

On Anticipatory Development of Dual Education Based on the Systemic Approach

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ABSTRACT

The article addresses separate theoretical and methodical aspects of the anticipatory development of dual education in the Republic of Kazakhstan based on the systemic approach. It states the need to develop orientating basis of prospective professional activities in students. We define the concepts of anticipatory cognition and anticipatory learning based on the systemic approach. The technology of anticipatory education based on the systemic approach is founded not only in the systemic organization of the educational process, but primarily, on accelerated development of students' abilities and skills of systemic thinking, and systemic approach in cognitive, theoretical, practical and other types of activity.

KEYWORDS

anticipatory cognition, anticipatory education,
systemic approach, anticipatory information,
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Introduction

The anticipatory state of the national education system and the dual education, performed by it, have to correspond to the current goals of industrial-innovative development of the Republic of Kazakhstan.

The need to actualize this problem is defined by multiple reasons, including the need to train employees, who are capable of performing strategical and innovative transformations of the economy, society and the state in general. Furthermore, the basis, the system-generating factor and the driving mechanism of anticipatory learning consists of constantly upgrading (in the

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anticipatory sense) strategic goals. Modern anticipatory education should prepare the subjects for actualizing these strategic goals and defined tasks of the future.

The problem consists in the need for the paradigm of anticipatory development of education and anticipatory dual learning to gain their real existence. This requires not only certain experiments but also an active development of theoretical, methodological, methodical and other basis of anticipatory training of specialists.

According to our studies over many years, an important condition for fulfilling the goals and tasks of dual education is active actualization of the systemic approach. In this case, the opportunities for developing subjects' systemic representations and abilities and skills of systemic thinking. On the other hand, anticipatory acquisition of the systemic style of thinking, as well as of the systemic methods of cognition and transformation of the surrounding environment, facilitate active development of methods of the systemic approach for the efficient and high-quality solution of the tasks of anticipatory training of the modern specialists.

Successive development of students' systemic thinking significantly effects the development of their intellectual skills as the goal, the basis and the mean of dual education, which, in turn, provides the preparation of the growing generation and specialists for an active life and work in new conditions and for constant self-education and self-development.

The concept of dual education

One of the most important characteristics of the modern stage of professional education development is integrational processes, which reflect, on the one hand, content- and structural changes within the educational system *per se*, and on the other hand – the processes of interaction between professional education and industrial field. Such dual unity of integrational tendencies in the field of professional educational and the process, which it produces, imply their comprehension from the position of duality as a methodological category, which has general-scientific and pedagogical aspects (Aytuganov, 2009). The words “dualism”, “dual”, “duality” and “dualistic” represent one abstract general methodological concept (from Latin *dualis* – dual) and are used relatively widely in various fields of knowledge.

In pedagogics, the concept of “dual system” was first used in the middle of 1960s in FRG for referring to a new form of organizing professional education. This system includes two different educational-industrial environments – of a private enterprise and state professional school, which conduct cooperative activity for the common goal – increase of the quality of the professional training of students (Romanov, 2008).

Dual system implies involving the enterprises in the process the employees training; and the enterprises accept rather significant expenses related to teaching the employees, because they are well aware that expenses of quality professional education are a reliable investment. Moreover, they become

interested not only in the results of the education, but also in its content, organization, etc. This defines the significance of the dual system as a model of professional training, which allows overcoming the gap and the mismatch between industrial and educational fields in the questions of training professional staff.

Our analysis showed that creating an integral system of dual target education of students in the conditions of a single educational-industrial environment allows re-orienting the process of education from technical and technological affirmations, which currently dominate in training the employees of technical profile, to personality development of students and teachers, which is defined by the requirements of modern industry and society.

We relate such form of organizing dual training of employees to the development of a model of a college, which can currently be viewed as a new type of integrated educational institution – multi-level, multi-functional, multi-profile, the one that actualizes a wide range of technical and professional education programs based on the principle of life-long learning, along with post-graduate education. College's educational activity is aimed both at satisfying the needs of the job market in highly qualified workers and middle ranking specialists, and actualization of individual educational and professional requests of various categories of students, including adult population. Therefore, dual target education becomes a natural form of organizing life-long professional education in the integrative structure of “college-industry”.

During the development of theoretical bases of creating the dual target education, we regarded, on the other hand, social-economic needs in society development, the need in rational filling of professional schools on the job market, and on the other hand, the idea of a person's life-long education. Combined, these aspects define the main tendencies and principles of modernization of technical and professional education system (hereafter, TaPE) in our country.

