

Didactic Features of Modeling Professional Competence of the Physics Education Students

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Abstract The paper focuses on the solution of problems and effective implementation of semantic, organizational and management functions in physics teaching methods course as an effective medium educational standards and means of formation of future teachers of professional competence and outlook. It contents standard requirements outlined in the study of physics. The article presents the structural logic of various types of control based on academic performance standards of control.

Keywords: *educational weather, educational standards, reference gauges the quality of knowledge, binary target program effectiveness, competence, vision, methodology, management, the concept of physical education*

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1. Introduction

Leading scientists from many countries recognize the priority of physical and technical education in the real existence of each state. Our studies in physics teaching methods prove that future teachers of physical and technological type [3,7,8] are carriers of ideology and popularizers of scientific and technological progress, interpreters and commentators of modern ideas about the scientific picture of the world. Future specialists in the 21st century is an innovator and translators of scientific and technological implementations (nanotechnology, energy saving technology, agro-cultural technology, technology of creating materials with predetermined properties, space technology, etc.). The main theme of the preparation of future teachers of physics is to master this methodology of influence on the learning process, thanks to the possibility of mastering the basics of scientific and applied physics efficient (but not formal) level.

Investigating the formation of competent future teachers of physics held by us on the basis of higher educational institutions of Ukraine. During the research it was concluded [2,9] that the formation of professional skills of future teachers that meet the needs of the development of modern society, it is possible with the use of competently specified settings. The developed method involves training on the basis of the target program for professional training, based on a binary basis. The essence of the binary principle we see in clear definition and ensuring achieving proper level of semantic (with specific academic subject) and professional (methodological)

knowledge. Of future physics teacher goes through a combination of two interrelated processes: the organization of the future specialist and controlling this activity. Controlled object here is a student (as guided and self-governing system); object of control - his teaching activities. The subject of management is the process of achieving the projected results of future specialist training; subject to control - is the process of mastering the planned professional achievements. Success in this way organized learning is a consequence of successful management actions [2], resulting in forming basic human qualities - competence: outlook, knowledge, manners, creativity, sociability.

The technological aspects of innovation management impacts on the process of competence-philosophical qualities of future teachers of physics [1,5,6,10,11,12], we present and justify in these schemes and the corresponding descriptions.

2. Conceptual Basis

In the present system of higher and secondary education Ukraine introduced alongside the traditional innovative training schemes: personal orientation, interactivity, creativity, strategy, quality training. Experience has shown that the effectiveness and efficiency of learning knowledge of most students [2,9] is at a level far from the requirements of state standards. We identify two problems that need to be an immediate solution: the creation and implementation of clear determinants of education; guaranteed to ensure the effectiveness and efficiency of learning skills of all who study physics or any other

academic subject. The successful solution of these problems is possible if action coordination of all educational innovations with the mechanism of educational doctrine.

In our interpretation [[2], p. 9-18] educational doctrine - "... it is theoretically justified system of beliefs, ideas, attitudes, values and norms, which is a determinant of educational priorities and mechanisms for their implementation at the national level." At the value level the crucial role to play for mechanisms is that predetermined orientation of educational doctrine on terminal values, those that define, shape or constitute the purpose of life of the individual. Other mechanisms of modern educational doctrine to guide the transition of information and performance to design a creative learning system, ensure the development of thinking and worldview as the rational and logical, and the emotional and evaluative levels, contribute to the formation of behavioral traits, spiritual and social activities of the pupil, student, employee. It is clear that educational doctrine extends its influence throughout the educational community, it applies to the full scheme of continuous training and education outlines the following specific objectives:

- comprehensive development of subject knowledge, love of truth, flexibility of thinking;
- weapons knowledge and skills, competence and outlook from the standpoint of the principle of integrity, reflected in thinking, feelings and actions;
- concern for strengthening the spiritual and mental and physical health;
- harmonious development of the individual-level sports, crafts, social, artistic, intellectual and moral faculties;
- formation reassuring social openness, responsibility and willingness to participate in the creation of a free and democratic system;

- preparation for life in harmony with nature, the development of value-productive activity, stimulate initiative in conducting a reasonable leisure, etc..

