Organizational Methods of Formation of Military and Special Competence in Future Border Guard Officers in the Continuing Education Process

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Abstract: *Military and special competence in border guard officers is essential for their successful professional activities. The purpose of the article is to distinguish the relevant organizational methods for the formation of military and special competence as a necessary condition for enhancement of efficiency of the educational process and describe their implementation in the continuing education process. To achieve the purpose the following methods were used: theoretical methods (bibliographical method, comparative analysis, structural and systemic analysis, method of theoretical modeling, etc.), empirical methods (questionnaire, conversation, direct and indirect observation, testing, method of expert estimations, self-assessment), and pedagogical experiment. The study involved 160 cadets of second and third years who study for specialty "State border security" and "Law" at the National Academy of the State Border Guard Service of Ukraine named after Bohdan Khmelnytskyi. During the research, we outlined the realization of guided and intentional influence upon the process of formation of military and special competence, verified the effectiveness of pedagogical system of formation of military and special competence in the continuing education process, explained the implementation of active teaching methods, information and communications technologies and acmeological approach to enhance the efficiency of educational process at the Academy. The attention was drawn towards the development of recommendations to lecturers to improve their practical skills of implementation of innovative organizational methods within the educational process. As a result, at the lessons, where information and communications technologies, active teaching methods, and acmeological approach were applied, the level of military and special competence increased significantly by two criteria – activity-practical and personality-functional.*

Keywords: *methods; formation; military and special competence; future border guard officers; continuing education.*

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1. Introduction

To modernize the law-enforcement institutions in the Ukrainian society, a number of measures are taken. They concern the implementation of the border maintenance system, transition to the integrated principle of border management, management of cross-border movements of people, vehicles, and goods. In this regard, several legislative acts were adopted in the last decade to improve the conditions within the legal fold. Thus, the Order of Cabinet of Ministers of Ukraine No 2031-p of 27 October 2010 elaborated and approved the Concept of integrated border management that emphasizes the necessity of designating and following the standards and new approaches to integrated border management. Also, it supports the arrangement and coordination of actions of integrated management subjects (Cabinet of Ministers of Ukraine, 2010). Recently the procedure of approximation of Ukrainian legislation to EU laws outlined a wide range of tasks and identified them as priority issues. Therefore, some amendments referring to border security were included. The Cabinet of Ministers of Ukraine re-passed the Order On approval of the Concept of integrated border management (Cabinet of Ministers of Ukraine, 2015) and approved the Strategy of integrated border management for the period up to 2025 (Cabinet of Ministers of Ukraine, 2019).

The corrections concerned the following: reformation of legal system in the sphere of integrated border management, state border protection during the Joint Forces Operation in the east of the country and mechanisms of implementation of cooperation on counteraction to organized transborder and transnational crime; introduction of system of control of foreigners and stateless persons entering Ukraine that adheres to EU standards; inclusion to global information environment; implementation of European standards of border control into border guards' activities; adoption of mechanism of realization of foreign trade activities and development of world trade, ensuring a high level of transit capabilities.

These aspects mentioned above, together with transformations taking place in military education, imply improvement of professional training of future officers for the State Border Guard Service of Ukraine. Obviously, this concerns the choice and application of appropriate methods to organize professional training at the higher military educational establishment, the efficiency index of which is the formation of the required level of military and special competence in future border guard officers.

2. Literature review

The efficiency of professional training relates to the acquisition of certain professional knowledge and skills that provide the opportunity for a future specialist to use this accumulated educational capital in real conditions of professional activity. Today competence and professionalism are main factors of professional realization of personality, whereas the implementation of the competence-based approach is an essential prerequisite for the professional development of future border guard officers, as evidenced by many researchers. Thus, the overview of the formation of military and special competence in future officers are described in scientific works of Barabanshchikov (1962), Bachevsky (1998), Protasov (2007), Severyna (2009), Yahupov (2007), Tsarenko (2009), et al.

