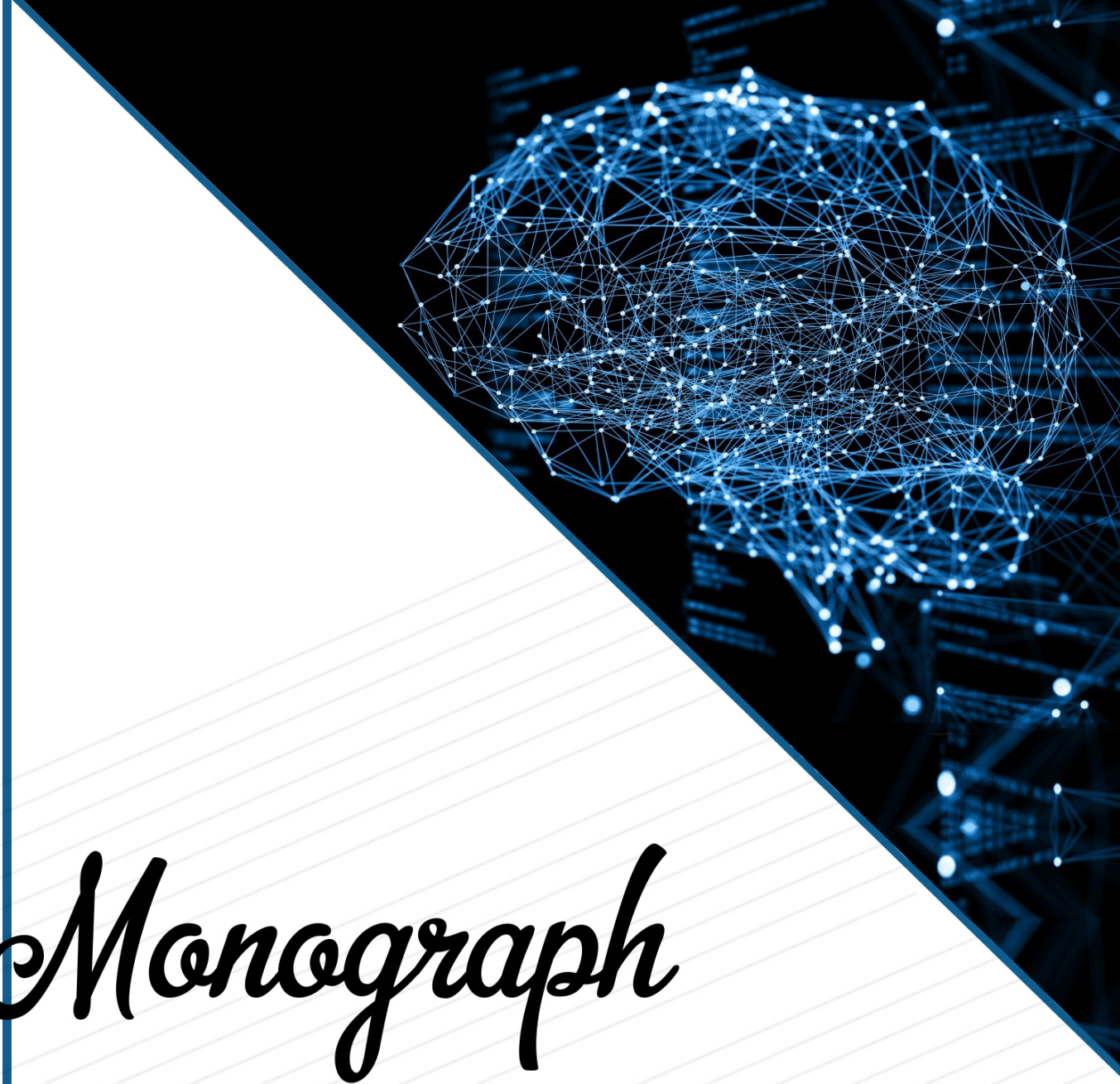

Monograph

Information and communication competence of teachers in the military education system: theory and practice of development in distance learning form

Kyva Vladyslav Yuriiovych

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INFORMATION AND COMMUNICATION COMPETENCE OF TEACHERS IN THE MILITARY EDUCATION SYSTEM: THEORY AND PRACTICE OF DEVELOPMENT IN DISTANCE LEARNING FORM

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The objective of this monograph is to investigate and solve the academic problem of developing information and communication competence of teachers, who work in the system of military education, in the process of distance learning. It analyzes Ukrainian and foreign experience in developing information and communication competence of teachers in the area of military education. The study substantiates the essence and structure of the basic concept «information and communication competence of teachers of military education system» as well as justifies and experimentally proves the professionally-oriented model and methods of teachers' information and communication competence development in the system of military education during distance training. This book provides methodical guidelines including developed criteria and indicators for diagnosing the development of information and communication competence of teachers of the system of military education.

This monograph is intended for teachers who work in the system of military education, as well as those scholars and readers who are interested in the formation and development of information and communication competence.

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CONTENTS

LIST OF ABBREVIATIONS

ICTs	–	Information and Communication Technologies
ICC	–	Information and Communication Competence
MOD	–	Ministry of Defense
NATO	–	North Atlantic Treaty Organization
Incl.	–	Including

PREFACE

The relevance of the research consists in the need of significant changes in the system of military education as one of the key elements of the country's military sector development in the information society. The need for changes is connected with Ukraine's accession to the European educational space, changes in the legal framework for the national education development, the necessity to adjust the format of military education system to up-to-date requirements of NATO countries' servicemen military-and-professional training. Consequently, the main factor in reforming the system of military education is the intentional formation and development of ICC of both individuals and units of military education including the introduction of information technologies along with teaching tools in their scientific and educational activities.

This strategy is reflected in the following normative legal documents: Laws of Ukraine «On Higher Education» [155]; «On professional development of employees» [156]; decree of the Ministry of Science and Education of Ukraine «On the approval of the field Concept of continuous pedagogical education development» [49]; Cabinet of Ministers Decision «On the approval of National Qualifications Framework» [32]; National Strategy of Education Developments in Ukraine on the period up to the year 2021 [51]; Concept of the National Digitalization Program [154]; Regulation on distance learning [50]; Requirements to Higher Educational Institutions and Post-graduate Educational Institutions, Scientific, Educational-and-Scientific Institutions which provide distance learning courses as well as advanced training courses for specialists according to the list of accredited specialties [48]; Decree of the Ministry of Defense of Ukraine «On the Strategic Defense Bulletin of Ukraine» [52], «On the approval of Regulation on the peculiarities of educational process organization in Higher Military Educational Institutions of the Ministry of Defense of Ukraine and Military Educational Departments of Higher Educational Institutions of Ukraine» [47], «On the approval of the Concept of Distance Learning in the Armed Forces of Ukraine» [46], «On the State Program of Development of the Armed Forces of Ukraine for the period up to the year 2020» [186].

Thus, in March 2017 «State Program of Development of Armed Forces of Ukraine for the period up to the year 2020» [53] was promulgated by the Decree of the President of Ukraine, which defines main steps necessary to take to achieve the goal of Armed Forces of Ukraine development. The key

tasks are training and readiness assessment of servicemen and military units according to the NATO standards [161; 54]. The Program envisages the implementation of servicemen distance training which it its turn uncovers the problem of the ability of teachers of military education system use ICTs, including the technologies of distance training.