The integrity of the dual system of qualified employees training is reached by the essential unity of two directions of integrations: on the one hand, the integration of TaPE programs and corresponding educational structures, and on the other hand, the integration of TaPE and industry. Development of the abovementioned phenomena serves the common goal – increasing the quality of students' professional training.

Moreover, the horizontal vector of interaction between an educational institution with a profile employer is a priority, because gradual and multi-aspect interaction between college and industry – employer of staff – is the basis for: specification of the social order in the professional education system in qualitative and quantitative aspects; design of the goals, content and results of education; search for the optimal ways of reaching the planned results in the conditions of vertical successive structure of multi-level training of highly qualified workers and specialists, with correspondence to the requests of a person and the society and requirements of highly technological science-based industry towards the development of employees' potential in the industry. Modern stage of social partnership development in the field of professional education is characterized by the transfer of focus from organizational aspects to

content aspects of interaction between the professional school and employers. According to the researchers, content of education in the professional school is objectively defined by the current and prospective requirements from the industry towards the nature and content of specialists' work. Because of this, the development of the dual target education content has to be based on the model of specialist's activity.

In this sense, the priority goes to the task of actualizing the content of technical and professional education, the solution of which is provided by matching professional and educational standards. Professional standards allow: establishing and maintaining common requirements towards the quality of work; revealing new tendencies in the field of labor; developing official instructions for the staff; and creating a basis for certifying the employees according to the common criteria. They contain the requirements towards employees' performance of the job functions, which allow defining the goals, structure and content of the educational standards of professional education and module educational programs, which are based on competencies.

One of the ways of developing the mechanisms of matching educational and professional standards is the use of module-competence approach. Module-competence approach allows developing the mechanisms of matching educational and professional standards according to the requirements of modern science-based industry and unites professional education system with industry and educational services market with job market.

This unity is possible because of the transformation of job market's requirements towards employee's competence into the requirements towards the quality of the end result of the educational process.

The most important organizational and economic condition of developing the dual form of specialists' training is attraction of the funds of the material industry fields to the professional school. Modernization of material-technical basis of educational institutions with financial participation of partner industries becomes one of the defining factors of quality improvement of the dual target education of specialists, especially in the conditions of rapid change of industrial technologies and equipment. In order to supply this activity, an industry is obligated to supply the machinery, materials and equipment; to provide the grounds for internships; to create the conditions for graduates' employment. In turn, educational institutions are obliged to prepare the specialists of a corresponding profile in the amount that is necessary for the industry. In general, the mechanism of relationships between colleges and industries contains both traditional (agreements of social partnership) and new elements – cooperative educational-industrial structures (laboratories, educational fields, industrial areas, etc.).

Therefore, creating a system of dual target training of prospective specialists, aimed at the real need of a regional job market, specific industries, social and career expectations of the youth, allows providing the interaction of professional educational institutions and industries on a qualitatively new level, and therefore providing cooperative quality in specialists' education.

In the Republic of Kazakhstan, dual education is defined as a form of employees' training, which combines education in an educational organization

with mandatory periods of education and practice in an industry with the provision of work places and compensational payments to the students with equal responsibility of an industry, educational institution and students (Law of the Republic of Kazakhstan from 27th of July 2007 “On education”; Decree of the Minister for education and science of the Republic of Kazakhstan from 21st of January 2016 “On establishing the Rules of organizing dual education).

G.Ya. Fedotova characterizes dual form of professional education as an educational process, which combines practical education with part-time employment in an industry and studying in a traditional educational institution (Fedotova, 2002).

According to the Russian-German dictionary, dual education is a combined model of professional education: obtaining theoretical and practical knowledge simultaneously (Dual system of education. Russian-German dictionary-handbook, 2014).

In our opinion, dual education is an integration of inter-related processes of students’ professional training, which imply the movement from basic knowledge and acquired patterns of orientating basis of the forthcoming professional activity (recommendations, rules, algorithms, instructions, norms, patterns of actions, etc.) to their transfer and actualization in the conditions of practical activity under the management and control from the teaching specialists.

Anticipatory dual education based on the systemic approach

According to the law of the Republic of Kazakhstan “On education”, one of the goals of the national educational system is the support of anticipatory development of technical and professional education through active interaction with employers and other social partners (Law of the Republic of Kazakhstan from 27th of July 2007 “On education”).

Important factors of anticipatory dual education are accelerated (in anticipatory sense) acquisition of the efficient types of activity and corresponding ways of thinking, methods of integral and anticipatory comprehension of the surrounding environment, students’ mindful urge and ability to anticipate the reached levels of knowledge and skills. The way of organizing cognitive activity defines the content of acquired knowledge about it; during the process of activity interiorization it becomes a way of thinking.