Recent studies have shown the interest of researchers to certain aspects of officers' professional training (e.g. physical, applied military, educational, moral, and political). For instance, Penkova (2015), Mul (2016), and Volynets (2018) paid attention to psychological readiness of future officers to professional activities. Marionda & Sharodi (2018), Starchuk (2011), Hnydiuk & Didenko (2015) studied physical training of future officers. Balashova & Korchev (2013) outlined the process of formation of economic and corporate culture in future border guards, Vyshynska (2006) – information culture, Yavorska (2005) - social and psychological maturity, Ulich (2007) - readiness to management activities. Balendr (2010) studied the peculiarities of training of future border guard officers to resolve conflict situations in professional life. Bunicev (2014), Ivaniuta & Kubitskyi (2013) investigated the methodical principles of formation of professional competence of future officers and worked to improve the assessment of their learning outcomes. But only a few studies concern the methods of formation of military and special competence.

Taking this into account the significance of military and special competence for improvement of future border guard officers' professional training in general, the given research is to provide the overview of methods of its formation and to reveal the outcomes of experimental study. The results of the experiment in the formation of military and special competence in future border guard officers were made possible after thorough analysis and designing the model of the relevant pedagogical system.

3. Materials and Methods

A number of foreign and native investigators analyzed the problem of methods in pedagogical research (Starosta & Tovkanets, 2015, Sysioieva & Krystopchuk, 2013, Chaichenko et al., 2015, Curtin & Hall, 2018, Nind & Lewthwaite, 2018). They covered theoretical methods (bibliographical method of sources studies, comparative analysis, deductive and inductive methods, structural and systemic analysis, method of theoretical modeling), empirical methods (questionnaire, conversation, direct and indirect observation, testing, method of expert estimations, self-assessment), pedagogical experiment (ascertaining and formative stages) to verify the efficiency of pedagogical system described in the research, and methods of mathematical statistics to process the results and determine qualitative and quantitative dependencies between the phenomena and processes. Every single method helps to produce a limited portion of findings. To achieve the concrete results, we used a number of methods and followed the requirements for the research of this type.

The conducted ascertaining stage of pedagogical experiment in the formation of military and special competence in future border guard officers demonstrated such characteristics as spontaneity and traditional nature of approaches and major teaching methods, that did not provide the formation of optimal level of military and special competence in cadets according to the appropriate criteria and indices during their studying at the National Academy of the State Border Guard Service of Ukraine. In order to overcome the shortcomings that occurred during the ascertaining stage of the pedagogical experiment, we have conducted the formative stage of the pedagogical experiment.

The realization of ascertaining experiment created the possibilities for the following: management and purposeful influence upon the process of formation of military and special competence of future border guard officers; verification of efficiency of pedagogical system of formation of military and special competence in future border guard officers in the continuing education process; evaluation of the methods of formation of military and special competence in cadets of the National Academy of the State Border Guard Service of Ukraine. Thus, we made a supposition that at the first (bachelor) level of training of higher education, it is required to take the following steps: to provide pedagogical guidance and support of the first-year cadets; implement active teaching methods; improve the content of methods of cadets' practical training. Concerning the main stage (master level of training of higher education), our attention is drawn towards the

following: improvement of organizational methods of scientific and research self-education activities of future masters. Generally, the suggested working hypothesis reveals the dependence of the process of the formation of military and special competence in future border guard officers on the authors' pedagogical system. The main aim of the research was to obtain the result that will allow us to find unconditional dependence of the results on the variables presented in our pedagogical experiment.

During the experiment, we used complementary research methods. The aim of the use of empirical methods was to study subjects of learning at the lessons. The main empirical methods were: scientific observation of certain changes, conversations, complex assessments that are closely connected with methods of quantitative evaluation in order to ensure the measures of qualitative changes in levels of military and special competence according to indices of activity-practical criterion (acquisition of specialized knowledge, formation of special skills and expertise, obtaining of practical experience in the field of border defense). To evaluate the levels of military and special competence of cadets of the National Academy of the State Border Guard Service of Ukraine according to indices of personality-functional criterion (determination of values-based orientations and ideals, creative potential, professional focus, and personal features), we used psychodiagnostic testing.