Hence, it is necessary to form and develop teachers' competence in using ICTs. This means that teachers need not only basic knowledge of ICTs, but also be able to apply them in their scientific and educational activities as well as their professional self-development. Consequently, one of the important components of their professional-pedagogical competence has to be ICC. However, the obstacle on its development is the gap between teacher's obtained professional training in certain area and the requirements of the present-day military practice to teachers, which are based on the harsh Ukrainian military reality in times of the aggression from Russian Federation.

Post-graduate education can help in solving this problem. In particular, using distance form of training enables teachers to quickly react to the present-days challenges and learn how to use up-to-date ICTs.

At the same time, the analysis of scientific literature on the topic shows that there are many scientific researches in this area, conducted by both Ukrainian and foreign researchers, aimed at solving the following problems:

– **implementation of ICTs in the field of education** (M. Area [5], M. Leshchenko [6; 20; 158; 160], C. Blurton [17], M. Shyshkina [21; 31; 237; 238], J. Cecil [40], J. Pablos [45], J. Engelbrecht [64], V. Bykov [73], J. Hamilton [85], J. Harvey [88], O. Hlazunova [91; 92; 93], A. Hurzhii [106], J. Itmazi [110], B. Khan [120], L. Larson [152], D. Merino [172], N. Morze [178; 180; 182; 183; 184], J. Pankin [201], R. Pea [203], J. Prados [210], J. Salinas, B. Benito & A. Lizana [223], A. Martin, J. Peirats & I. Gallardo [225], O. Spivakovskyi [250], Yu. Tryus [261], J. Wavrik [274], M. Zhaldak [298] etc.);

– **teachers' advanced training in the system of post-graduate pedagogical education** (N. Klokar [122; 123], V. Oliinyk [190; 191], J. Peirats, I. Gallardo, A. Martin & S. Cortes [205], N. Protasova [211; 212], O. Spirin [249], S. Sysoieva [254] etc.);

– **the basics of effective use of ICTs in training future specialists, teachers in particular** (J. Anderson [3], V. Bykov [19], G. Finger & M. Lloyd [56], O. Hlazunova [78; 79; 80], D. Haag [118], A. Kolomiiets [126], T. Koval [129], B. Mandernach [170], N. Morze [175; 176; 241], G. Romeo [221], S. Semerikov [232; 234], H. Staker [251], Yu. Tryus [261], M. Zhaldak [299]

etc.);

– **implementation of distance learning technologies in Institutions of Higher Education** (I. Bloshchynskyi [16], F. Bodendorf [18], V. Bykov [23; 25; 26; 29], H. Dichanz [58], M. Dickey [59], B. Eckert [61], G. Hoppe [76], G. Freedman [81], J. Kettunen [119], K. Kolos [128], H. Lobin [163], M. Martynenko [171], S. Semerikov [231; 233], J. Shen [236], Ye. Smyrnova-Trybulska [242; 243], P. Stefanenko [252], V. Kukharenko [258] etc.);

– **scientific considerations of the definition of the notion «ICC» by different researchers** (A. Ferrari [69], M. Gisbert & F. Esteve [77], I. Gutierrez [84], A. Hurzhii [106], M. Koehler & P. Mishra [125], R. Krumsvik [134], O. Kuzminska [137], V. Larraz [151], N. Morze [176; 181; 241], V. Vembr [181], M. Napal, A. Penalva-Velez & Mendioroz [185], O. Ovcharuk [193; 196; 197; 198], D. Schneckenberg & J. Wildt [229], O. Spirin [247], V. Yahupov [257], D. Tigelaar, D. Dolmans, I. Wolfhagen & C. Van-Der-Vleuten [259]), **formation** (H. Fedoruk [68], D. Schneckenberg & J. Wildt [229], I. Tymofiieva [262]) and **development** (F. Carrera та J. Coiduras [37], H. Dehtiarova [55], F. Esteve [77], P. Hrabovskyi [103], A. Kocharian [124], N. Soroko [244]) of this competence.

However, according to the results of the analysis of the research problem and comprehensive analysis of the state of military-educational practice on the development of teachers' ICC in the system of military education as part of their professional competence revealed that complex issues of its development in view of education system digitization are understudied and do not comply with the necessities. Moreover, the scholars' views about ICC differ significantly, and sometimes contradict each other. It should also be noted that existing researches do not highlight the perspectives of teachers' ICC development using distance learning and taking into account the characteristics and the specificity of their scientific and educational activities.

Thus, the analysis shows the corresponding and objective contradictions between:

– high requirements from the side of the State to teachers of military education system and insufficient level of their professional training in the field of ICTs;

– constant attention of scientists to the problem of teachers' ICC and the lack of scientific researches devoted to its development in the form of distance training for teachers of military education system;

– the need for pedagogical modeling of teachers' ICC development in the field of ICTs and the insufficient level of its modeling in the system of distance

learning;

– the need for the teachers of military education system ICC development and its insufficient methodological support in the system of distance training.

The aim of the study is to substantiate and experimentally verify the professionally-oriented model of teachers' information and communication competence development in the system of military education in the process of distance learning.

According to the aim of the research we defined the following **tasks**:

1. To analyze the level of exploration of the problem of teachers of military education system ICC development in pedagogical theory and practice and to improve the conceptual and categorical apparatus of the research.

2. To carry out pedagogical modeling of teachers of military education system information and communication competence development in the process of distance learning.

3. To develop the author's methodology for the teachers of military education system information and communication competence development in the process of distance learning.

4. To experimentally verify the effectiveness of the model and methodology of teachers of military education system information and communication competence development in the process of distance learning and work out guidelines for its development.

The object of the research is the professional and pedagogical competence of teachers of the military education system.

The subject of the research is a professionally-oriented model of teachers' information and communication competence development in the system of military education in the process of distance learning.

To achieve the aim of our research and to solve the research tasks we used the following **methods**:

1) theoretical:

– analysis of Ukrainian and foreign scientific and pedagogical literature and normative legal documents in order to determine the level of problem exploration according to its subject and research tasks;

– synthesis, generalization and systematization in order to determine the essence of the concept of «teacher's ICC in the system of military education» and substantiation of criteria and indicators for diagnosing the formation and development of teachers' ICC in the system of military education;

– structural-functional and comparative-analytical methods in order to

systematize research results on the problem under analysis;

2) empirical:

– questionnaires, surveys, testing and self-assessment for the purpose of determining the current state of formation/development of teachers' ICC within the military education system;

– pedagogical modeling with the purpose of building a pedagogical model of teachers' ICC development in the system of military education in the process of distance learning;

– pedagogical experiment (state and formation stages) with the purpose of checking the effectiveness of the developed pedagogical model;

3) statistical: the method of mathematical statistics – the G-signs test, which was used to process the obtained statistical data of the pedagogical experiment and, accordingly, confirm or refute the statistical/scientific hypothesis of the research.

