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The Structure and Content of Senior Pupils Research Position Formation: Case of Analytical Chemistry

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Abstract

Research position expresses the leading features of personality's development process, reflects the universality of its relations with the surrounding world, initiates abilities to creative self-expression, self-development, determines the efficiency of cognitive activity, contributes to the transfer of knowledge, abilities, skills of research in any area of cognitive and practical activities. Therefore, this article is aimed at the discovery of the structure and content of the educational process of formation of senior pupils' research position. The leading method in the study of this problem is a modeling method, which allow present the structure and content of senior pupils' research position formation as the complete pedagogical process directed on formation in the unity and interconnection of all components of pupils' research position. The article presents the structure of pedagogical process of senior pupils' research position formation, consisting of diagnostic, project-targeted, content, operational-activity, technological and result – assessing units. Structural components of this process determine the goal-setting, comprehensive diagnostics, methods and forms of work, technological and didactic support.

Keywords:

Research Position, Formation, Structure and Content, Pedagogical Process, Senior Pupils.

1. Introduction

Pre-university training of senior pupils - is a specific educational activity designed to meet the pupils' cognitive needs oriented on early choice early of specialization and continuation of their further studies in chemistry high school. Today there are various forms of organization of pre-University training for senior pupils: physics-mathematical school, chemistry specialized research associations of students, etc. In recent years, in universities special educational structures - lyceums with day or evening classes are widely used. Solving the problem of continuity of training in the system "school - high school," these institutions are also called upon to conduct purposeful work on the development of pupils' personal qualities that will be needed in the context of university education. Therefore, it is especially

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important to find ways to organize the educational process in such institutions, stimulating pupils' research initiative that promotes the formation of their research position in cognitive activity.

For the individual with well-developed research position is quite natural the desire for novelty, the desire to go beyond known knowledge, to independently understanding of the truth that plays a significant role in cognitive activity, largely defines success. However, the natural impulse motivating research often encounters a limitation in the form of social attitudes, framework, regulations that accompany the developing personality. The tradition of the "reproducing" education is more widespread in secondary school and often leads to the fact that the pupils get used to "gain knowledge". As a result, many school graduates – future students – give preference to reproductive activity that does not involve significant independent efforts in search for the unknown. This has a negative effect on the subsequent performance of vocational training, involving a manifestation of initiative and independence of students in the mastering of science, bringing them to the research activities. This fact leads to the need for more specialized training for future entrants, providing not only their commitment to the specific high school training, but also the formation of their special attitude to knowledge, dictating a desire of a comprehensive study, investigation of the properties of reality.

2. Literature Review

The phenomenon of the research position of the individual is increasingly becoming the subject of discussion in the academic literature, periodicals and teachers treat it too. However, there is a wide range of views on the structure and content of the concept, the characteristics of the process of formation and development of a senior pupils' research position in school learning activities. In science, there is certain theoretical background for the problem's solution of person's research position forming: submission about a priority in the development of a person of his individual subjective properties [1] [2] the unity of the position and orientation of the individual [3] [4] on the role of a research position in the development of pupils [5].

Psychological aspects of the individuals' position, their attitude to reality was considered by Asmolov [6] and others. Of great importance in understanding the nature of cognitive activity underlying the formation of a research position of the person, are works of a number of domestic and foreign scientists [7] [8]. Psycho-pedagogical features of pupils' research activity are reflected in the works of Brushlinskaya [9], Menchinskaya [10] and others.

A number of studies are devoted to the development of the individual's creative potential, the search for means of independent creative solutions' experience formation of philosophical and research problems [11] [12] . Attention is paid to the development of scientific thinking, creative imagination, independence, formation and development of generic research abilities and skills and students' mastering of research methods and epistemological knowledge [13] [14].

Quite a lot of attention is paid to the development of variable forms of pre-university training of future entrants, which solve the problem of cognitive independence development, initiation to scientific research, issues of methods and techniques of research training, its methodological support, etc. [15] [16] [17].

Several studies have examined the possibility of applying problem and research tasks in the practice of senior pupils' teaching, including the stage of pre-university training as a

means of development of: thinking [11] [18], outlook, "educational motivation" [19], students' research competence [20] [21] [22] training effectiveness improving [19], etc.