4. Results of Research

Obtaining reliable information during the pedagogical experiments is possible upon condition that its clear and logical scheme is designed. It is necessary to assert that the main tasks of the experiment were to determine cause-effect relations between variables. For this reason, we formed two groups - control and experimental. Note that the task of the experimental group (hereinafter EG) was to specify the accurate statistical dependence between variables. The task of the control group (hereinafter CG) was to compare the results obtained in two groups. Due to this approach, we had a possibility to distinguish alternative cause-effect relations and clearly define the particular statistical dependence between the results produced. The explanation of causes of the use of this approach by giving examples concerns the adaptation of the methods of experiment realization to peculiarities of the educational process of cadets at the only higher military educational establishment of border agency in Ukraine. The participants of the pedagogical experiment in the formation of military and special competence were cadets of second and third years who study on specialty

«State border security» (EG – 79 cadets) and «Law» (CG – 81 cadets). Totally, the experiment involved 160 participants. The sample size helped us obtain objective outcome data of statistical measurements. It is necessary to note that the formative stage of experiment lasted 4 years (2014-2015, 2015-2016, 2016-2017, 2017-2018 academic years), that equals the duration of cadets' full-part study program at the National Academy of the State Border Guard Service of Ukraine, from the first to fourth year.

During the experiment we faced the following tasks: providing the same initial conditions to all cadets of EG and CG; teaching of military and special courses to cadets from CG on the basis of traditional technologies and techniques; formation of major indices of activity-practical and personality-functional criteria of military and special competence in cadets from EG under specifically organized conditions on the principles of implementation of authors' pedagogical system; introduction of acmeological principles and active teaching methods at the first (bachelor) level of formation of military and special competence in future border guard officers; analysis of results of training activities of cadets from EG and CG when they study military and special subjects; reaching conclusions and specification of statistical accuracy of the results produced.

The algorithm of experimental work requires to select adequate procedures of organizational methods of research. Under this condition, the methods of longitudinal and transversal assessments are efficient as they include regular control in different samples that are homogenous for all important ratios in accordance with selected indices of activity-practical and personality-functional criteria of military and special competence. Throughout the research, we involved the cadets since the individual characteristics of activity-practical and personality-functional criteria of military and special competence in cadets were generalized on the basis of the expert evaluation method.

We consider that it is imperative to analyze the key stages of the formative experiment. The first (preparatory) stage lasted during September-November 2014 when the homogeneous composition of EG and CG was determined, and the choice of the expert commission was substantiated. At this stage, we planned to ensure favorable conditions to carry out the procedures of input diagnostics, produce accurate information, and collect enough materials for research. During the first stage, we collected the initial research data and studied the homogeneity of experimental and control groups. Thus, while organizing the first stage of research, we compared the characteristics of cadets to monitor such parameters as age range; first-year cadets' performance regarding the level of average general education (the

“Motherland Defense” course was the focus of attention); monitoring of school certificate average grades. At the end of the research, we formulated the differences between cadets from EG and CG at the beginning of the formative stage of the experiment. We can conclude that these differences were insignificant.

The main (formative) stage of experiment concerned the practical activities of authors and teaching staff of the educational establishment that were involved in the procedures of implementation of methodical principles oriented towards the formation of military and special competence in cadets from EG according to all the indices of activity-practical and personality-functional criteria.

The described problem includes a number of designed and implemented methodical principles. They are the following: psychological and pedagogical supply and guidance of professional development of first-year cadets considering the essence and peculiarities of formation of their military and special competence (patterns, directions, and principles); introduction of scientific and methodical seminar to train teaching staff how to use active teaching methods and adopt acmeological fundamentals during the formation of military and special competence in cadets; implementation of simulation methods within the educational process to improve indices of activity-practical criterion and non-simulation technologies to enhance the levels of indices of personality-functional criterion of military and special competence, also improvement of organization methods in the process of training of future border guard officers who study according to the first (bachelor) level of training of higher education.