Based on the systemic approach, we developed and proposed a systemic type of orienting, which is aimed at the development of cognitive actions of a systemic nature. Moreover, it accounts for the dependence of the way of thinking from the way of acting.

As it has been shown (Developing systemic thinking: Textbook for colleges, 2002), organizing educational-cognitive activity by the model of systemic research defines the structure of the developed knowledge on the subject, its content, form of generalization, way of organization in a paradigmatic system and principle of designing the theory of the subject; it develops new vision of the subject, systemic type of orienting in the subject as a new way of thinking.

The process of acquisition is an activity, which shapes the way of thinking. The task consists of organizing ways of acting, which define the creation, development and use of the systemic thinking.

According to L. Booth Sweeney and D. Meadows (Booth Sweeney and Meadows, 2007), a person, as a systemic thinker: sees the picture of the world in general; analyzes complex systems from various perspectives in order to see new key points; bases his thought on independent opinions; thinks about the impact of thinking stereotypes on our future; prefers long-term perspectives; has a wide world-view (and a wide perspective on things), and is capable of revealing complex causal links; can predict where undesired consequences might occur; can discover the essence by focusing on facts, rather than on accusations; is able to come to terms with the existence of paradoxes, controversies and disagreements, not trying to resolve them at any cost.

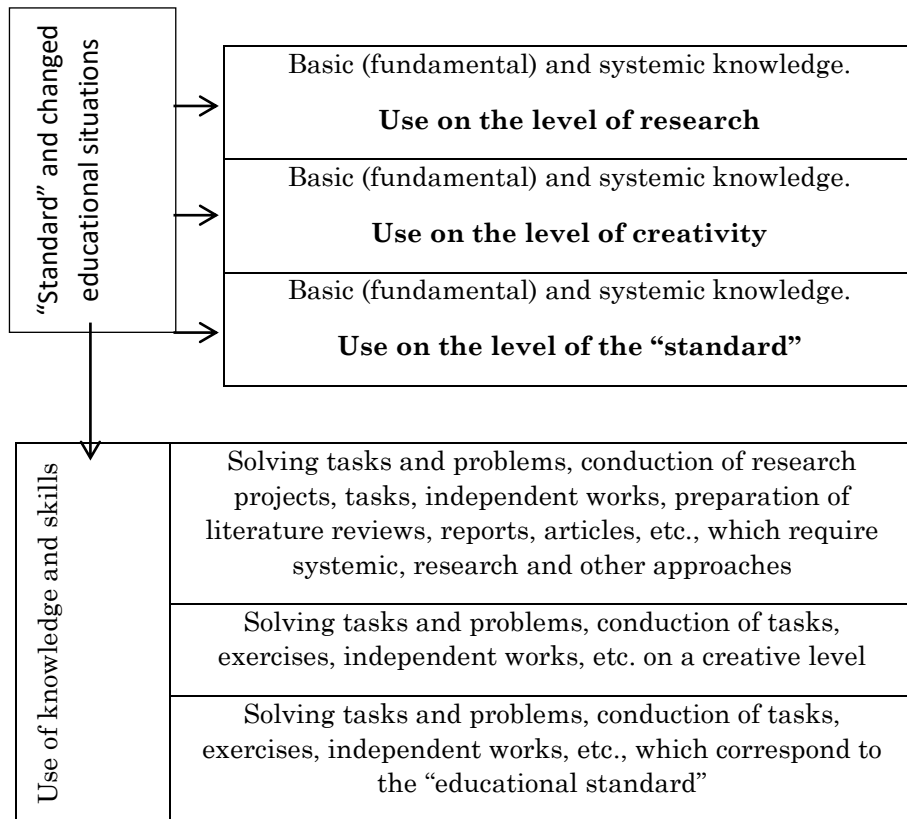
Systemic thinking is defined by subject's activity related to systemic representations and systemic comprehension of the objects of the surrounding environment, systemic structuring of the studied information, design and study of the corresponding models of systems, etc.

Actualization of the systemic approach implies not only the development of the corresponding systemic methods, but also their mastering by the students. Systematic use of these methods in the educational process and independent learning facilitates the development of certain systemic ideas. A specific trait of this process is the fact that it can be conducted within the traditional education as its developmental component.

The efficiency of the development of abilities and skills of systemic thinking and systemic approach is reached by using basic textbooks and handbooks for these aims. Furthermore, study material is addressed as an integral informational system, which should be handled with specially developed systemic methods, as stated above (Karimova, et. al. 2015; Syzdykbaeva, et. al. 2015).