An analysis of the literature shows that the concept "position of the person" is used very widely. This phenomenon is considered from different points of view: in line with the philosophy and pedagogy – as beliefs [3]; in sociology and social psychology - as a social position [4],; in personality psychology and developmental psychology - as a personal position, the inner position, the vital concept [6],, etc. Most important and backbone concept for all these interpretations is the relation of man to society, to himself, to the surrounding reality.

The relationship of the individual - it is not only the subjective views and opinions but it is also its ways of interacting with other people and reality. Formation of a position is due to the reflection of the person at the conscious level of the objective nature of existing relations in which he lives.

In this context, the researcher's position can be regarded as personal formation, reflecting the ognitive relations of the person to the world, society, itself. A necessary prerequisite for its formation is a stable research activity of the individual [24], , the biological roots of which lie in the researching behavior - a mechanism ensuring the adaptation to the dynamic external environment[25]. However, the establishment and development of a research position as a personal quality are not determined only by biological prerequisites, but also social factors. Among these factors, the external (natural, social-economic and material conditions of human life, ideological orientation, spiritual and ethical attitudes, norms and values, education and training) and internal (cognitive needs, interests and motives of the research) are distinguished.

To the internal driving force of research activity, a number of scholars refer the need for new impressions [26]. Among the cognitive needs [27] allocate research need, the subject of whivh is the knowledge acquired in the course of self-study. The high degree of need for creative research finding is a key feature at the same time a prerequisite for the formation and development of senior pupils' research position. According to Zhafyarova[28], true researcher is interested in the research process not only as a means, but first of all, as the purpose of the activity, personally significant value and the research motive expresses the desire to explore, to investigate any manifestations of rapidly changing realities. The pupil's important manifestation of the motive is his tendency to self-sustained mental efforts in the search for the unknown, persistence in achieving of cognitive goals, preferred efficient methods for knowledge cognition.

However, the problems of the formation of a research position, as a special relationship of the individual to knowledge and actually, cognition process has not been sufficiently described in the pedagogical theory and practice.

3. Results

3.1. The essence of senior pupils' research positions

Under the research, position of senior pupil a relatively stable personality formation is understood, expressing value attitude to the study as a preferred form of cognitive activity. It is actualized in situations of training and practice, where a high degree of novelty and uncertainty is presented

The research position corresponds to the terminologically related concepts. Thus, in the notion of "research activity" need-motivational aspect of position is underlined, in the concept of "research

activities" the aspect of commitment and focus is reflected; in the "exploratory behavior" the aspect of human interaction with the outside world due to his research position is manifested.

3.2. *Components of senior pupils' research position*

Expanding the content side of the studied phenomenon from the point of axiological approach, we have identified the structure of a senior pupil's research position a number of components. Motivational-value component assumes dominance of cognitive needs and interests of research orientation in need-motivational structure of the person. Emotional and volitional component reflects a positive emotional attitude of senior pupils to research as effective way to resolve cognitive problems, willingness to overcome the difficulties in the search for the unknown. The cognitive component is a basic knowledge of research methodology. Reflective component reflects the ability of pupils to comprehend the training situation, to understand the causes of cognitive difficulties, to have a critical attitude to the common belief, to assess adequately their own successes and failures. The present study shows that the establishment of a senior pupils' research position, in general, plays a significant role in their personal self-development.

Isolation of the structural components of a research position allow to determine benchmarks in the process organization of its purposeful formation and make a choice of ways to organize activities in which with a necessity, in unity and relationships these components are developed. With regard to pedagogical processes related to the subject learning, this method should determine the appropriate conditions of pupils' training activities' organization.

3.3. *Schematic representation of pedagogical process structure of senior pupils' research positions' formation*

Figure 1 shows pedagogical process structure of senior pupils' research positions' formation.

3.3. *Content description of pedagogical process's structure in senior pupils' research positions' formation*

Diagnostic unit involves the study of the initial individual manifestations of senior pupils' research positions (input control), as well as forecasting of the prospects of its formation during the subject teaching (i.e. analtyical chemistry, chemical science).

Project and target unit defines the purpose of the pedagogical process: to form senior pupils' research positions in the acquisition of knowledge and to ensure its manifestation in their training and practice.

Content unit defines the components of a research position, to be formed and the criteria for their formation.

Operational-activities unit defines the methods, means and forms of activities' organization that contribute to the formation of senior pupils' research positions.

