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Integrated approach to studying general and professional training subjects of future officers of rocket and artillery armament

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Abstract. Based on the analysis of scientific research, the principles of integration of professional training of future rocket and artillery armament officers are substantiated: transferring the knowledge, using the conceptual apparatus of other subjects, convergence of the components of general scientific knowledge, combining the components, and prediction. The main factors that affect the efficiency of the integration of general and special knowledge are defined: unity and interrelation of social, professional, pedagogical, logical and legal phenomena; need for a synthesis of knowledge and skills for all kinds of training and combat tasks and situations; opportunity for officer cadets to realize their potential effectively; ability to solve professional tasks in atypical situations. Coming from the variety of objectively existing factors, the levels of complementarity are defined, as well as the didactic synthesis and the level of integrity. The integrated approach in the professional training of future rocket and artillery armament officers is in the fact that, along with the independent conditionality, military education is the link between the professional and military education, it brings together all of the knowledge, abilities, skills, norms and values in a coherent whole. In the context of the integration of knowledge for general pedagogical and didactic purposes, integrative studying is close to the developing one as it is included in almost all learning types, it significantly affects the content of education and has the theoretical and exploratory nature. Consistency of professional knowledge is found out to be provided by the development of modern educational technology and the phased formation of the professionalism of the future rocket and artillery armament officers. In the educational process, the leading activity of cadets is training, during which further formation of the personality occurs, the professional competence and necessary skills of their service activities are being formed. The main tasks of preparing cadets to their professional activities are formulated, and directions for integration of general and professional training subjects are defined.

Keywords: integration; professional training; future officers of rocket and artillery armament; principles; knowledge; skills.

Інтегративний підхід до вивчення дисциплін загальної та професійної підготовки майбутніми офіцерами ракетно-артилерійського озброєння

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Анотація. Обґрунтовано принципи інтеграції професійної підготовки майбутніх офіцерів ракетно-артилерійського озброєння: перенесення знань, використання понятійного апарату інших дисциплін, зближення компонентів сфери загальнонаукових знань, об'єднання компонентів, прогнозування. Визначено основні чинники, що впливають на ефективність інтеграції загальних і спеціальних знань: єдність і взаємозв'язок соціальних, професійних, педагогічних, логічних і правових явищ; необхідність синтезу знань і вмінь під час вирішення різного роду навчально-бойових завдань і ситуацій; можливість курсантів ефективно реалізовувати свій потенціал; вміння вирішувати професійні завдання в нетипових ситуаціях.

Ключові слова: інтеграція; професійна підготовка; майбутні офіцери ракетно-артилерійського озброєння; принципи; знання; вміння.

INTRODUCTION

Abstract. An important task of military institutions of higher education (MIHE) under the modern conditions of establishment of the Armed Forces of Ukraine (AFU) is to prepare highly qualified officers of rocket and artillery armament, who could fully realize their potential in the professional activity. High professionalism of military experts can be achieved under the condition of scientifically reasonable and continuous update of the educational content, use of modern information and communication educational technologies, based on the latest achievements of psychology and pedagogy, a highly advanced material base, etc.

A special role in the solution of the specified task is played by target preparation of future officers of rocket and artillery armament that is carried out according to the orders of the Ministry of Defense of Ukraine (MDU) as well as the integration of educational and scientific (occasionally, production) processes at MIHEs. The significance of the specified factor is determined by the fact that, in the educational process of the military institution of higher education, officer cadets should be able to participate in the real research acquiring certain practical experience.

Analysis of recent study and publications. The study of integrated processes in education was carried out by a number of Ukrainian scientists, in particular: aspects of integration in education are contained in the works of R. Gurevich; development of interdisciplinary links in education, that show the propaedeutic aspects of integration are considered in the scientific papers of V. Donii, Ye. Sudakov; integration of educational subjects as a pedagogical category is presented by V. Sydorenko; methodological approaches to the educational content formation on the integrative basis are substantiated by S. Goncharenko.

The analysis of scientific works on the integrated processes in military education became the basis for the selection of the principles for the development of theoretical and methodological foundations of knowledge integration of future officers of rocket and artillery armament. According to M. Neschadym, the integrated approach to the educational process requires the development of its special pedagogical characteristics (Нещадим, 2003). Meaningful characteristics include the logical and conceptual structure of integrative processes, their multifold elements, levels, the scope and forms of integration. These processes substantially depend on the types of elements involved in the integration and those that emerge in this process (Козловська, 1999).