Analyzing practical aspects of organizational methods of psychological and pedagogical supply and guidance of cadets from EG, we took into consideration the recommendations of psychologists (Rean, 2002; Maklakov, 2005; Rybnikov & Chermyakin, 2009; Chalikova, 2017) regarding the existence of psychological features in the set of functional states of every cadet are the same as they are given at the genetical level but they also have some significant individual differences in their manifestation and dynamics that is substantiated by inner characteristics of mechanisms of regulation of certain activity and individual psychic peculiarities of every personality. Creating the mechanisms of supply and guidance, we considered that in modern society, the main task is oriented towards the training of highly qualified experts and therefore, it imposes a number of complex requirements to graduates of the higher military educational establishment.

During the training, the cadets should be explained about the positive and negative sides of the future professional activities they can face,

in the educational establishment environment and upon graduation. In view of this, every cadet should estimate his or her possibilities and determine the individual pace of acquisition of principles of future professional obligations.

Academic and teaching staff of the National Academy of the State Border Guard Service of Ukraine, who are involved in the formative stage of the experiment, elaborated a kind of methodological support of lessons for first-year cadets. These methodological complexes enable to eliminate controversies between possibilities and new recommendations to the educational process. Also, they contribute to cadets' involvement in the process. The primary attention has been drawn towards the adaptation of cadets that refer to significant changes in the activities followed by transformations in the social environment. Due to the content of psychological and pedagogical supply as well pedagogical support the level of abilities of cadets to improvement of military and special competence enhances right from the first days at the Academy, from the beginning of integration into educational community, they acquire new types of educational and scientific activity, build new types of interpersonal relations, adapt to new living conditions and organization of leisure activities. The measures related to psychological and pedagogical supply and psychological and pedagogical support were taken in the 2014-2015 academic year to sample from first-year cadets from EG of 79 people. During the research, we used a multi-level personality questionnaire «Adaptability» and the questionnaire «Sociopsychological comfort of the environment».

The results obtained at the beginning of research showed that only 8 first-year cadets (10,13 %) have respective high adaptation potential; 32 cadets (40,51 %) possess an average level of adaptation potential; 39 cadets (49,36 %) have a low level of adaptation potential. In the context of taking measures of pedagogical guidance, first-year cadets learned basic concepts of future professional activities, existing traditions of the educational establishment. Also, some meetings were conducted between cadets and representatives of structural units. Over the analyzed period, the adaptation capabilities of first-year cadets according to quantitative indices changed. It is necessary to emphasize their positive dynamics. At the same time, quantitative parameters increased that is evidence of the sociopsychological comfort of cadets within the educational process.

We can state that taken measures related to pedagogical support and the psychological and pedagogical guidance of first-year cadets initiated the development of subjective-subjective interrelations, cooperation, mutual creative work of lecturers and cadets when the exchange of professional personal and social experience occurs. These measures lead to the

improvement of the sociopsychological comfort of cadets in the educational environment of the Academy. The implementation of the respective measures related to the development of important professional qualities of the future officers of border agency positively affected the formation of each criterion of military and special competence and resulted in an increase of active learning and cognitive activity of cadets.

Forming military and special competence, we paid attention towards the development of the content of scientific and methodical seminar to train teaching staff how to use active teaching methods (hereinafter ATM), information and communications technologies (hereinafter ICT) and implementation of provisions of acmeological approach in the process of formation of military and special competence. The experiment involved 16 lecturers of the department of tactics of border guard service and 4 lecturers of the department of border control. Among 20 lectures teaching the subjects of military and professional cycle, 3 lecturers (or 15 %) have a scientific degree of PhD in pedagogical sciences, the rest - 13 lecturers (65,0 %) – do not have a scientific degree. During the research, we found that these lecturers do not have higher pedagogical education. This fact laid the groundwork for the organization of scientific and methodical seminars to train teaching staff to use active teaching methods, information and communications technologies, and principles of acmeological approach in the process of formation of military and special competence in cadets.