Technological unit implies organization of research position's formation process as a logical sequence of successive steps, determined by senior pupils' autonomy level in teaching and research activities.

Result and assessment unit provides a systematic monitoring of the process efficiency in senior pupils' research position formation in order to organize timely and individual methodical guidance to pupils. The formation of a research position is estimated by the severity of its components, each of which is selected by corresponding indicators: for

motivational-value component – the interest and enthusiasm in the study of preferred orientation on the process of activity; for emotional-volitional component – positive attitude towards the procedures and elements of the study, persistence in overcoming educational difficulties; for cognitive component – watchfulness, hypothetical productivity, experimental activity; for reflexive component - self – assessment of independence and being initiative in cognitive activity, independence of mind, critical attitude to their own successes and failures.

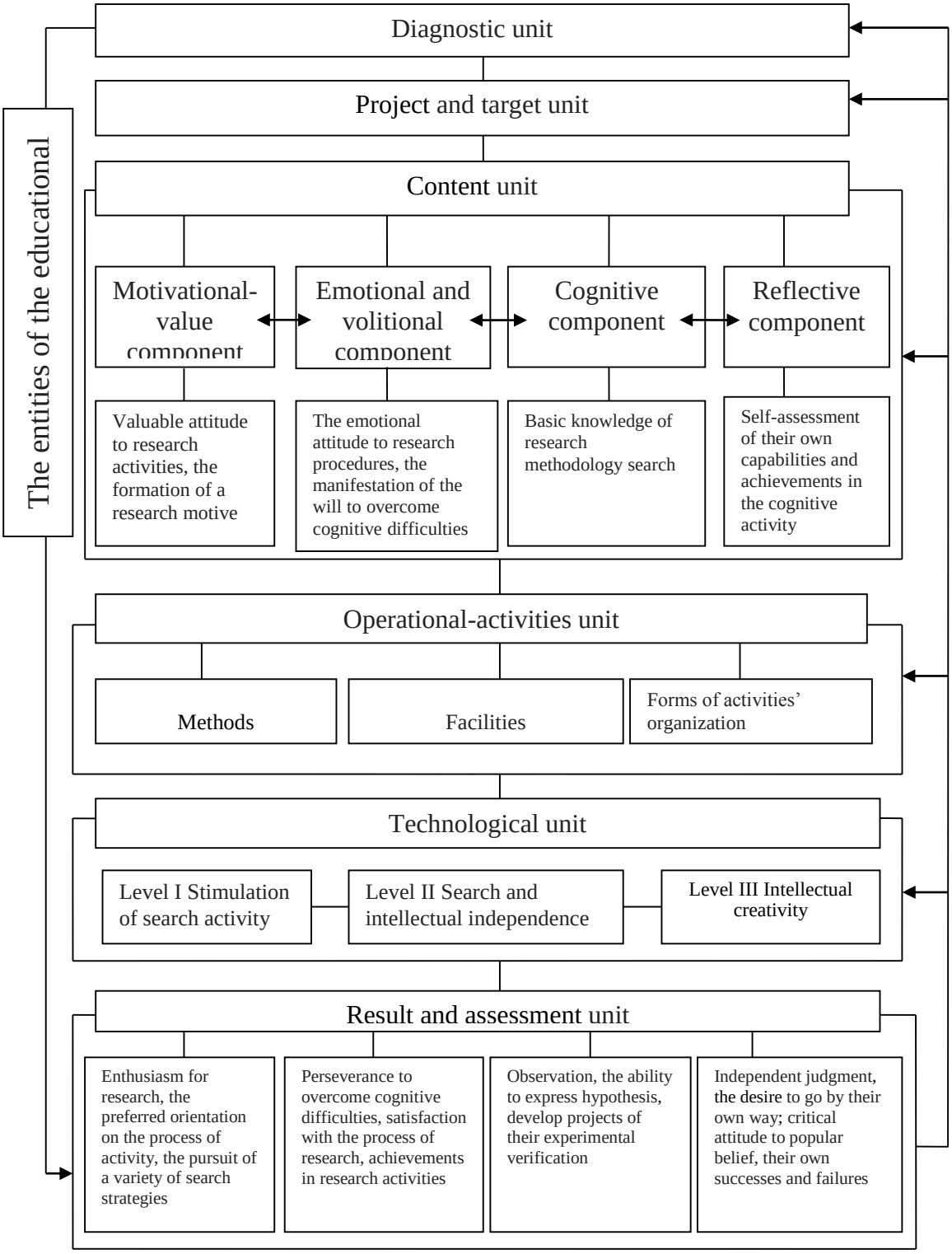

Fig. 1. Pedagogical process structure of senior pupils' research positions' formation