3. Methodology

In the course of the training of future teachers of physics, we focus on the use of targeted training program. Target training program is an organizational document that defines the content and methodology of teaching material components in personal activity aspect of its implementation. Based on the target program is easy to focus all activities of the student, the selection of tasks for each phase of work with the knowledge that the preparation of an experienced teacher of physics involves simultaneously acquiring it clearly predicted measures of awareness both in physics and in methods of teaching.

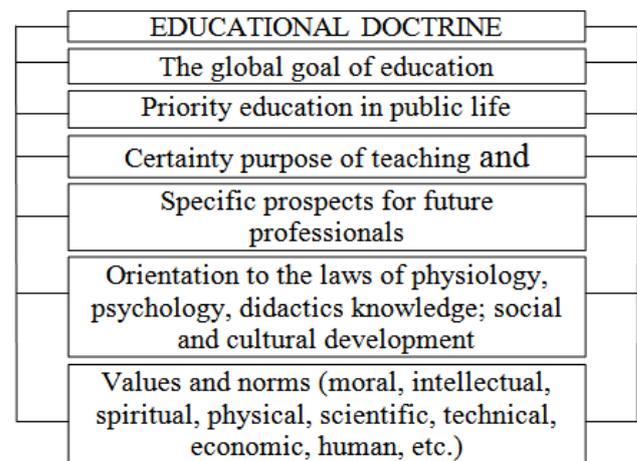


Figure 1. The structure of educational doctrine

Table 1. Scheme-matrix targeted curriculum

Objectively substantive conditions to achieve the goal			Level of learning		
Educational technology; method, base training	Educational material resources, educational-methodical complex	Type of intellectual activity; type of tasks	During training	In the study section (topics)	Upon completion of the study of school discipline

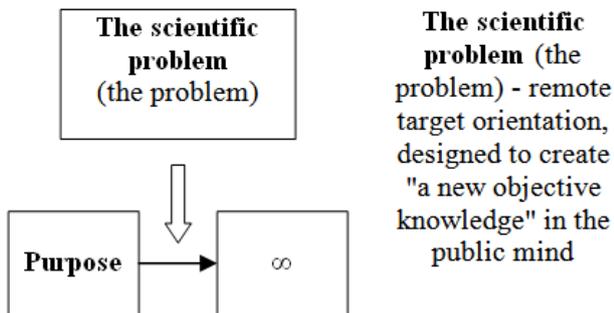


Figure 2. The essence of the scientific structure of the problem (the problem)

3.1. Summary of Tasks Set by Learning Physics

The scientific problem (the problem) is a remote target orientation, which is designed to create "a new objective knowledge" in the public mind. Such problems solved, as a rule, by scientists and inventors. Experience shows that disregard these objectives in education is not necessary,

because the involvement of future teachers of physics to the understanding of important scientific problems are the reasons prompting him to thoughts, fantasies, search activity. Also work on scientific problems shaping values, beliefs and ideological positions, developing intelligence. In general, these problems provide strong preconditions for the emergence of stable cognitive interest and activity of future professionals.

Cognitive task functionality provides a logical series of educational and cognitive act and acts as a kind of knowledge cell of the learning process. Orienting cognitive task on the "zone of proximal development" of the future specialist: "Zone of proximal development" is defined such mental operations that a student is not able to accomplish on their own, but which are feasible for him with some outside help. Operating mechanism, albeit conditioned system of temporary connections subject and object of knowledge, always work on the principle of appropriateness that historically formed social development rights, defining a particular order of both external and internal interactions that lead to certain changes in the facility as well as knowledge in the subject. With the operation of this mechanism student student

masters the "new subjective knowledge" and ways to obtain it (knowledge + methodology).