The practical part of the organization of scientific and methodical seminars for teaching staff reflected theoretical provisions regarding the use of ATM, ICT, and acmeological approach and also the formation of practical skills enabling to improve military and special competence in cadets. There were conducted 5 lectures and 5 professional simulation games. Informative scientific and methodical seminars created preconditions for the creative understanding of pedagogical theory by lecturers and the formation of necessary skills of using a theoretical basis in their professional activity. In order to conduct practical training of teaching staff involved in the experiment, we used complex methodical techniques of activation of reserves of possibilities of an adult. The theoretical fundamentals were constructed using the content of problem-based lectures. At the same time, necessary practical skills were formed during professional simulation games that included discussions and problem-role situations. According to the reviews of lecturers participating in the scientific and methodical seminars, the level of their practical and theoretical preparedness to the usage of ATM, ICT, and provisions of acmeological approach in the process of formation of military and special competence in cadets has been increased significantly.

The special attention should be drawn towards practical mechanisms of implementation of different types of simulation methods and non-simulation technologies into the educational process of the National Academy of the State Border Guard Service of Ukraine. For example, the studying of the «Organization of border control» course (at the department of border control) involves the cadets to professional simulation games. In particular, the topic No 5 «Actions of personnel of taking special measures related to searching for the violators and localization of crisis (non-standard) and conflict situations in the checkpoints through the state border» requires the usage of professional simulation games.

At the lessons the cadets had to do the following tasks: to decide on personnel behavior in particular professional situations and what special actions to take in order to carry out tasks related to searching for the violators in the railway and highway checkpoints; solve the cases on actions of personnel to localize crisis situations in highway and railway checkpoints; find out optimal decisions in professional situations concerning passage of people, vehicles and cargoes beyond the checkpoints. In the classroom, future border guard officers could work with certain professional situation titled «Attempts of the violator to escape from the vehicle stopped in the border control zone». Note that cadets had limited time to solve the problem (10 minutes). The leader of the game appointed the roles (border details, playing team, experts), set them tasks to prepare workplace, combat uniform, equipment, and lined the personnel in a certain place in the highway checkpoint «Podillia». All actions of participants were video recorded that helped cadets decide on situation mistakes and discuss the correct solutions.

The main emphasis was placed on such ATM as brainstorming, discussions, and round tables. For example, we designed typical tasks the border guard officer may face while communicating with persons in checkpoints through the state border of Ukraine, namely: Border detail «Documents examination» (conversation with a person producing documents for inspection; conversation with a person denied in entry/exit in/from Ukraine on the grounds of instructions received from the law-enforcement organs; conversation with a person who is not satisfied with long documents examination procedures; conversation with a person refusing to follow the instructions of border detail; conversation with a person crossing the state border and responds to border detail's messages in abusive language; conversation with a pregnant woman who is rude to border detail and demands to expedite the documents inspection).

ICT were actively used at the lessons of the «Organization of border control» course. In particular, they include multimedia instruction of using expert class documents examination device or software «FOSTER+FREEMAN VSC-5000 Video Spectral Comparator», which is presented in figure 1.

Multimedia instruction enables an interactive regime to obtain practical skills of using instruments of video spectral comparator while conducting a second-line examination of passport data. It is used by teaching the staff of the department of border control while teaching the topics concerning measures of second-line document examination.

Fig. 1. FOSTER+FREEMAN VSC-5000 Video Spectral Comparator (The screenshot presents the description of expert class documents examination device or software «FOSTER+FREEMAN VSC-5000 Video Spectral Comparator» and describes its characteristics, interface, and functional possibilities), contributed by Border Control Department, National Academy of the State Border Guard Service of Ukraine named after Bohdan Khmelnytskyi.

Multimedia course called «Security features of passport documents and the main fraud methods» designed to form skills and acquire knowledge on passport documents security and fraud methods. The program includes three chapters: theory, practice, and testing.