SECTION 1
THEORETICAL FUNDAMENTALS OF DEVELOPMENT OF THE INFORMATION AND COMMUNICATION COMPETENCE OF TEACHERS IN THE MILITARY EDUCATION SYSTEM

1.1. Scientific analysis of the problem of development of the information and communication competence of teachers in the military education system

Currently, the education system is considerably influenced by the ICTs, which enable citizens to get a wide range of educational services. One can argue that they significantly upgrade today's education system at all levels, including higher education. This is directly fostered by web-based educational data centers and innovative ICTs in education. In this respect, the ability of teachers to use them in line with the needs that arise in the process of teaching is especially important. It is worth emphasizing that their information and communication training should be dynamic and continuous, as information technologies are systematically and rapidly updated and improved. As a result, teachers need to constantly improve their skills in accord with the changes taking place in the information society. It should be mentioned that dynamic changes in the modern world correspond to the stages of transition to the information society, which «dictate» the necessity to search for new methodological approaches to the theory and practice of forming and developing competence in the field of ICTs in all spheres of human life, including scientific and educational activities.

Thus, one of the main pedagogical problems is the ability of teachers to use ICTs according to the contemporary requirements and the education system in general. That is why their use in institutions of higher military-professional education is a prerequisite for reviewing the conceptual approaches, theoretical and methodological basis of professional training of military professionals. ICTs should be implemented directly by teachers who have the appropriate level of ICC formation and development.

Analysis of scientific literature and dissertations on ICC shows that researches are conducted in the following areas: the problem of defining and

interpreting the concept of ICC by various experts (A. Ferrari [69], M. Gisbert and F. Esteve [77], I. Gutierrez [84], A. Hurzhii [107], M. Koehler and P. Mishra [125], R. Krumsvik [134], O. Kuzminska [137], V. Larraz [151], V. Vember [174], N. Morze [178; 179 181], M. Napal, A. Penalva-Velez and A. Mendioroz [185], O. Ovcharuk [193; 196; 197; 198], D. Schneckenberg and J. Wildt [229], O. Spirin [247], D. Tigelaar, D. Dolmans, I. Wolfhagen and C. Van-Der-Vleuten [259] etc.), the problem of ICC formation (H. Fedoruk [68], D. Schneckenberg and J. Wildt [229], I. Timofeieva [262] etc.) and the problem of ICC development (F. Carrera and J. Coiduras [37], H. Dehtiariova [55], F. Esteve [77], P. Hrabovskyi [103], A. Kocharian [124], N. Soroko [244] etc.).

Although these researches and some other works on this topic have substantial results, currently there are numerous discussions about the formation and development of ICC. In this context, it is important to analyze, clarify, specify and systematize the notion of ICC in accordance with the competence-based approach in the system of military education.

The beginning of the XXI century is characterized by rapid changes in the society, in particular education, which is the result of the revolution in the field of information technologies, especially information-and-communication, and the overall modernization of education in Ukraine in general. Among others, the basis is laid for the transformation of professional thinking and changing the role of the teacher in the educational process. As a result, the system of postgraduate education has also to undergo changes in the training and retraining of teachers to ensure the continuity of professional education as a strategic direction of development of Ukraine.

It is worth noting that nowadays Ukrainian education should meet the world standards and promote Ukrainian integration to European Union. This is reflected in the following documents: Laws of Ukraine «On Higher Education» [155], «On professional development of employees» [156]; decree of the Ministry of Science and Education of Ukraine «On the approval of the field Concept of continuous pedagogical education development» [49]; Cabinet of Ministers Decision «On the approval of National Qualifications Framework» [32]; National Strategy of Education Developments in Ukraine on the period up to the year 2021 [51]; Concept of the National Digitalization Program [154], Regulation on distance learning [50], Requirements to Higher Educational Institutions and Post-graduate Educational Institutions, Scientific, Educational-and-Scientific Institutions which provide distance learning courses as well as advanced training courses for specialists according to the list of accredited

specialties [48]; Decree of the Ministry of Defense of Ukraine «On the Strategic Defense Bulletin of Ukraine» [52], «On the approval of Regulation on the peculiarities of educational process organization in Higher Military Educational Institutions of the Ministry of Defense of Ukraine and Military Educational Departments of Higher Educational Institutions of Ukraine» [47], «On the approval of the Concept of Distance Learning in the Armed Forces of Ukraine» [46], «On the State Program of Development of the Armed Forces of Ukraine for the period up to the year 2020» [186].

As defined in the Law of Ukraine «On Higher Education», postgraduate education is a «specialized improvement of education and professional training of a person by deepening, expanding and updating his/her professional knowledge, skills and abilities or obtaining another profession, specialty on the basis of previously acquired educational level and practical experience» [155, p. 1]. Thus, there is a methodological task for educators to qualitatively update an important component of postgraduate education, the system of advanced teacher training. The information-technological prerequisite for solving this problem consists in digitization of the society and education.

According to L. Danylenko [43] the innovative changes that take place in education result from modern scientific principles in the field of adult training and educational innovation. We agree with this statement adding that today in Ukraine the only organized branch of postgraduate education is pedagogical education, which has been operating for over 70 years. It meets the needs of Ukraine, has its own specificity and plays an important role in the professional training of teachers. It should be pointed out that one of the main tasks they perform is continuous development of teachers' professional competence.

The above stated demonstrates that postgraduate education has to be continuous, and the priority should be given to the subjective and professional development of a teacher [282; 292]. The appropriate pedagogical risks of postgraduate education which include the need of retraining teachers cannot be ignored. The efficiency of such retraining depends on teachers' professional qualities, among which are responsibility, self-reliance and self-sufficiency. These are the qualities that influence the outcome of teachers' development as professionals in the field of science and education.

Considering the development of the system of post-graduate education we believe that it is directly influenced by a large-scale and rapid digitalization of the whole society and education. Hence, one of the latest directions of education system successful functioning is teachers' training to

comprehensively solve all the issues connected with its digitization. It should be pointed out that the process of teachers' advanced training, as the main component of postgraduate education, plays an important role in developing teachers' professional competence as required by the information society and modern high-tech information production.

Additionally, T. Havlitina, considers that «advanced training is aimed at improving and forming the readiness of a teacher to perform more complex job functions» [89, p. 3]. The aforementioned enables us to outline the main functions of teachers' advanced training system:

1. Value-motivational (awareness of teacher's information and communication activities value aspects in the information society; readiness for information and communication skills improvement and development; positive emotional and motivational attitude to ICTs and its integrated application in teaching; the content of this function are needs, motives, goals and values for the use of ICTs in teaching).

2. Information (systematization, deepening understanding about the information technologies, educational and defense being of the country, psychological and pedagogical knowledge of systematic and professional use of ICTs in scientific and educational activities, system knowledge of the methodology of teaching certain disciplines within the system of military education).

3. Reproductive (actualization and deepening professional abilities of teachers in the field of education digitization and direct application of up-to-date ICTs in military education systems).

4. Methodological-and-technological (learning and mastery of up-to-date teaching technologies, including ICTs, latest teaching experience of educators in the field of digitalization of education, information technologies and methods of their application).

5. Scientific (learning scientific achievements in the field of ICTs, as well as in the theory and methodology of teaching disciplines).