In scientific sources, unsufficient attention is paid to the integration processes of the study of professional training subjects of future officers of rocket and artillery armament. All this proves the relevance of the study of the integrated approach in the educational environment of MIHEs.

Purpose and objectives of the article. The purpose of the research is to substantiate the integrated approach to the study of professional training subjects of future officers of rocket and artillery armament at military institutions of higher education. The main tasks of the substantiation of the integrated approach to the study of professional training subjects are the following: 1) creating the preconditions for integrative processes in the educational environment of MIHEs; 2) ensuring the interconnection of the subjects of general and professional training; 3) activating the cognitive activity of officer cadets, aimed at mastering the pooled knowledge, abilities and skills.

THEORETICAL FOUNDATIONS OF THE STUDY

An important component of the integration is "defining integrative factors of synthesizing concepts of science that have a wide general education value (Мадзігон, & Бурда, 1996, p. 5). The role of these factors can be performed by complex objects of the study (high-tech armament), methods of cognition, scientific theory, general ideas, individual sciences or group of sciences, complex problems in general and issues of the interdisciplinary nature, etc. In particular, in the pedagogical aspect, integrative factors include the approaches to the use of methodological knowledge in the process of educational and cognitive activity, teaching methods, etc.

Integrative factors perform various roles, namely: a general method on specific developments, that makes it possible to create new knowledge through the transition from simple to difficult one and vice versa; a means of qualitative and

quantitative synthesis, the content and functional synthesis, and generalization of integration processes in the whole, these processes are examined in various sciences, their explaining and finding their place in the system of the whole; logical and theoretical substantiation of laws, theories and areas of expertise; prediction of unknown properties on the basis of general theories (Козловська, 1999). We consider that the more common, integrated knowledge contains more information and are more slowly exposed to aging.

Taking into account the variety of objectively existing factors, the following factors are presented: the level of complementarity (interdisciplinary links), the didactic synthesis (integrators are technical objects), and the level of integrity (formation of a new academic discipline), where integrative factors are new integrated sciences. By integration levels, it can be interpreted as a process that "goes from the simple classification of facts and theories to the systems of theories, intertheories, local academic views of the world, and global horizons of knowledge (Депенчук, Крымский, & Ахундев, 1980, p. 161). At every next level, integration is growing: the highest level is the integrative system. The notion of integration structurally reveals the processes of interpenetration of the sciences at different levels (Козловська, 1999) (Table 1).

Table 1

Levels of Integration

First classification of approaches	
I	Interchange of facts and specific data of science
II	Use of the categorical and conceptual system and a specific language common for different branches of knowledge
III	Mutual use of theories, ideas and principles
IV	Interchange of means, methods and scientific methods
Second classification of approaches	
Empirical	Integration of the experiment classified data or empirical concepts and laws, etc.
Theoretical	Integration of the main categories, principles, theories and ideas

The integrated approach to the professional training of future officers of rocket and artillery armament is in the fact that, along with the independent conditionality, military education is the link between the professional and military education, it brings together all the aggregate knowledge, abilities, skills, norms and values in a coherent whole, – in the system of professional training of military experts mentioned above.

Development of the rocket and artillery armament (development of new samples) changes the content of the duty of the officers of rocket and artillery armament. It is connected with the use of automated systems of management and control, monitoring the technical condition of missiles and artillery weapons and reducing the psychological burden on the military experts. The importance of the integrated approach is in the fact that it allows to optimize the educational process

of MIHEs. The results of integration are manifested in the fact that knowledge of cadets becomes systemic, and their skills become generalized, and this contributes to their complex application in the military training.

RESULTS OF THE STUDY

The analysis of pedagogical practical work (Ващук, 2012) gives grounds to argue that the integration of general and special knowledge can provide growing the level of professional competence of future officers of rocket and artillery armament. Considering this, we found out major contradictions that exist in the process of professional training of future officers of rocket and artillery armament: discrepancy between the inner logic of academic subject and its interdisciplinary links; discrepancy between educational information and goals. As a result, the effectiveness of the educational process is low. Therefore, the best solution of the specified problem should be the construction of the pedagogical system of professional training of future officers of rocket and artillery armament on the principles of integration.

