

# Comparative Analysis of Approaches to the Specialists' Competences Development in Innovative Industries

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**Abstract-**The paper contains a comparative analysis of approaches to educational activities for specialists, taking into account the accelerating pace of technological development of society. Classic academic approach and training in the process of professional activity are considered. The paper contains the consideration of approaches' history, and their key features in relation to the developed competencies are highlighted. The rationale for the need for psychological research in the period of vocational education in higher educational institutions is given. According to the results of a comparative analysis, it was concluded that it would be expedient to combine approaches in the training of specialists in high-tech industries for the sustainable development of society. It is proposed to use academic education only when teaching general cultural, general professional and basic professional competencies. Training for highly specialized competencies is proposed to be carried out mainly in the process of professional activity. It is assumed that this distribution will lead to the maximization of the effectiveness of the process of training specialists in innovative industries.

**Keywords-**competence, education, learning by doing, personal psychology, technologies

## I. INTRODUCTION

Vocational training at any time was an important component of the life of both the individual and the whole society. The difference lies in the fact that over time the very approach to learning has changed dramatically, while moving in the direction of improving the efficiency of learning. Independent acquisition of skills was replaced by family learning crafts, then - private schools, the system of public universities. At the moment, studying at a university in one of the programs of higher professional education is a traditional way of acquiring and developing professional competencies of potential employees in the framework of training personnel in organizations of high-tech industries [1]. But there are alternative approaches to solving the problems of professional training of specialists. The most common of these is «education in the process of the professional activities», or «learning-by-doing».

The purpose of this work is to identify the most effective approach to the development of competencies of specialists in knowledge-intensive industries in the context of accelerating shifts of economic and technological structures. To achieve this result, it is necessary to ensure the implementation of several tasks: to determine the basic approaches to the development of competencies of specialists in high-tech industries; analyze the features of these approaches; identify their strengths and weaknesses; choose the most effective approach or put forward assumptions about the appropriateness of their combination to achieve the best results in the development of specialists.

In this paper, we consider two main approaches to vocational training: the classic and with the acquisition of skills in the process of professional activity.

## II. EXISTING APPROACHES ANALYSIS

### A. Classic Approach

In the classical approach, the training of highly qualified personnel for high-tech industries is mainly responsible for institutions of higher professional education. At the same time, in the educational process three types of competences are formed: general cultural, general professional and professional [2]. The latter are of particular interest in this work. Specialized competences are also distinguished among professional ones - they are not related to the field, but to a specific area of professional activity. Training in highly specialized competencies in various higher educational institutions is implemented mainly in the framework of graduate programs [3].

In this approach, the concept of individual trajectories of professional development is relatively new, in which students have the opportunity to independently vary their own list of educational disciplines in order to maximally match the acquired competencies to their priorities and requirements of the potential employer, including the qualifications of hired professionals [4].

The main disadvantage of this approach is the length of the training cycle, aggravated by the lack of flexibility (or its inadequacy in applying the concept of individual professional development trajectories). Many technologies that are modern and relevant at the beginning of their studies become obsolete by the end of their studies (after 4–6 years). At the same time, most of the technology, even at the time of the start of training, is already beginning to lose its novelty due to a long bureaucratic process linking the awareness of the need for training specialists of the technology and the ability to implement it within the educational process [5]. Of course, this deficiency has little effect on teaching general professional and professional basic competencies (indeed, the basic laws of science and the fundamentals of industries practically do not change), but this training is very significant for training highly specialized specialists who are in urgent need of a high-tech industry.

### *B. Learning-by-Doing*

An alternative to the classical approach is the acquisition of competences in the process of professional activity (or «learning by doing») [6]. The spread of this approach is associated with the acceleration of obsolescence of existing and the emergence of new technologies. Most of the educational programs were unable to be adaptable to frequent changes, especially this fact was noticeable in rapidly developing industries, in which new directions had time to appear much more often than the structure and content of educational programs in higher educational institutions changed [7]. Thus, the development of the approach to the acquisition of competencies in the process of professional activity was of a forced nature.

The essence of the approach lies in the distribution of tasks among the performers in such a way that the work performed periodically requires the presence of some knowledge, skills or skills that are not available to a particular performer (they may often not be present in the organization as a whole, and in exceptional cases in world experience). In the course of the work, the performer acquires the missing knowledge, skills and abilities, thereby increasing his level of professional competence. Subsequent executions of such tasks lead to the development of skills, which leads to faster execution of work and (or) improvement in the quality of their performance, as well as other manifestations of operational improvement.