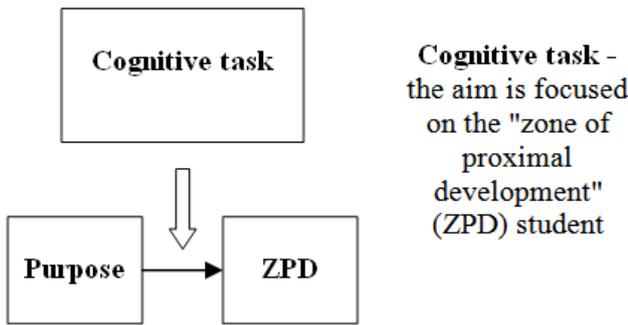


Figure 3. The essence of the structure of cognitive problems

Cognitive task must meet the cognitive capabilities of the student, be attractive in its text, clear, accessible and feasible. This problem is a prerequisite for intellectual, emotional and philosophical enrichment of the individual.

Here is an example of cognitive problems: how must a child swinging a swing push it to gain optimum height?

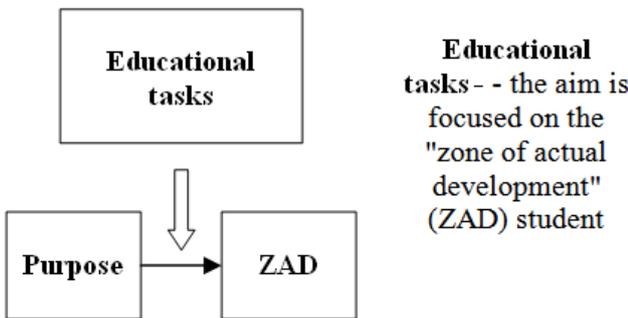


Figure 4. The essence of the structure of educational tasks

Training problem: a system of tasks that the student is able to solve without the help of a teacher. It focuses on the area of actual development of the student. In the course of solving educational problems is "improvement of new knowledge", i.e. ways of mastering its discovery, application, transition, transformation. During this activity the student is enriched methodologically and thus discovering a new quality of "new knowledge", therefore, receives new knowledge in terms of methodical effectiveness. Educational problems is a necessary condition for intellectual and, if appropriate selection - emotional, philosophical and methodological enrichment of the individual. Examples of learning tasks are all questions and problems that are placed in the collections of tasks and textbooks. Based on the foregoing, it can be argued that the initial "new knowledge" student gets only through cognitive task. This assertion follows from the fact that the scientific task can not acquire the status of compulsory education and training task performs a specific element of the educational environment and actually serves a cognitive task. Therefore, based on this view, we define cognitive tasks as object characteristic of the learning process.

3.2. Technology Perception and Learning

The main quality characteristics of the process of learning (or parameters) we highlight awareness, stereotype and passion.

Insight into the proposed object or phenomenon of objective reality reflected through a system of interrelated concepts and categories in the public consciousness. Ordering in thoughtful operations and mental images associated with such a quality of mind as awareness - the ability to allocate more importantly, establish connections with known desired, set the sequence of actions in the present tense. Awareness is always associated with the content of consciousness in today its correlation with past experience. To understand a particular real fact - means mentally turn it into relationship objective world and perceive it in this regard. Awareness object examining cognitive task describes current state of operation, reflecting that in reality, in this study the situation directly in the process of learning the student is aware of understanding this cognitive task in accordance with the normative content of a certain class of problems in the public consciousness.