4. Discussions

The analysis of traditional (corresponding to "support" type) and innovation (based on the orientation of the search) educational concepts and approaches revealed their capabilities and limitations in terms of the senior pupils' research position formation. The study shows that the model of training, corresponding to the "support" type (dogmatic, criterion-oriented, programmed instruction, model of complete assimilation, etc.) contribute to the retranslation, reproduction of social experience, mastering of the given samples with a predominance of the reproductive orientation activities. In reproducing training executive processes are successfully implemented, but the creative processes to which research is referred, cannot be realized because they depend not so much on activity, but much on a person [29]. It allows consider any process models of reproducing learning as ineffective ones in terms of the formation of senior pupils' research position.

Another type of learning is considered as the absorbing process of new experience. In domestic didactics there are such directions in innovative teaching as developing [7], problem [18], heuristic[30], research training [25]. The analysis of these types of training from the standpoint of activities approach has revealed that pupils' own activities are put forward to the forefront. Thus, the essence of the learning process through problem solving requires the creation of a situation that forces the pupil to search for a solution. The use of heuristic methods in the learning process enables pupils to master the techniques of solving creative and inventive tasks. However, particularly productive in terms of pupils' research position formation is a research method of learning because it gives the most complete set of appropriate procedural conditions under which its structural components are formed. Its function is the transformation of knowledge into a tool of creative exploration of the world. Creative self-realization of pupils in terms of this kind of training combines the desire to know the unknown and make it individual by overcoming difficulties.

In this study, the understanding about the structure and content of the pedagogical process of forming research position got its technological embodiment on the stage of pre-University training of senior pupils. Pre-university stage has a wide possibility of pupils including in such activities, which is a variable in content, provides for the application of knowledge from different subject areas in teaching and research activities. Implementing of these opportunities contribute to the formation of such skills and qualities which are peculiar to the individual with a strong research position and are in high demand in the context of university education: independence in the acquisition of knowledge, the ability to search for and process information, the ability to organize and manage their own cognitive activity.

The study showed that for the successful implementation of the senior pupils' research position formation process in the educational process of the Lyceum at the stage of pre-University training the following set of conditions should be implemented:

-organizational and pedagogical conditions: designing of the educational process as a systematic and phased solution of educational and research purposes; monitoring of pupils' research position formation on the basis of criteria and indicators of its components' formation.

- information and technical conditions: the availability of information technical resources that create a problem-enriched environment in which senior pupils carry out educational and research activities (laboratory and demonstration equipment, computer equipment, advanced multimedia systems, software, etc.).

5. Conclusion

On the basis of theoretical analysis and the essential characteristics' highlight of a research position, it is established that the pupils' position is a relatively stable personal formation, expressing the valuable attitude of pupils to the study as to the preferred form of cognitive activity which is actualized in situations of novelty and uncertainty during training and practice. The composition of a research position of senior pupils includes the following components: motivational and value, emotional and volitional, cognitive, reflexive.

The structure of the pedagogical process of formation of a research position of students, which consists of diagnostic, design and target, substantial, operational-active, process and result-assessing units. The structure of the pedagogical process of senior pupils' research position formation is presented, consisting of diagnostic, project and targeted, content, operational and activities, technological, result and assessment units.

It is established that the formation of a research position of senior pupils is a holistic pedagogical process aimed at the formation in the unity and interconnection of all components of a research position, which is based on exploratory approach to learning. Structural components of this process determine the goal-setting, comprehensive diagnostics, methods and forms of work, technological and didactic support.

6. Recommendations

The study does not cover all aspects of this problem. Beyond it, there are questions about the specificity of the formation of a research position in the educational process at different stages of comprehensive schools and other educational institutions. There is an acute problem of preparation of students - future teachers for teaching activities, one of the important goals of which will be the formation of their own research position - the basis of self-education and self-development. However, it is hoped that the results of this study will be useful for solving the above-mentioned problems.

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