Of course, this approach has several conceptual limitations, the main of which is related to its unsuitability for teaching the basics of science and basic professional competences. To use this approach, it is necessary that the contractor is already a professional in his field: only in this case it is possible to organize the acquisition of competences in new areas of professional activity.

In addition, the difference between the required and existing levels of competence should not be large - otherwise the likelihood of a situation in which not only the

training will not lead to the planned result, but also the work will not be completed is critically high. Thus, the use of this approach is associated with a certain risk, which should be considered and measures taken to minimize the likelihood of its implementation. The most effective way to minimize risk is to select tasks that are optimal in complexity, but since there are currently no sound formalization methods in this direction, this process becomes the responsibility of managers who make these decisions based on their own expert assessments — accordingly, there is a chance of making a mistake.

Another way to reduce risk is the use of phased work planning (which is, for example, the basis of flexible project management methodologies). In this case, the losses associated with the impossibility of achieving the planned result are reduced by an order of magnitude.

### III. ROLE OF THE PERSONNEL MANAGEMENT OF ENTERPRISES AND UNIVERSITIES IN THE STUDENT COMPETENCES OBTAINING PROCESS COORDINATION

Personnel management of a modern enterprise, defined as an organization's human resource management technology, comes to the aid of managers, allowing minimizing the likelihood of errors in staffing, dividing into two components: strategic and tactical [8]. And it offers exactly how to optimally carry out the functional and structural flexibility of a professional team, adequate professional identity of each employee, optimally high quality and effectiveness of the results of the team's activity as a whole, including those students who receive targeted training, acquiring modern professional competences directly research process. The tactical component of personnel management determines which technologies of assessment, management and correction of specific and non-specific personal, intentional and specific professional competences will be progressively applied in the process of formation and further improvement of the professional team.

The choice of tactics and approaches is a key point that determines how the formed team will be, and ultimately the result of its activities. Of course, the number of methods available on the market, tests and tables of interpretation of the results for them, allowing to evaluate and adjust, is huge. But the fact is that behind each test there is a certain psychological basis, and the understanding of what exactly the test measures vary depending on this basis. Ultimately, the heads of recruitment services or personnel management departments are solely responsible for super important decisions on the selection of recruitment and hiring employees, as well as the selection of testing techniques that require different degrees of preparedness in the field of psychology, psychoanalysis, medicine, socionics, management, specific knowledge of professions and others [9].

In such a situation, complex software and hardware solutions, combining, on the one hand, modern IT

technologies, the basis for longitudinal studies of students' psychological and professional features, provided by the university, and, on the other, the best assessment methods that exist today from a conglomerate of the above Sciences in one product, which allows to summarize and implement the most effective methods of analysis of nonspecific personal qualities, specific professional qualities in intensionnogo and personality traits [10]. Such a tool could look, for example, as an electronic portfolio with the results of dynamic studies collected in various ways, in a long period of study of a future candidate in a higher educational institution and further, throughout the entire period of qualification training, already in a professional environment. This would greatly facilitate the early selection of the learning path most appropriate for a

particular student, adequate to its natural features and allowing the student to maximize the talents of the student, on the other hand, would reduce the time for choosing an enterprise or workforce in which continuing professional training would be the most suitable. The cooperation of vocational guidance departments of the university and the personnel departments of enterprises is the next step that should and can be done in the promising direction of acquiring students' competencies in the course of their work activities.

#### IV. CONCLUSION

The structured results of the analysis are shown in Table 1.

TABLE 1. THE RESULT OF COMPARATIVE ANALYSIS

Criteria	Education in universities	Education in the process of the professional activities
Location of competences obtaining	Universities	Industrial enterprises
Education results	Predominantly knowledge	Skills
Technologies changes adaptability	Low	High
Learned technologies	Traditional	Innovative
Term between the advent of technology and the learning beginning	Not less than 5 years	None
Career guidance influence	Full study, including specific and non-specific personal qualities, the potential of disclosing natural features in the profession	Improving personal potential
Types of competencies, the development of which is most effective	General cultural, general professional, basic professional	Highly specialized professional

According to the results of a comparative analysis, it was revealed that none of the considered approaches separately can meet the requirements of industrial enterprises of high-tech and high-tech industries in raising the competence of specialists. There is a feasibility of a combination of training in institutions of higher vocational education and training in the process of professional activity. At the same time, it is rational to divide the developed competences in the way indicated in the column «Types of competencies the development of which is most effective» of the Table 1.

In the proposed approach, higher education institutions will have to develop general cultural, general professional and basic professional competences (which do not lose their relevance when new technologies appear). Training in innovative highly specialized technologies will occur mainly at industrial enterprises in the process of professional activity. It is assumed that this separation will lead to the maximization of the effectiveness of the training of specialists.

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