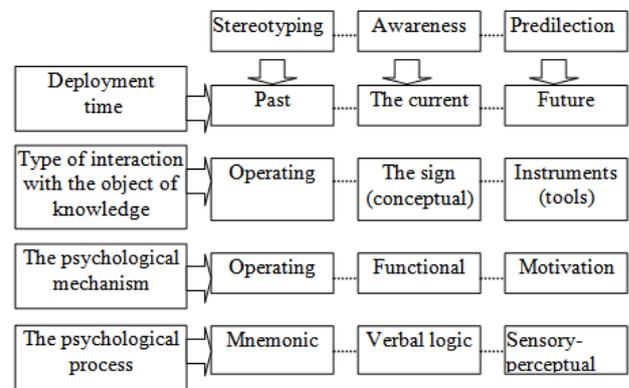


Figure 5. Main activity characteristics parameters of learning

Another important characteristic of cognitive tasks are acting passion of the student, its content and form. Passion describes how knowledge that make up the content of cognitive tasks, with a young man of personal meaning as they embody their needs, motives and goals, and how they related to it subjectively foreseeable future. Not only is knowledge in its conceptual form, but any physical stimulus will not cause reactions in humans, if this indifferent signal. Conversely, the contents are more of an impact coincides with the prospects of man, with his aspirations and interests, the richer will answer its psychological and physiological effects of this [2].

Absolute playback cognitive problems do not happen. But the main features of the reproduction may be repeated, which may even cause the formation of a stereotype, which reflects the common features of a class of cognitive tasks. Formation of a certain stereotype occurs when the constant shifting motives to goals and objectives are transformed into conditions. Collapsing in the development of educational material stereotype manifested in the transformation activities in actions that subsequently reduced to the level of automated operations. In practice, the acquisition of individual experience, a transformation of knowledge is important because it provided automatic execution (at operation), previously complex intellectual and motor activities that require great effort of mental and physical strength. Now translated into unconscious region, these operations are performed quickly, easily and accurately, providing birth and development of new activities. This phenomenon is

explained by the need to consider the third option cognitive problems - stereotyped.

The degree of stereotyped cognitive task depends primarily on the number of repetitions of the same type of operation; it is directly obtained from the use of content and cognitive problems in the past. Stereotyping refers to past experience; it appears prudent operation by thinking and memorizing.

Above we described how the process unfolded display world time manifests itself in human consciousness with its characteristics such as passion, awareness and stereotype. These characteristics make up an integrated system for any human knowledge as they interpret it in the light of understanding the past, present and future. Therefore, we consider it appropriate to use passion, stereotyped and awareness as the basis for allocation of levels of knowledge that can be put in targeting framework for implementing learning management:

- the parameter mindfulness distinguish these qualitatively different levels of learning, corresponding to a lower optimal and higher critical value (understanding main (UM), full ownership of knowledge (FPK), the ability to apply knowledge (AAK));
- the parameter stereotyped, pointing at three closed loops of cognitive activities that relate to the following levels of learning: memorized knowledge (MK), corresponding to the first, or lower standards; full possession of knowledge (FPK) - second (optimal) standard; Flying (F) Thirdly (higher) standard;
- the parameter passion: imitation (I), corresponding to lower levels of assimilation; full possession of knowledge (FPK) - the optimal level; beliefs (B), which corresponds to the highest standard of cognitive activity. Summarizing the analysis capabilities provide professional training of future teachers of physics, we note the following technology aspects.

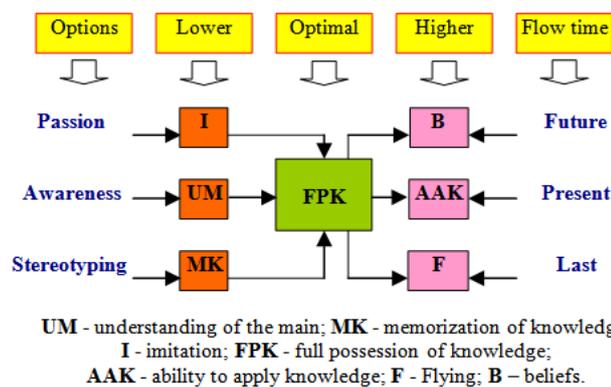


Figure 6. The content and activity patterns

3.3. Summary of Standard Requirements

According to the parameters selected by us, we can classify the characteristics of standard requirements depending on the specific parameter, under which is the assimilation of cognitive tasks. Setting mindfulness "models" of cognitive activity of the subject of study will be:

- understanding of the main (UM): property compressed reproduction of the content of educational material;

- full possession of knowledge (FPK): property productive and active display of all elements of the educational material in any structure of presentation;

- ability to apply knowledge (AAK): property management, creative use of the key link of teaching material in the new connections.