Currently, one of the main directions of developing teachers' professional competence is the broadening, improvement, systematization, development, and in some cases acquiring new knowledge about up-to-date ICTs. It should also be emphasized that when integrating modern ICT tools into the higher military educational institutions educational process there is the task to develop teachers' ICC. Today's state of Ukrainian system domestic military education, especially in the context of Russian aggression make the question

about its digitalization even more topical. Due to this fact the system has got to have teachers, real representatives of the information society. Therefore, for the successful professional activity of modern teachers it is necessary to evaluate their ICC, which will enable us to determine the level of ICC formation and adjust the key directions and technologies of their ICC development on advanced training courses as well as on distance training courses.

Western scholars consider the development of teachers' qualifications development in the field of ICT a necessary element of the system of continuous professional education. Thus, the task of developing teachers' ICC is a topical issue. According to K. Osadcha teachers' ICC standards should establish certain professional requirements that are necessary for the development of skills in the use of ICTs in teachers' daily activities [192]. Therefore, we believe that not only in everyday activities, but primarily in their scientific and teaching activities.

It should be mentioned that teachers' ICC formation and development is influenced by various factors, among which are socio-cultural processes, globalization of education, world and European trends in professional education development, modernization of Ukrainian education system, digitalization etc. Moreover, following the war in Syria, aggression of Russian Federation in the east of Ukraine and on the Azov Sea, application of modern information technologies against Ukraine make us focus on the digitalization of our education system, implementation and usage of up-to-date ICTs in training officers to model combat actions. However, it's not enough to form teachers' ICC, we need to develop it, update and, for this reason we stress on the necessity of permanent ICC development within the system of post-graduate education.

The analysis of scientific publications and dissertations on the ICC (F. Carrera & J. Coiduras [37], H. Dehtiariova [55], H. Fedoruk [68], A. Ferrari [69], M. Gisbert & F. Esteve [77], I. Gutierrez [84], P. Hrabovskyi [103], A. Hurzhii [107], A. Kocharian [124], M. Koehler & P. Mishra [125], R. Krumsvik [134], O. Kuzminska [137], V. Larraz [151], V. Vembr [174], N. Morze [178; 179; 181], M. Napal, A. Penalva-Velez & Mendioroz [185], O. Ovcharuk [193; 196; 197; 198], D. Schneckenberg & J. Wildt [229], N. Soroko [244], O. Spirin [247], D. Tigelaar, D. Dolmans, I. Wolfhagen & C. Van-Der-Vleuten [259], I. Tymofieieva [262]) made it possible to distinguish the problem of its formation and development, clarify and adapt all the necessary methodological approaches to the ICC development in the system of

military education.

However, it should be emphasized that pedagogical science is grounded on the achievements from various areas of expertise, different in their scientific theories ontological content. The outcome of scientific theory formation is a compromise between logic and experience, which is achieved by establishing the dynamic balance between the two. As a result, any scientific approach must be based on a specific scientific theory. The scientific approach is a methodological «compass», which directs the research, influences the choice of means for exploring pedagogical objects, phenomena and processes. It presupposes understanding the value of the phenomena, which cannot be quantified.

In scientific literature, the term «approach» is defined as a set of ideas, principles and methods that form the basis for problem-solving. In many cases this is reduced to a method (e.g. the assimilation of a system approach and a system method). H. Ibrahimov disagrees with it emphasizing that «approach» is a broader notion than «method», describing it as an «ideology and methodology of solving the problem, that reveals the main ideas, socio-economic, philosophical, psychological and pedagogical preconditions, main goals, principles, stages, mechanisms of achieving the goals set. On the other hand, «method» is a narrow notion that encompasses knowledge of how to act in a given situation to solve a problem» [108, p. 361–362].

The analyzed pedagogical models of teachers' ICC formation and development in the system of postgraduate education rely on a set of methodological approaches, which form the basis for education organization. In modern pedagogy, there are numerous studies dedicated to both traditional (system-based, complex, action-related, knowledge-centered) and modern (information-based, competence-based, situation-based, context-based, poly-paradigmatic, ergonomic, subject-action based etc.) methodological approaches on which advanced training of teachers is based, including teachers of military education system.

In the researches on ICC H. Dehtiariova [55], H. Fedoruk [68], P. Hraboskyi [103], A. Kocharian [124], N. Soroko [244] & I. Timofieieva [262] used both traditional and modern methodological approaches.

1. System-based approach presupposes pedagogical activities in a systemic perspective, as any educational event is not only a separate phenomenon, but also interacts with many other pedagogical phenomena and forms a system.

2. Competence-based approach is unequivocally the key in the process of

modernization of education of all levels in Ukraine, including the postgraduate education system. Therefore, teachers' advance training is relevant. Competence-based approach is focused on the learning outcomes, ability and readiness to act in different problematic situations, inclusive of pedagogical. Generally speaking, the competence-based approach is an attempt to supplement the educational process with a subjective component, which makes learning outcomes significant outside the education system. However, it should be pointed out that it does not oppose traditional approaches, which are grounded on the paradigm of knowledge, skills and abilities. Competence-based approach complements educational process with value, motivational and activity aspects. In this respect, any future specialist must not only master a set of knowledge, skills and abilities in professional subjects, but also act as a professional, «a subject of professional activity, including teaching».

3. Subject-action based approach focuses on the students' rights, who are rightful participants of the educational process. This approach presupposes that a student chooses his/her life path and is able to self-determination. It is a really «appropriate» approach for the system of professional education. On the one hand, all the students in the system of postgraduate education are adults and specialists. On the other hand, students improve their professional competence. Thus, it is recommended to use a subjective approach in combination with activity, «subject-action».

4. Humanist approach is viewed as the «humanization» of the system of education. Within this approach, human values are respected and rights of the individual as a specialist who develops and updates his/her abilities during advanced training taking into account available subjective and professional potential are recognized.

5. Differentiated approach is important as during advanced training we have to take into account that teachers are from different knowledge areas and different age groups. For this reason, teachers are grouped according to certain criteria (personal criteria, which includes experience, level of training, etc. and general criteria, their specialty). This approach includes adaptation of learning components to these groups (content, methods, forms, etc.) to achieve optimal development, e.g. teachers' ICC. In addition, differentiation is relevant for teachers of certain disciplines, as each of them has professional, social, life and other experience.

6. Andragogy-based approach presupposes goals specification, adaptation and individualization. It also includes hierarchy of goals and tasks, content, forms of education organization, teaching methods, types of classes

and teaching tools because of continuous development of an adult person.

From our standpoint, these methodological approaches are relevant for the development of teachers' ICC in the system of military education. We agree with the researchers' opinion on the application of these approaches, in general. However, we'd like to make some clarifications on the use of modern methodological approaches in the development of teachers' ICC within the military education system. First of all, we need to take some of them (e.g. competence-based), but it is essential to add the following up-to-date methodological approaches: information-based, subject-action based and context-based. So, we'll take a detailed look at them.

1. Information-based approach is an extremely necessary one in the information society for the professional realization of any specialist. Within the system of military education, it is impossible to train officers without this approach, which consists in the selection and analysis, along with the material, gravitational, energetic and information aspects of military reality.