The theoretical module is used to learn text information, watch video materials, and presentations related to the topic of security and fraud methods.

The practical module helps to improve skills of person identification, determination of age changes, estimation of the computer-readable zone, and express inspection of documents.

The testing module assesses the knowledge and skills obtained in the first and second modules. The program is used when cadets and inspectors of border guard units study the topics related to the examination of the documents.

Figure 2 shows the «Security features of passport documents and the main fraud methods» multimedia course (theoretical part).

Fig. 2. Security features of passport documents and the main fraud methods (The screenshot presents a section of theoretical part of the multimedia course «Security features of passport documents and the main fraud methods» and provides the material devoted to the protection of documents using optical security features), contributed by Border Control Department, National Academy of the State Border Guard Service of Ukraine named after Bohdan Khmelnytskyi.

The «Security features of passport documents and the main fraud methods» multimedia course (practice) is presented in figure 3.

Fig. 3. Practical part of the multimedia course «Security features of passport documents and the main fraud methods», contributed by Border Control Department, National Academy of the State Border Guard Service of Ukraine named after Bohdan Khmelnytskyi.

Multimedia course «Security features of passport documents and the main fraud methods» (testing) is shown in figure 4.

Fig. 4. Testing part of the multimedia course «Security features of passport documents and the main fraud methods», contributed by Border Control Department, National Academy of the State Border Guard Service of Ukraine named after Bohdan Khmelnytskyi.

The program «Facial composite» is given in figure 5. The program is designed to get a facial composite of a person using its verbal description, to train identification skills of distinguishing private identification features.

The program is used during the lessons and workshops to improve the identification skills of future border guard officers that are essential for military and special competence.

Fig. 5. Program «Facial composite», contributed by Border Control Department, National Academy of the State Border Guard Service of Ukraine named after Bohdan Khmelnytskyi.

Fig. 6 shows the program «Training simulator of facial composition identification» used at the lessons of «Passport control». The task is used to improve the identification skills of future border guard officers and helps them to maintain technical competence as a number of various technical devices are used in their daily activities at the checkpoints.

The program is used to carry out training related to identification during border control.

While working with a training simulator, a cadet is required to identify from a large number of people the person who, on the basis of private identification features, matches the one whose documents are examined.

The program is used during the lessons and workshops to improve identification skills.

Fig. 6. Program «Training simulator of facial composite identification» (examples, with no real identification data), contributed by Border Control Department, National Academy of the State Border Guard Service of Ukraine named after Bohdan Khmelnytskyi.

Passport documents security features description software «Passport-express» is presented in figure 7.

Fig. 7. Software «Passport-express» (examples, with no real identification data), contributed by Border Control Department, National Academy of the State Border Guard Service of Ukraine named after Bohdan Khmelnytskyi.

The program includes a detailed description of the security features of passport documents of different states of the world. Security features can be viewed in different lights used for non-invasive analysis of documents.

The system of professional training of future border guard officers at the State Border Guard Service of Ukraine, as Budnyk (2009) asserts, concerns mainly the formation of their leadership skills. Note that our research of the system of professional training of future border guard officers at the National Academy of the State Border Guard Service of Ukraine demonstrates its predominant professional and technical orientation since generalization of reviews of graduates of the Academy about operational and service activity, attestations and service characteristics show that its main drawbacks are connected with the process of formation of military and special competence.

In the process of organization of the main stage of formative experiment we planned to conduct three assessments of state of development of military and special competence of cadets from EG and CG, in particularly: the first assessment – in the beginning of studying, in November 2014; second assessment – in the end of second academic year, in May 2016; third assessment – during graduation examinations, in May

2018. To establish the initial level of military and special competence in first-year cadets we considered the results of complex test with a view to defining general level of indices (special knowledge, skills, abilities, practical experience related to border security) of activity-practical criterion of military and special competence; conducted pedagogical observation, sociological survey, psychological testing to define the level of formation of indices of personality-functional criterion. Organizational methods of all three assessments were similar to the diagnostics procedure during the ascertaining experiment. Table 1 gives generalized results of three assessments demonstrating the dynamics of levels of activity-practical and personality-functional criteria of military and special competence of future border guard officers in the process of organization of the formative stage of the experiment.