For the parameters selected are stereotyped Control and measuring "samples" cognitive activity of the subject teaching as learning, full ownership, Skills:

- memorized knowledge (MK): a property of the mechanical reproduction of the amount of training material;

- full possession of knowledge (FPK): property productive and active reflection of all elements of the educational material in any structure of presentation;

- flying (F): property automatically use the content of teaching material in the same type of standard situations.

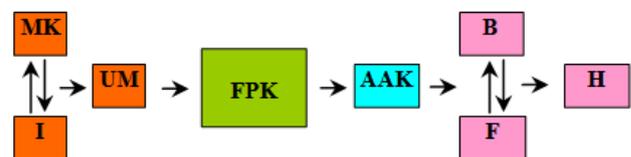
With the option highlighted passion qualitative "types" of knowledge - an imitation of full ownership, beliefs:

- imitation (I): the same property, the use of repetitive operations on training material for learning new ones;

- full possession of knowledge (FPK): property productive and active reflection of all elements of the educational material in any structure of presentation;

- beliefs (B): Property ideological justification for the content of teaching material [4].

4. Prediction of Forming Personal Competences



Dashed outline on the standard of "Habit" indicates that the traditional training of forming habits have not always agreed with the way claims student (student), and therefore can not take place

Figure 7. Plausible scheme of self-regulated learning process

In terms of educational reform, projected levels of educational achievement become immediately signs voluntary if entered in the mechanism of targeting functioning as rational and logical and emotional values of the abstract thought of beginning learners. Action mechanism of formation predicted academic performance [2] in learner-centered learning (Figure - dashed outline) is the gradual increase awareness (competence). Specified in the above scheme targets justifying the selection of five levels of educational and cognitive achievement: everyday knowledge, below the optimum, higher objectively new scientific knowledge. It is likely that students in the study of natural and technological sciences is somehow able to identify a rational and logical level of cognitive activities, but search and creative activity is impossible without a combination of both sides of cognitive act - rational-logical and emotional value (spiritual). Only from such a combination of influences on student activity in learning have a chance to shape his awareness of the level of

everyday knowledge relevant to higher levels of competence and outlook.

Management impacts as follows:

- The action mechanism of psychological settings: settings psychological mechanism in teaching safely work on the condition of the material (subject), operational and psychological readiness of future specialists to master a specific cognitive task at a given reference level. With the coordination of the components of the educational environment with the requirements of the target curriculum use of the psychological settings unproductive;
- Engaging students in active learning of the transition is the basis for the search and creative technology in the improvement of future teacher professional Physics: "theorist" should experiment more, and "empiricist" has more than theorize.

Inexhaustible possibilities suggestion relationships appear in the course of understanding of physical phenomena and processes as physics - a philosophical understanding of the experiment and its results: clarification of cause-effect relationships, disclosure of unity and struggle of opposites, to confirm the transition of quantitative changes in qualitative operation of law "negation". You have to "provoke" such activities regarding the content of the learning material, learning is projected target curriculum at the level of beliefs

In the long-term scientific and educational research, we have, for the first time in the domestic and international practice, validated and implemented, in particular technology binary target orientations (physics + methods of teaching physics), which is a prerequisite for the effectiveness of training (formation of a competency-philosophical as professionals) and form the core of holistic pedagogical credo future physics teachers.

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Statement of Competing Interests

The authors have no competing interests.

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