This approach has been spreading in various fields of science since last quarter of the twentieth century. It is reflected in dissertations, monographs, individual publications, dictionaries. Concepts of digitalization of modern education system, implementation of information technologies in the educational process, development of information and educational environment, creation of computer-oriented methodological systems, formation of information culture and competencies of specialists are analyzed in a number of Ukrainian researchers publications, for instance (V. Bykov [19], K. Horash [101], R. Hurevych [105], V. Imber [109], L. Kalinina [117], H. Kozlakova [130], O. Kravchuk [132], L. Kubska [136], Yu. Lotiuk [165], L. Panchenko [199], M. Zhaldak [301] etc.).

To determine the information and communication sphere of scientific and educational activities of teachers in the system of military education, information-based approach seems to be the most appropriate. ICC within this approach is related to information analysis and dealing with various information processes, inclusive of searching, collecting, qualitative processing and using this information for problem-solving in professional and research tasks [222, p. 261].

Consequently, information approach aims at determining the content of teachers' ICC, which should have the conceptual aspects of its development outlined. The meaningful content is to be realized in theoretical and practical educational material. The development of teachers of military education

system in a situation of postgraduate education and self-education implies the development of the content of training in the field of ICTs, which is the basis for the development of their ICC. In practical aspect, this is the program of its development.

Thus, the information-based approach is a set of ideas and principles of scientific knowledge that reflect the information aspect of reality, including scientific and educational activity of teachers. In our study, it is used to identify and analyze the information aspects of the process of teachers' ICC development in military education system. One of the main characteristic features of its development is the content of this process as «any kind of education presupposes selection of content grounding on the concept of the level of education. The subject of education cannot select it, because to do so he/she has to already have the information which is in the content of the chosen element of humankind objectified experience».

In this regard, information basis of teachers' ICC development becomes methodologically important. For classical theory of information method of abstraction from the specific content and relative value of information under analysis is typical. On the other hand, from information approach standpoint, exploration of the complex process should be done using information flows, which manage it. This is, in particular applicable to the process of teachers' ICC development in the system of military education.

2. Since our paper is devoted to the problem of teachers of military education system ICC development, we consider essential analyze the possibilities of a competence-based approach, which in its turn enables the international community bring education in line with the market needs and get rid of the contradictions between educational and professional activity. Moreover, V. Luniachek, believes that «in the XXI century the competence-based approach is that methodology which actively influences professional training in higher educational institutions» [90, p. 1].

It cannot be denied that a competence-based approach plays key role in the process of modernization of all levels of education in Ukraine, including postgraduate education systems. Hence, in the context of teachers' advance training it is important to highlight main theoretical and methodological provisions of the competence-based approach. For instance, theoretical and methodological provisions of implementation of the approach under analysis are reflected in the works of N. Bibik [12; 14], M. Holovanya [94; 95], O. Ovcharuk [107; 195], V. Lugovyi [166], J. Raven [217], V. Radkevych [215; 216], O. Savchenko [228], L. Spencer [245], O. Spirin [246], V. Yahupov

[286; 287], S. Zimnia [304; 305] etc.

Within the competence-based approach to teachers' professional development the value attitude to knowledge and educational activities teachers perform, the ability to solve problems in professional activities are on the first place. The andragogue and the learner act as partners in a continuous education. S. Ivanova analyzing modern approaches to adult learning, identified the following basic principles of competence-based approach, which are important for the ICC development «a combination of intellectual and scientific components of education; learning effectiveness; mobilization of acquired knowledge, skills, experience and ways of behavior in a specific situation, specific activities» [112, p. 173].

3. Subject-action-based approach in its subjective component presupposes that in the center of learning process is an individual, who is taught, inclusive of his attitude, values, motivation, goals and unique mentality. V. Yahupov defines the professional subjectivity of a teacher as an integral professionally important quality, which is based on positive self-attitude, self-reflection and understanding of his/her personal possibilities for self-realization in the professional area. It also specifies the ability to self-determination, self-organization and self-regulation of professional activity according to external and internal criteria of effectiveness and desirability in situations that, on the one hand, assume freedom of choice and, on the other hand, personal responsibility for the outcomes. Subjectivity in the cognitive teacher's activity as an adult is natural, because the need to update information and information search are its prerequisites [292, p. 230].

The analysis and generalization of scientific researches enabled us to outline the following principles of the subject-action-based approach:

– the principle of internal motivation of teachers of military education system to develop their professional competence, which is stimulated, primarily, by the system of pedagogical values and motives;

– the principle of stimulating and maintaining active subjective attitude of teachers to themselves, others (cadets/students), their educational and professional activities;

– the principle of taking into account the peculiarities of both their own and cadets' (students) life and professional experience;

– the principle of creating a subjective space for professional development, self-development, teachers of the military education system self-management;

– the principle of the presence, in the process of development of

professional competence, the role of a significant other in their professional development as subjects of an activity;

– the principle of the culture of professional life, the development of the culture of subject-subject behavior in the system of educational activity.

To achieve the above mentioned, it is necessary to follow the basic pedagogical requirements of the subject-action-based approach to the development of teachers' ICC in the system of military education:

– define axiological component of his/her pedagogical activity, i.e. the system of values of such an activity;

– stimulate and maintain his/her active subjective attitude to himself/herself, others, educational and pedagogical activities;

– create a subjective space for teachers' professional development and self-development in higher educational institutions;

– the presence in the process of professional training of the role of a significant other, primarily research and teaching staff in their professional development as subjects of educational activity;

– form teachers' subjective existence culture as a pedagogical expert [282, p. 347–355].

Therefore, we will formulate goals, define the content, design technologies and tools for the development of teachers' ICC in the system of military education in a way they form their active subjective attitude to educational and professional activities. It can be achieved by identifying and using their subjective experience, taking into account the peculiarities of their life and professional experience.

Thus, the success of achieving the objective of ICC development depends on the teachers themselves. They've got to be aware of this objective, accept it and follow the requirements of modern methodological approaches in the process of its development.

4. One of the important methodological approaches in the development of teachers' ICC is the context-basedone. It allows teachers to self-realize, concentrate their efforts, delve into the process of teaching, work to the best of their ability in the process of ICC development. It also ensures the development of relevant educational materials in compliance with the interests of teachers' professional activities. Since the development process will encompass their areas of interests, subject areas they are experts in and disciplines they're teaching it will encourage teachers' cognitive activity.

We consider that context-based approach gives a practical focus on

professional activities, which is a powerful motivating factor. It's based on the following principles:

– personal revitalization of the teacher in educational activities under the conditions of appropriate psychological and pedagogical support;

– modeling of future pedagogical activity conditions; the interconnection of subjects of educational process;

– integration of modern technologies of pedagogical training;

– indivisibility of the educational process regarding teachers' advance training.

5. The andragogy-based approach allows us to find out individual features of ICC development of teachers of military education system in the course of distance learning according to their age, scientific and pedagogical needs, professionally important qualities and individual objectives.

Hence, taking all the above mentioned into account, we can conclude that the considered methodological approaches, on the one hand, coincide and complement each other, and on the other hand, are mandatory in the development of teachers' ICC. Without their integration, it is impossible to develop a modern professional-oriented model of ICC development, and the development procedure should be considered as a holistic process of their subjective and professional growth.

