilot sites. Forming of meta-competencies in integrating production and pedagogical tasks is possible both in a company and at pilot competition sites.

In the scheme below the modern approach to organizing the content of meta-competency forming process is shown in two levels – subject and meta-subject (Figure2).

Meta-subject level	Performing work in one or several professions	Participating in competitions of different levels	Conducting workshops	Compiling "an achievement portfolio", presenting one's achievements	Participation in developing the method of sharing experience and knowledge
Subject level (special disciplines, management, economics, legal studies, business communication culture					

Figure 2. Model of forming meta-competencies in modern workers' training

Discussions

Forming of meta-competencies has been studied by many scientists and researchers. According to T.I. Isaeva (2010), meta-competencies are "readiness of a person for self-actualization and self-identification, means of creating and enriching the inner world of a person, ability to perceive and understand people, their emotional state and ability to manage own state of mind and emotions".

Many scientists have studied the analysis of mentor training status in Russia. According to G.N. Zhukov (2013; 2014), currently mentor training lacks integrative approach in training.

The result of workers' training activity should be formation of an integrative-holistic specialist who possesses meta-subjective competencies (Kraevsky, 2007). According to D.S. Ermakov (2011), competence is meta-subjective in nature and is an ability and readiness of a person to act as holistic and joint subject of the "Man-World" system development.

E.A. Klimov (2010) studies the professional competence of the "man-man" system. According to this study, competence is "professional education as it is, experience and individual abilities of a person, his/her motivated desires and readiness for constant self-education, self-improvement, being tolerant and open" and includes such skills and abilitiesas "ability to search for information and to use it in certain situations for solving certain professional problems" (Klimov, 2010). This is the basis of meta-competencies.

According to A. Shelten (1996), competencies can be special and social:

- *special competence* is "being prepared for performing independently certain types of activity, ability to solve standard professional tasks and evaluate the results, ability to independently acquire new knowledge and skills in one's profession";

- *social competence* is, "on one hand, development of positive personal image and on the other hand, ability to behave in a group when performing group tasks". The author underlines that these competencies intercross when performing a production task.

According to A.M. Novikov (2008), training of a worker should include the following components – ability to independently find one's bearings in a

situation, acquire new knowledge, set a right goal, define certain actions and work methods, improve them and finally reach the goal". These elements canexist only in unity and integrity being involved in one integration process.

A.R. Masalimova (2014) in her works studies the methodological and pedagogical parts of mentor training.

The aspect under study – forming of meta-competencies in modern worker's training by integrating pedagogical and special knowledge – has never before been studied in scientific works.

In this article we have tried to describe the model of forming meta-competencies in modern workers' training. The result is carving-out of challenges and problems presented by the topic

The first problem is forming meta-competencies which, in our opinion, are leading in activity of a modern worker. A modern worker in a high-tech industry is considered as an element of subject-subject relations and as a person ready for self-actualization and self-identification, for enriching his/her inner world, able to perceive and understand people, their emotional state, knowing rules of behavior in a communicative situation and able to manage own state of mind and emotions.

Are modern teachers ready for such level of training and do we have the required methodological support? Is it possible to train a master without "the mentor" (Zhukov, 2015).The problem can be solved by searching for scientific and methodological approaches in training students – future mentors – to productive professional and pedagogical activity which integrates professional and psychological and pedagogical knowledge. The researchers state that 82% of future masters not only find it difficult to prepare a professional training lesson but also have cursory view on the structure of the learning activity. According to N.K. Chapaev (2005), subject training of future professional education mentors prevails over pedagogical training and that is why the problem of integrating pedagogical and special knowledge has become actual. Thus, training of mentors should correspond to it. One of the ways to solve it is to use the training model described in this article. Acquiring knowledge of competency-based technologies based on using instruction charts which integrate pedagogical and production tasks. This integration process leads to forming of meta-competencies.

The second problem is assessing the level of meta-competency maturity. The modern Russian assessment system is not ready, as both professional and meta-competencies should be assessed. The system of assessing the subject level is developed, tested and operative while assessing meta-activity (supra-subject level) requires new innovative approaches. In our opinion, the assessment system is multi-level: reproductive, partially-productive and productive.

Conclusion

Development of meta-competencies in modern worker's training will be successful if integration of pedagogical and production tasks is organized as a process of goal-oriented and conscious acquisition of knowledge and skills based on the elaborated model that consists of integrated motivational, value-oriented, practical and reflective components. Applying and using in training of highly-qualified workers the competence-oriented techniques which include using integrative instruction charts and different-level evaluation will lead to developing professional competencies and meta-competencies necessary for

professional development and growth, as well as worker's adaptation and self-actualization.

The article can be useful for supervisors, mentors and teachers who participate in training modern workers for high-tech industry.

During the course of study new issues and problems have arisen that need to be solved. It is necessary to continue studies of developing the method of integrating professional and meta-competencies in training of highly-qualified workers due to integration of pedagogical and technological knowledge.

Disclosure statement

No potential conflict of interest was reported by the authors.

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