During the educational process, the students conduct (primarily independently): analysis of study material as informational system; synthesis, systematization, specification and generalization of the information revealed during the analysis; creation of a paradigmatic model of this information; description (often in writing) of the conclusions; cooperative discussion of the results of work with the study material. Systematically reproducible synthetic activity facilitates the development of students' creative skills.

In our opinion, leading competencies of the prospective specialists should include: use of the acquired knowledge, abilities and skills on the level of the "standard" (educational activity and its results, which correspond to the educational standard), on the level of creativity and on the level of research. Picture 1 presents the model of the abovementioned competencies development.



Pic. 1. Development of leading competencies of the prospective specialists

Intensifying the learning and acquisition of the educational content allows increasing the time for solving professionally-oriented problems, performing various creative tasks, exercises, etc.

Another important moment of education is cooperative development and use of the patterns of orienting basis of the prospective professional activity (instructions, rules, patterns, recommendations, algorithms of practical actions, norms, etc.).

On the conventionally first stage, student acquire the paradigmatic model of the main points of the study material, patterns of the orientating basis of the prospective professional activity, as well as the necessary abilities and skills. This stage can be considered as the stage of the development of basic knowledge, abilities and skills, which match the corresponding educational standard.

Successively acquired knowledge, abilities and skills, as well as the orientating basis of the prospective professional activity, have to be appropriately used on a work place under the management and control of a specialist. This stage contains practical actualization of the acquired knowledge, along with the orientating basis patterns (instructions, rules, patterns, recommendation, algorithms of practical actions, etc.) of the prospective professional activity.

We define anticipatory dual education based on the systemic approach as a specially organized process of accelerated (based on intensifying the educational process) development of students' abilities and skills of systemic and other efficient ways of thinking, systemic and other progressive approaches towards conducting cognitive, creative and practical activity, which serve anticipatory development of fundamental and systemic knowledge, as well as the corresponding competencies, with minimal expenses.

Orientating basis of the conducted and prospective activity

Developing a student's systemic thinking is the basis of his versatile development and his ability to organize any type of activity with the general principle of orientation, both in the subject of activity and in the process of the activity itself.

It largely depends on the results of anticipatory development of the orientating basis of the conducted and prospective cognitive, practical or other activity of the students. Moreover, it creates the conditions for developing creative, systemic and anticipatory styles of thinking.

The technology of dual education based on the systemic approach, which we developed, uses the orientating basis for actualizing the systemic approach towards organizing and actualizing cognitive and practical activity. Such orientating basis of an action is conducted by a student himself (during interaction with the teachers) by the methods, which necessary has to be mastered by him. For comparison, we also developed orientating bases, which had, for example: incomplete content of the orientating basis, while the reference points were presented in a specific type and were highlighted by a student himself; presence of all specific conditions necessary for the correct conduction of an action, which are provided to the students in a complete form, etc.

Many aspects rely on the results of anticipatory development of the orientating basis of the conducted and prospective cognitive, practical or other activity of the students. Moreover, it creates the conditions for developing creative, systemic and anticipatory styles of thinking. Simultaneously, the educational process creates and develops orientating basis of the prospective professional activity and subject's readiness to conduct it: in "anticipatory" regulation; for efficient development and actualization of strategic goals and tasks; for the development and efficient actualization of innovations; for reaching the predicted states of certain objects of the political, economic, legal and other realities; for the goals of scientific-technical and technological progress; for preparing and making decisions, etc.

Orientating activity is defined as a system of a person's ideas about the goal, plan and means of conducting a prospective and currently performed action (Rapatchevich, 2010; Smirnov, 1995; Galperin, 1981).

The main goals of the orientating activity, according to the pedagogical encyclopedic dictionary (Pedagogic encyclopedic dictionary, 2002), are: analysis of the problem situation; establishment of the relationships between the elements of situation and their actual meanings; creation of a plan of actions; control and correction of its conduction.

In the opinion of D.V. Chernilevskiy, orientating knowledge is knowledge about the way of performing a new action. Structural components of this

knowledge are reflected in the pattern of orientating basis of action. It includes knowledge about the end product and object of the activity, about means of transformation and control of actions, and algorithmic instructions for performing the actions. Working with a pattern of orientating basis of action implies that knowledge acquisition is conducted through acquisition of the corresponding actions and operations, while the knowledge itself is their product (Chernilevskiy, 2002).