The principles of integration of professional training of future officers of rocket and artillery armament are substantiated on the basis of the scientific research of the Russian scientist G. Shpak (Шпак, 1999).

The principle of the knowledge transfer, use of the conceptual apparatus of other disciplines provides the following:

– social features of the educational activities of MIHEs;

– joint activities of all participants in the educational process;

– optimization of the management of scientific and pedagogical workers of MIHEs;

– improvement of information and technical aids and methods of their use in the educational process.

The principle of convergence of the components of general scientific knowledge includes the following:

– integrated approaches to professional training;

– differentiation of contents of the professional training subjects at MIHEs.

The principle of combining the components is focused on the following:

– improvement of methods of teaching general and professional subjects, military and professional subjects, and professional and specialized subjects;

– integrated approaches to social and professional adaptation of officer cadets in various courses;

– creating conditions close to real service environment;

– practical orientation of trainings and exercises.

The principle of prediction is aimed at the following:

– optimization of content filling of the disciplines of professional training and its relevance to the level of the received knowledge and skills;

– peculiarities of the interconnections of the creative abilities of officer cadets and the features of systematization of the knowledge they acquire.

The selected principles of integration of professional training of future officers of rocket and artillery armament are taken as the basis of design (improving) the content of the disciplines of professional training in accordance with the goals of educational process – formation of cadet professional readiness for operational and combat activities.

The analysis of general characteristics, methods, and forms of integration in military education, is the basis for selecting the principles for the development of theoretical and methodological foundations of integration of knowledge of future officers of rocket and artillery armament at MIHEs. Implementing the integrative principles in the educational process requires the development of their special pedagogical characteristics. The purposive characteristics determine the pedagogical goal of integration, its content, in particular, formation of philosophical concepts and system of scientific concepts about individual objects, etc.

In our opinion, the purposive, content, structural and procedural characteristics of the integrative processes in military education are advisable to slightly rearrange by selecting its content and procedural aspects on the basis of the objectives of integration. This will give the opportunity to avoid bulky constructions in the process of creating the models of integration of knowledge of future officers of rocket and artillery armament.

In the context of integration of knowledge for general pedagogical and teaching purposes, integrative learning is close to a developing one, as it is included in almost all types of learning, it significantly affects the content of education and has a theoretical and exploratory nature. The integrative learning comes with the modular and problem learning.

The modular learning integrates a series of areas: programming, projecting, problem learning, etc. Therefore, implementation of the scientific approach to the integrative and modular learning requires, above all, establishing and proving the original classification of science and branches of knowledge, on the basis of which the educational subjects are formed. Then, the relationship of knowledge in the content of learning (integrated learning units of different scale, educational modules, etc.) will be organic parts of the system of actually existing knowledge and relations between them. In contrast to traditional learning systems, modular syllabi and integrated fields of knowledge form exactly such approach to structuring the contents of the educational material. We believe that modular learning and use of integrative means of learning have the significant potential for the formation of integrative subject system of learning with the efficient use of traditional and innovative technologies (Депенчук, Крымский, & Ахундев, 1980).

The integrated educational process, by contents, forms and methods, has a number of analogues in modular learning. Narrowing of information, construction of content units on the problem basis, and not on the subject basis, gives the

possibility to concentrate the attention of future officers of rocket and artillery armament on the contents of educational materials. In our opinion, integrative means should be used as a tool while constructing the modules, and the principles of modular learning – integrative courses: links between modular and integrative learning have objective prerequisites for deeper interaction (Горбатюк, 2008).

The theoretical analysis of scientific sources and experience give reason to make conclusions that systematic professional knowledge is supported by the development of modern educational technology and the phased formation of professionalism of future officers of rocket and artillery armament. In the educational process, the leading activity of officer cadets is learning, which forms their personality, competences (knowledge, abilities, skills), essential qualities of their professional activity. For the formation of developing feature, the leading activity should be conducted from one discipline to another. In terms of the contents of the learning syllabi, a graduate should have a logically completed amount of knowledge for the service activity. This is achieved by selecting the appropriate number of academic hours to study the disciplines of professional training of specialty 141 Electrical power, electrical engineering and electrical mechanics (specialization: exploitation and maintenance of artillery weapons, exploitation and maintenance of rocket weapons, ammunition, explosive devices, lighting and signaling tools) to get a bachelor's degree.