1.2. Definitive study of the essence and content characteristics of the information and communication competence of teachers in the military education system

Current military and political situation in the world is characterized by fundamental changes in the system of international relations, both on global and continental levels. As new threats to international security and stability emerge, it is necessary to activate a wide range of activities aimed at improving defensive capacities of Ukraine and Ukrainian Armed Forces [99].

The implemented new Concept of Ukrainian Armed Forces training defines the aim, principles and components of such training. Thus, we need to plan and provide training of specialists in the system of military education taking into account best practices of leading countries in the world. The gradual transition of Ukrainian standards of education to European ones, modern economic, political and social realities of life, Ukraine's goal to

become a NATO member require changes and updates in the system of military education, especially in the field of information society [113; 281; 285].

System of military education includes a set of educational institutions which provide military training in accord with the educational and qualification levels according to the state government entities' laws, decrees, regulations, acts, directives and normative documents.

The current period is characterized by serious changes in Ukrainian security and defense sector, especially in military education system. It is worth mentioning that military education system during the modernization period acts as both subject and object of reforming Ukrainian security and defense sector. The level of development of military education system is the main criterion for the development of security and defense sector, since combat readiness and operational effectiveness of the Armed Forces of Ukraine, its ability to secure the territorial integrity and sovereignty of Ukraine depend on the professional training of specialists, their professional competence to act and fulfill the assigned duties in response to emerging threats.

In this respect, it is necessary to implement the concept of competence-based approach in the system of military education on the basis of National Qualifications Framework [32], which comply with European educational standards and will enable us to systematically analyze the issue of training servicemen of the security and defense sector of Ukraine.

Hence, the subject of military education system is a teacher. The result of training military specialists for the Armed Forces of Ukraine will depend on the richness of knowledge and competence of a teacher. As a result, teachers need to constantly improve their professional qualifications to meet the changes in scientific and technical areas, information area in particular. We'd like to point out that dynamic changes of the modern world dictate the need to search for new methodological approaches to the theory and practice of forming and developing specialist's competences in the ICTs, inclusive of scientific and educational activities of teachers in the system of military education.

Taking all the above mentioned into account, one of the main pedagogical problems is the ability of teachers to apply ICTs according to the requirements of the education system. Thus, a teacher has to have the appropriate level of professional competence, which includes ICC.

Professional competence of teachers in military education system combines various components, which allow them to use their abilities in

different areas of scientific and educational activities. These components include cognitive-intellectual, design, organizing, prognostic, IC, stimulating, methodological, analytical, psychological, communicative, reflexive, diagnostic, assessment and research types of competences.

Within our research we're focusing on the development of teachers' ICC. To solve this problem we need to understand the meaning of this complex concept, its content and structure. It should be mentioned that there is still no uniform definition of the notion under analysis, content and competences structure in the field of ICTs application. We'll try to analyze the existing definitions and form the most appropriate, to our mind, definition of the notion, content and structure of teachers' ICC in the system of military education.

Analysis of the researches and dissertation on the ICC demonstrates that a lot of them are devoted to the definition of this notion, for instance F. Carrera & J. Coiduras [37], H. Dehtiariova [55], H. Fedoruk [68], A. Ferrari [69], M. Gisbert & F. Esteve [77], I. Gutierrez [84], P. Hrabovskyi [103], A. Hurzhii [107], A. Kocharian [124], M. Koehler & P. Mishra [125], R. Krumsvik [134], V. Larraz [151], M. Leshchenko [159], N. Morze [178; 179; 181], V. Vembr [181], M. Napal, A. Penalva-Vélez & A. Mendioroz [185], O. Ovcharuk [193; 196; 197; 198], D. Schneckenberg & J. Wildt [229], N. Soroko [244], O. Spirin [247], D. Tigelaar, D. Dolmans, I. Wolfhagen & C. Van-Der-Vleuten [259], I. Tymofieieva [262], UNESCO [263].

Despite the availability of the results of the above mentioned researches on the topic, there is a long-standing debate on the definition of ICC, its content and structure. For this reason, it is important to analyze, specify and systemize the existing ideas of scholars in the context of competence-based approach of training military specialists in system of military education.

Scientific literature is full of terms that are typically used as synonyms and applied to name competence in the field of ICTs, for instance: information, informatics, IC, information-communication-technological, information, technological, information-communication knowledge, information knowledge. It is clear that the etymology of these terms adds certain shades to their meaning. That is why we're going to analyze only some of them.

To the definition of the notion «competence» and its synonymic term «information», «informatics» devoted the works of O. Baranovska [7], P. Hurevych [104], A. Kolomiiets [127], O. Novak [188], O. Spirin [247], S. Sysoieva & N. Balovsiak [255], O. Vasenko [264], M. Zhaldak [300] etc.

Firstly, we'd like to draw attention to the definitions of the terms

«information» and «informatics», which were analyzed in great details in the context of the notion «process» by A. Fridland. According to Fridland A. [74, p. 132], information process is «a set of intellectual processes, taking place in human mentality, processes of reception, storage, processing and transferring of data that initiate certain information». He considers that processes of learning, studying and management can be classified as information processes. He introduces the term «information process» which is defined as «a collection of actions (input, output, storage and transfer) which is taking place within information process» [74, p. 133]. These two definitions formed the basis for further exploration of the concepts «information» and «informatics» competence.

Some consider information competence to be one of the key individual's competences (O. Baranovska [7], O. Novak [188], O. Spirin [247], S. Sysoieva & N. Balovsiak [255], O. Vasenko [264] etc.). Others R. Hurevych [104], A. Kolomiiets [127], M. Zhaldak [300], they analyze it together with the categories of «computer knowledge» and «information culture» which characterize an individual's level of development. However, all of the researchers stress out that information competence takes a leading role in the list of key competences.

S. Sysoieva, N. Balovsiak [255, p. 106] outline that information competence is responsible for the three functions of professional activity of an individual:

– search-information (effective operation with information of its forms);

– computer-technological (ability to work with up-to-date computer programs and tools);

– process-action (ability to use up-to-date information technologies).

It should be mentioned that the notion of «ICTs competence of a teacher (instructor)» was first introduced in the UNESCO project «ICT Competency Standards for Teachers». According to O. Spirin [247, p. 8] it is synonymic to «teacher's competence in the field of ICTs», namely «information-communication-technological competence», «information-communication competence», «computer competence», «information-computer competence», «information-technological competence».

O. Ovcharuk [194, p. 1] points out that IC competence is a «key category, which is analyzed as a complex concept, a set of knowledge and understanding, skills, abilities, and personal attitudes and human value orientations in the field of ICTs and the ability to autonomously and responsibly

demonstrate them in practical, professional activities and lifelong learning».

According to O. Spirin [247, p. 7], to define the term «ICC» which derives from the notion of «information competence» one should use the existing understanding of the term «information and communication technologies», taking into account that these are technologies for developing information systems and building communication networks, for formalization and solving tasks in certain subject areas using these systems and networks. He specified and expanded the definition given by M. Zhaldak, and offered to define ICC as «proven ability of individuals to use autonomously and responsibly in practice the ICTs to meet their own personal needs and solve socially significant, inclusive of professional, problems in a particular subject area or type of activities» [8, p. 46].