Various forms of mental reflection, which are included in the orientating activity structure, facilitate the actualization of its (orientating activity) functions: preparation, regulation and control of subject's behavior in the changing conditions. The process of orientating activity contains the exploration of an existing situation, in which the prospective actions are performed or planned, and the creation of their plan. During the actualization of such plan, the necessary correction of actions and evaluation of intermediate and final results are conducted. Any psychological functions, including the cognitive ones, are various forms of orientating activity.

B.Ts. Badmaev proposed a structure of the educational process, which is created according to the theory of gradual development of mental actions: pattern of orientating basis of actions – actualization of actions with regard to the pattern of orientating basis of actions – acquisition of the results of education, including the ability to act with predefined qualities (or with the knowledge of the action). In this case, a pattern of orientating basis of action is an educational-methodic tool, namely, a structural-logical chart (tables, graphs, instructions, study diagrams, etc.) of a practical action.

In correspondence with the technique of accelerated learning, proposed by B.Ts. Badmaev, the pattern of OBA is developed first; by using it a subject: becomes familiar with the proposed (given) task; following the OBA pattern, performs the necessary actions (defined by the conditions of the task); and solves the proposed (given) task. The abovementioned technique is aimed at developing the abilities to act, which develop during the process of obtaining the knowledge and not after it. In this technique, knowledge is acquired during their practical application (Badmaev, 2002).

Orientating basis of activity constitutes the core of subject's readiness for efficiently performing current or prospective activity. In this light, subject's orienting in mastering and goal-directed use of the means of actualizing the systemic approach is significant.

These means include knowledge, abilities and skills of designing paradigmatic models of the systems of studied objects, creating and developing one's own system of knowledge, which is adequate for the studied science, developing target programs as products of actualizing the designed system of the studied object, systemically structuring, presenting and studying the information about the object, etc.

As a system, orientating basis of activity is, at the same time, also a mean of reaching the set goals. Because of this, it is recommended to develop (design) and actualize the orientating basis in practice on the basis of the systemic approach, which facilitates the efficient fulfillment of the set goal with minimal expenses. Subject's actualization of the systemic approach helps efficient creation and development of his integral orientating basis of the performed or prospective (cognitive, scientific, practical, or other) activity.

We define specially developed subject's orientating basis of the performed or

prospective (cognitive, scientific, practical, or other) activity as a system, which includes his ideas and systemic knowledge about: a corresponding “subject field”, including the future state of its studied objects; actual problems and possible ways of solving them; the main points of theory and practice; goals (including strategic ones); the main principles, content, functions, plan, methods, means, requirements, conditions, specifics, resources of the activity; as well as required competencies, abilities, skills and ways of thinking, acquired by the subject, which provide his readiness to perform this activity efficiently and with high quality.

Conclusions

As the studies, conducted over the years, have shown, systemic approach towards organization and actualization of the educational process allows significantly increasing the efficiency and quality of education by facilitating the creation and development of abilities and skills of systemic thinking and systemic approach in students’ cognitive and other activities.

Generally, anticipatory education based on the systemic approach is a specially organized process of accelerated (based on intensifying the educational process) development of students’ abilities and skills of systemic and other efficient ways of thinking, systemic and other progressive approaches towards conducting cognitive, creative and practical activity, which serve anticipatory development of fundamental and systemic knowledge, as well as the corresponding competencies, with minimal expenses.

The results of the study show that, upon the increase of the level of acquisition and reproduction of abilities and skills of the systemic approach and systemic thinking in educational, scientific, practical and other activities, efficiency of actions and activity of the prospective specialists changes significantly.

An integration of specific reference points, revealed by the subject in the process of reflecting the surrounding reality, constitutes the basis of his orientating activity. Orientating basis, which actualizes the systemic approach towards organizing and conducting cognitive and practical activity, is characterized by more or less complete content of reference points, which are presented in a generalized form, speed and precision of the action development process, robustness, wideness and easiness to transfer. Such orientating basis of action is combined independently with a method or a technology, which ultimately have to be mastered by a subject.

Efficiency, which manifests during practical activity, points to the activity of cognition. Orientating basis defines the speed of action development and its quality, thus having an active impact on the efficiency of subject’s activity. Actualization of the orientating basis of a cognitive image and corresponding orientating basis of subject’s activity facilitates accelerated and efficient fulfillment of the set goals.

Our studies revealed that theoretical and practical mastering of the efficient methods of cognition on the basis of the systemic approach significantly helps

the students with creating, developing and efficiently using the system of cognitive and practical activity and increasing their productivity.

The experience of actualizing the technology of dual education based on the systemic approach allowed also revealing a significant dependence of the efficiency and quality of students' intellectual development from presence of the abilities and skills of systemic thinking and systemic approach.

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