Particularly, cadets involved in the experiment could reach much better results in comparison with cadets from CG. Notably, according to the experts' review, 72,15 % of future border guard officers had a sufficient level of activity-practical criterion and 10,13 % – high level. At the same time, 37,04 % of cadets from CG had a sufficient level of activity-practical criterion, and only 3,70 % of cadets possessed a high level. Similar results we obtained in EG and CG, estimating indices of personality-functional criterion.

Table 1. Dynamics of levels of military and special competence in cadets (formative stage of research)

Groups and number	Levels	Criteria of military and special competence											
		Activity-practical						Personality-functional					
		I assessment		II assessment		III assessment		I assessment		II assessment		III assessment	
		abs.	in %	abs.	in %	abs.	in %	abs.	in %	abs.	in %	abs.	in %
CG 81	Minimal	64	79,01	25	30,86	3	3,70	62	76,54	27	33,33	1	1,23
	Average	17	20,99	46	56,78	45	55,56	19	23,46	40	49,38	48	59,26
	Sufficient	–	–	10	12,36	30	37,04	–	–	13	16,06	30	37,04
	High	–	–	–	–	3	3,70	–	–	1	1,23	2	2,47
EG 79	Minimal	63	79,75	20	25,32	–	–	61	77,22	18	22,78	–	–
	Average	16	20,25	22	27,85	14	17,72	17	21,52	20	25,32	15	18,99
	Sufficient	–	–	35	44,30	57	72,15	1	1,26	37	46,84	54	68,35
	High	–	–	2	2,53	8	10,13	–	–	4	5,06	10	12,66

To compare the results of research, we used parametric methods and matched parameters of general combinations: average values of indices of development of military and special competence in cadets according to activity-practical and personality-functional criteria and variances.

The formulation of conclusions based on obtained characteristics (see table 1) is grounded on the comparison of experimental data used to estimate empirical criterion, with theoretical characteristics, whose values are shown in the corresponding tables (for example, in A. Kyverialg (1980). Describing methods of research in professional pedagogics, the researcher determines the hypothesis that is subject to control as null and the hypothesis that is compared as an alternative one.

To verify the hypothesis of our research, we used the comparison of variances using the F-criterion, determined according to the formula of A. Kyverialg (1980)

$$F_{emp} = \frac{\sigma_1^2}{\sigma_2^2}$$

where σ_1^2 – larger variance, and σ_2^2 – smaller variance, determined on the basis of values of first and third assessments to determine indices of development of military and special competence in cadets according to activity-practical and personality-functional criteria.

Variances were estimated using the following formula:

$$\sigma^2 = \frac{\sum f(x_i - \bar{x})^2}{N}$$

f – a number of cadets with a certain level of development of military and special competence according to each criterion;

$(x_i - \bar{x})$ – difference between values of average grades and values of the index of every level (minimal – 2 grades, average – 3 grades, sufficient – 4 grades, and high – 5 grades);

N – a number of cadets in the groups (control or experimental), where the variance is calculated.

To verify the obtained results, we compared the indices of empirical F-criterion of CG (F_{emp} -CG) and EG (F_{emp} -EG) with indices of theoretical F-criterion (F_{krit}), whose values are given in the standard table (Kyverialg,1980).

On the condition the number of degrees of freedom (a number of cadets in the groups being studied minus 1) will be from 24 to infinity and

from 60 to 120 (as in our research: $81 - 1 = 80$ and $79 - 1 = 78$), the index F_{krit} for CG and CG must be in the following boundaries:

$$1,7.....1,4 ;$$
$$1,6.....1,3 .$$

The results of the calculation of variances and F-criterion on the basis of indices of development of military and special competence in cadets according to activity-practical criterion are shown in table 2.