According to the authors of the Digital Competence Framework for Citizens, «today, there is no clear definition of a person's ability to use ICTs». Therefore, they offer to use the terms «digital competence», which is synonymous with «information-digital», «information-communication» etc. [57, p. 9].

In addition, the European Commission defines the ICC as «the ability to use ICTs in life, for learning and work, to constantly update it» [267].

It is also important to take into account the updated recommendations of the EU Parliament and the Council of European Union which define ICC as a key competence for life-long learning [307]. According to it, ICC means «confident and responsible usage and interaction with digital technologies in education, professional activity in the society» [307, p. 9].

M. Leschchenko in her work [30] outlines the following:

– the emergence of the categories of «information-communication competence», «media competence» and «digital competence» results from the need to characterize the ability of people to exchange information in the historical retrospective of technological development in civilizational progress;

– characteristics of interconnections between the categories «information-communication competence», «media competence» and «digital competence» in accordance with the rapid development of technology in modern information society. These categories are often used as synonymous to describe teachers and students' acquired knowledge and skills to find, critically evaluate, share and create information messages based on the use of digital technologies;

– specific features of the categories «information-communication competence», «media competence» and «digital competence» (the category of «information and communication competence» is considered to have universal

character and describes the ability to find, critically evaluate, share and create information messages to characterize the processes of communication and information exchange that take place in three environments that integrate with each other: *information exchange between people in the environment of direct interaction; information exchange using paper and analog media; information exchange using digital technologies*).

Therefore, M. Leshchenko identified the features of these categories application, namely:

– to characterize the ability to carry out direct *information exchange in the environment of direct interaction between people*, only the category of «information-communication competence» is used;

– to characterize the ability to carry out *information exchange in the paper and analog media environment*, two categories can be used «information-communication competence» and «media competence»;

– to characterize the ability to carry out *information exchange in the environment where information messages are encoded using digital technologies*, the category «digital competence» is used. It is also possible to use categories of «information-communication competence» and «media competence», in case they describe the process of information exchange which contains digital technologies.

Additionally, M. Leshchenko [30] focuses our attention on the fact that foreign researches dedicated to teachers' ICC development discovered a trend for enhancing skills of creating information and educational cyberspace, using cloud computing technologies. Taking into account the comparative and pedagogical analysis of Ukrainian and foreign scholars' approaches to the interpretation of ICC, as well as functionally related notions, it was found out that the acquisition of cybernetic characteristics by pedagogical reality led to the implementation of new technological and metaphorical categories, adding to the standard meanings pedagogical understanding and, thus broadening the conceptual and terminological field of scientific and pedagogical researches.

Consequently, ICC development within the system of continuous pedagogical education abroad is focused on enriching the motivational, technological and reflexive-pedagogical components. Hence, teachers' ICC development is aimed at forming the following:

– abilities to deepen the democratic trends when realizing educational tasks;

– flexibility of educational process organization;

– individualization of the learning process;

– transparency of the educational process.

One should mention that it is important to take into consideration the Ukrainian and foreign scholars experience when defining the notion of ICC, its content and structure.

For this reason, let's analyze the latest scientific researches on ICC definition (table 1.1).

Table 1.1

Definitions of the notion ICC by various scholars

Author	Definition
1	2
P. Hrabovskyi	«based on dynamic combination of knowledge, skills and practical experience, ICC is the ability and readiness to use information technologies, especially ICTs and electronic educational resources, to support professional activities in teaching students mathematics» [103, p. 35];
H. Henseruk	«Complex phenomenon which directs human activity in the information society, including four types of competences: information and media competence, communication competence, technical competence, consumer competence» [90, p. 10];
H. Dehtiariova	«an important component of professional competence, which is complex dynamic holistic integrated entity of an individual, synthesis of subject-specific knowledge and skills which reflect the real achieved level of training in the field of ICTs. It is a set of motives that are represented in the willingness of constant improvement of the acquired ICT competences. It is a special type of subject-specific knowledge organization that allows correct assessment of information and learning situations, make effective decisions in professional and pedagogical activity using ICT» [55, p. 132];
O. Zhernovnykova, L. Peretiaha, A. Kovtun, M. Korduban, O. Nalyvaiko, N. Nalyvaiko	«student's integral ability which combines the complex of knowledge, skills and reflexive attitudes of future teachers in interaction with digital education environment» [302, p. 173];
Ministry of Education of Ukraine	«it presupposes confident and critical usage of information-communication technologies for creating, search, processing, exchange of information in job-related settings, public and private settings. Information and media competence, basics of programming, algorithmic thinking, data bases operation, cyber-security. Understanding of the ethics of working with information (copyrights, intellectual property etc.)» [187, p. 11];

I. Tymofieieva	«complex integrated characteristic of an individual which presupposes a set of knowledge, skills and experience that give the possibility to effectively carry out certain activity or perform certain functions, achieve certain professional standards» [262, p. 36];
H. Fedoruk	«dynamic characteristic which determines the ability of an individual to navigate in the information space, receive information, operate it, have the appropriate level of ICTs knowledge and skills» [68, p. 40];
A. Kocharian	«ability to autonomously and responsibly apply the acquired theoretical and factual knowledge, skills and abilities in the field of ICTs to meet personal needs, solving socially important tasks, including professional ones» [124, p. 58];
N. Soroko	«component of information culture, which consists of theoretical and factual knowledge in the field of ICTs, relevant skills and knowledge, ability to individually/collectively use tools, resources, systems to solve problems of language acquisition and study the literature and formation of general information worldview» [244, p. 28];
A. Ferrari	«a concept that goes beyond technical competence, assuming that it includes the following areas of competence: information management; cooperation; possibility of communication and exchange of information; creation of content and knowledge; ethics and responsibility; assessment and problem solving» [69];
I. Gutierrez	«a set of values, beliefs, knowledge, skills and guidelines for the proper use of technology, including computers as well as various programs and the Internet that allows you to search, access, organize and use information to build knowledge» [84, p. 201];
M. Gisbert, F. Esteve	«a set of skills, knowledge and attitude not only in technological aspects, but also in information, multimedia and communication, which characterizes the complex multifaceted» [77];
V. Larraz	«the amount of literacy (technological or informational, media or communicative) to participate in a secure, ethical and civic way of digital identity» [151];
R. Krumsvik	«definition of digital competence with a holistic nature, where, in addition to purely technological, the author addresses the importance of pedagogical and didactic results for teachers and trainers in a professional context. Thus, ICC is a teacher's competence in the use of ICTs in a professional context, in particular awareness of the strategy of digital teaching students» [134, p. 45];
D. Tigelaar, D. Dolmans, I. Wolfhagen, C. Van-Der-Vleuten	«it is a set of personal characteristics, knowledge, abilities and attitudes necessary for effective action in different learning contexts» [259].

Analysis of scientific researches on the ICC and the aforementioned considerations enabled us to define the notion of **teachers' ICC in the military education system** as a dynamic professional ability of teachers of the system of military education to the systemic and contextual use of ICTs in scientific and educational activity, which is expressed in the integral unity of value-motivational, intellectual, information-technological, praxeological and subjective components.