We believe that the foundation of technical training of future officers of rocket-artillery armament is the knowledge of the material of the specialized disciplines ("Fundamentals of building rocket and artillery armament and maintaining tools", "Fundamentals of the theory of reliability and operation of rocket and artillery armament", "Missiles and ammunition", etc.). Technical training of officer cadets is implemented in standard forms of classes in special disciplines. And general knowledge has a basic role and nature regarding technical knowledge. For example, if conducting a combined lesson, its structure and organization are pedagogical aspects; surveying, delivering new material, its reinforcing, summarizing (evaluation), giving homework, etc., indicate that having to deal with the material of specialized disciplines, scientific and pedagogical workers perform pedagogical functions. Technical and production components are within the pedagogical ones. The technological logic is subordinated to the pedagogical objectives, to the goals of high quality classes.

The conducted studies allow to determine the main factors that affect the efficiency of the integration of general and special knowledge: unity and interconnection of social, professional, pedagogical, logical and legal phenomena; the need for a synthesis of knowledge and skills for all kinds of training and combat tasks and situations; the ability of officer cadets to effectively realize their potential; the ability to resolve professional tasks in atypical situations.

All the facts mentioned above allowed to formulate the basic tasks of preparing future officers of rocket-artillery armament to the professional activity, and to identify some areas of integration of the disciplines of general and professional training, namely:

– parallel learning the subjects of general and professional training for the entire time spent at MIHEs. For this purpose, there is need for the methods, means

and forms of organization of educational and cognitive activities of the integration of general and special knowledge;

– ensuring the relationship of general and special knowledge. This can be achieved during the accomplishment of the course works and diploma works, as well as during the training and production practice;

– activation of the cognitive activity aimed at possessing the pooled knowledge, abilities and skills. This can be achieved by the use of effective methods of teaching that provides interconnection of educational materials;

– harmonious development of abilities of officer cadets on the basis of personal characteristics and objective requirements for professional activity. It requires the use of the system of methods, means and forms of organization of educational and cognitive activity, aimed at integrating general and special knowledge, in the educational process of MIHEs;

– mastering knowledge, skills, techniques and methods of integration as the basis for professional training of future officers of rocket-artillery armament. It is possible under the conditions of constant interconnection between the disciplines of different cycles in the educational process.

In the context of the defined areas of integration of general and special knowledge, we substantiate the contents of the discipline "Theory of automatic control", which is basic in the system of training the modern officer of rocket and artillery armament in the field of knowledge 14 Electrical engineering. The subject of the discipline is the principles of construction, analysis and synthesis of the systems of automatic control of missile strikes and artillery fire. In the training of officer cadets, this discipline takes one of the main places, because it provides the graduates with theoretical knowledge and practical skills necessary for their professional activities. The contents, provided by the syllabus, is structured in the form of modules: mathematical models of the systems of automatic control and their construction; analysis and development of the systems of automatic control (SAC). Each module consists of relevant topics, such as mathematical models of the systems of automatic control and their construction: the basic principles of operation, equation of SAC and its elements, transfer functions, structural transformations, time and frequency characteristics of the systems and components, method of variables, typical dynamic links. The study of these themes is based on interdisciplinary connections with mathematics, physics, theoretical bases of electrical engineering, etc.

The integrative study of the disciplines of general and professional training involves solving a number of problems. First of all, it is the development of methodological bases of integrative studying (particularly, within one comprehensive subject). Secondly, the problems of theoretical nature are connected with the development of didactic models of integrative studying of various types. Thirdly, formation of the logical sequence of the development of integrative ideas comes from their fundamental scientific rationale to the use in specific techniques.

CONCLUSIONS AND PROSPECTS FOR FURTHER STUDY

The studies have given grounds to argue that the modern educational system of professional training of future officers of rocket and artillery armament at MIHEs is focused on the formation and development of the personality of military professionals, improving their functional status, creativity, etc. Integration of the subjects of general and professional training of future officers of rocket and artillery armament consists in reviewing the approaches to the organization of this process. It (integration) has its own specifics, which defines the structure and content of professional training of officer cadets. Thus, integration, in our case, represents the interdependence of the major components of the educational system of formation of professional competence of future officers of rocket and artillery armament to the service activity.

The prospects for further study are the development of structural and functional model of professional training of future officers of rocket and artillery armament, which will take into account the main factors which influence the effectiveness of integration of common and special knowledge at military institutions of higher education.

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