The comparative analysis of the empirical index of the F-criterion of CG and EG according to activity-practical criterion within the specified boundaries F_{krit} showed that F_{emp} -CG with values of 2,35 is beyond the allowable boundaries (from 1,7 to 1,3), and F_{emp} -EG with index 1,69 confirms the outcomes reliability.

Table 2. Results of calculation of variances and F-criterion according to indices of development of military and special competence in cadets according to activity-practical criterion

Groups and CN	SC	Indices to determine F-criterion										F_{emp}	
		AG	f				$(x_i - \bar{x})$				$\sum f(x_i - \bar{x})^2$	σ^2	
			H	S	A	M	H	S	A	M			
CG 81	IC	2,2	0	0	17	64	2,79	1,79	0,79	-0,21	13,43	0,17	2,35
	OC	3,4	3	30	45	3	1,59	0,59	-0,41	-1,41	31,56	0,39	
EG 79	IC	2,2	0	0	16	63	2,80	1,80	0,80	-0,20	12,76	0,16	1,69
	OC	3,9	8	57	14	0	1,08	0,08	-0,92	-1,92	21,54	0,27	

Note: SC – stage of control; IC – input control; OC – output control; AG – average grade at the certain level of control; CN – cadets number; H – high level; S – sufficient level; A – average level; M – minimal level.

The results of calculation of variance and F-criterion on the basis of indices of development of military and special competence in cadets according to personality-functional criterion of military and special competence are shown in table 3.

The comparative analysis of estimated variance and F-criterion on the basis of indices of development of military and special competence in cadets according to personality-functional criterion in CG and EG within the specified boundaries F_{krit} showed, that F_{emp} -CG with values of 1,76 is beyond the allowable boundaries of standard table data, and F_{emp} -EG with index 1,5 confirms the outcomes reliability.

Table 3. The results of calculations of variance and F-criterion on the basis of indices of development of military and special competence according to personality-functional criterion

Groups and CN	SC	Indices to determine F-criterion											F_{emp}
		AG	f				$(x_i - \bar{x})$				$\sum f(x_i - \bar{x})^2$	σ^2	
			H	S	A	M	H	S	A	M			
CG 81	IC	2,2	0	0	19	62	2,77	1,77	0,77	-0,23	14,54	0,18	1,76
	OC	3,4	2	30	48	1	1,59	0,59	-0,41	-1,41	25,56	0,32	
EG 79	IC	2,2	0	1	17	61	2,76	1,76	0,76	-0,24	16,43	0,21	1,50
	OC	3,9	10	54	15	0	1,06	0,06	-0,94	-1,94	24,68	0,31	

5. Conclusions

The experimental research fully demonstrates the appropriateness of implementation of the pedagogical system of formation of military and special competence we designed into the educational process of the National Academy of the State Border Guard Service of Ukraine.

Also, note that dynamics of formation of military and special competence in cadets from EG starting from the second assessment significantly anticipates the similar indices in CG. In general, mathematical calculations we obtained enable to ascertain the fact that the effectiveness of formation of indices of military and special competence was determined by pedagogical influenced that were used during implementation of the pedagogical system of formation of military and special competence in future border guard officers.

Thus, the study and the analysis of dynamics of formative experiment, generalization of conversations with cadets and future masters, discussions of reviews of lecturers, commanders exactly confirmed the validity of our working hypothesis and provided grounds to state the appropriateness of use of pedagogical system while forming military and special competence in future border guard officers in the process of continuing education.

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All the participants of the research, 160 cadets of second and third years who study on speciality «State border security» and «Law» at the National Academy of the State Border Guard Service of Ukraine named after Bohdan Khmelnytskyi, were informed about the experiment that lasted 4 years (2014-2015, 2015-2016, 2016-2017, 2017-2018 academic years). They agreed to participate voluntarily in the experiment in accordance with the ethical requirement of the research conducting. We thank them for their active participation and significant assistance.

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