It should be noted that a distinctive feature of teachers' ICC in the system of military education from other education systems is teachers' contextual use of ICTs in the teaching general and special military disciplines, such as: «Information technologies of information-analytical support of troops (forces) governing bodies»; «Simulation of combat operations»; «Strategy and tactics of information warfare»; «Modern methods of decision-making support»; «Information security of the state in military sphere»; «Application of information technologies in the interests of troops (forces)» etc.

Moreover, to study teachers' ICC development it is important to determine its structural components. By structural components we mean a set of important characteristics of a teacher that enable him/her to perform professional tasks (duties) in the process of scientific and educational activities.

A review of scientific literature shows a diversity of approaches to the definition of the ICC content and structure. We consider the general trends that take place in defining its structure. Each researcher outlines their own main elements of the teacher's ICC. However, taking into consideration that there are different approaches to defining the essence of the ICC, we want to draw attention to the fact that recent researches have ambiguity in the understanding of teachers' ICC structure, e.g. (N. Balovsiak, P. Hrabovskyi, G. Dehtiariova, A. Kocharian, N. Soroko, H. Fedoruk, I. Timofieieva, V. Larraz, F. Carrera & J. Coiduras, D. Schneckenberg & J. Wildt, M. Koehler & P. Mishr, Digital Competence Framework for Citizens [38; 267], Center for Education and Technology, known as «ENLACES» of the Chilean Ministry of Education [65], Education Testing Service [67], The Framework of Digital Competence of Educators [218], UNESCO [263]). However, the common feature of all these researches is that they agree that teachers' ICC has multicomponent nature.

According to the European Commission the structure of individual's ICC is the following [38]:

1. Information and competence to work with data (view, search and filter data, information and digital content; evaluation of data, information and

digital content; data, information and digital content management).

2. Communication and cooperation (interaction using digital technologies; exchange using digital technologies; realization of civil position using digital technologies; cooperation using digital technologies; network etiquette; digital identity management).

3. Creation of digital content (development of digital content; digital content integration and processing; copyright and licensing; programming).

4. Security (devices security; personal data protection and privacy; health and well-being protection; environmental protection).

5. Problem solving (solving technical problems; identifying needs and search for technological answers; digital technologies creative use; identifying gaps in digital competence).

P. Hrabovskyi outlines three components in its structure:

– motivation and psychological readiness for information competence development;

– formation of user skills in the field of information technologies;

– ability to carry out adequate self-assessment of this information competence development [103, p. 60].

H. Dehtiarova considers that teacher's ICC components are the following:

– self-assessment of its own capabilities in the use of information technologies; knowledge system in the field of ICTs;

– knowledge of normative and legal documents on the use of digital educational resources;

– teacher's ability to navigate in the information environment;

– positive and negative manifestations in the use of ICTs and didactic possibilities in teaching subjects;

– personal readiness for changes, which creates conditions for the active use of information technology by the teacher showing interest in mastering ICTs [55, p. 153].

A. Kocharian developed the structure of ICC for the scientific and teaging staff of humanitarian specialties, in which he singled out the following components:

– motives for using ICTs for professional activities and meeting individual needs;

– knowledge system in the field of ICTs;

– procedural essence of using ICTs for professional and individual needs solving;

– abilities and skills to perform scientific and pedagogical research with experimental verification of scientific hypotheses in accordance with the subject of research [124, p. 68].

Similar approaches to the structural components we can find in works by H. Fedoruk, I. Tymofieieva, N. Soroko etc.

Thus, having analyzed the above mentioned structural components, we agree with a number of opinions. However, we also note that they need to be generalized, systematized and specified in accordance with the specificity of teachers' ICC in the system of military education.

Hence, it can be stated that scientists still do not have a uniform approach to the definition of teachers' ICC structure, including teachers of military education system. Consequently, taking into account the goals and specificity of their scientific and educational activities we distinguish the **structure of their ICC** combining the following functional components:

1. Value-motivational (ability to positively find values, motives, needs, interests, aspirations regarding ICTs application in scientific and educational activity).

2. Intellectual (ability to perceive, analytical-synthetic processing, critical thinking and design information messages of military-professional nature when studying in the field of digital technologies).

3. Information-technological (ability to use digital resources and digital technologies).

4. Praxeological (ability to effectively use ICTs in scientific and educational activities, in particular in distance learning).

5. Subjective (ability to carry out subject-subject interaction in scientific and educational activities).

Value-motivational component of teachers' ICC comprises two parts:

– values (personally positive attitude of teachers to ICTs, formed axiological sphere of their consciousness and self-awareness which is based on conceptual provisions awareness of the ICTs theory, their nature among the categorical concepts of the universe, the transformation of their essential characteristics in the information society: value orientations and creative focus in the information society, teachers' awareness of the value aspects of information and communication activities and the peculiarities of its practical application in their scientific and educational activities);

– motivations (motivational attitude of teachers to scientific and pedagogical activities, which includes focus on the development of interest in

the use of ICTs, the desire to enrich their own IC potential).

Intellectual component combines the following:

– a set of theoretical knowledge on the use of ICTs (synthesis of various technologies for implementation in the scientific and educational process, a set of ideas about ICTs, including the specificity, mechanisms, methods and technology of their operation);

– a set of analytical, critical and design actions.

Information-technological component includes:

– practical mastery of software and digital technologies by teachers, as well as their information and computer literacy as a subject of distance learning;

– focus on mastering innovative digital programs and tools, predicting their use in distance learning.

Praxeological component of teachers' ICC combines the following:

– ability and readiness to search and analyze information, synthesize, compare, abstract, generalize and specify it with the help of ICTs, taking into account the specificity of teaching general and special military subjects;

– flexibility and importance of special military and professional practical actions, the availability of skills, abilities to work with hardware and software, use it in scientific and educational activities;

– determines the development of practical skills in scientific and educational activities.

Subjective component defines the following:

– understanding that teachers and students are creative subjects of scientific and educational activities, whose self-awareness consists in self-determination, self-regulation and self-control of their own behavior and scientific and educational activities, creating a unique, individual, creative style based on awareness, analysis and evaluation of their own behavior and activities in the pedagogical environment, inclusive of their results;

– self-identification of an individual as a subject of professional activity, the bearer of professional values, which are manifested in the ability to implement democratic style of communication with subjects of distance learning ensuring the humanistic character of their learning process.

Thus, we analyzed and substantiated the notion, content and structure of teachers' ICC within the system of military education. Its realization depends on various factors, among which the leading one is the subjective factor – the dependence of its development on the teacher and his/her ability to be a subject of scientific and educational activities in the information society and the military environment.

1.3. Assessment of the levels of formedness of the information and communication competence of teachers in the military education system

The importance of the problem of teachers' ICC development in military education system can be experimentally verified with indicative pedagogical experiment, which allows empirically justify and verify the accurateness of scientific research, develop methods of formative experiment for ICC development. As a result, the pedagogical experiment allows obtaining new theoretical and practical knowledge, empirical facts about the object of the research in a specially created and controlled experimental environment. Hence, one can find the cause and effect links in recording changes of the subject of the research by manipulating experimental factors. Additionally, the main objective of pedagogical research is to confirm or reject a certain scientific or statistical hypothesis.

The pedagogical experiment can be classified according to the environment the experiment is held (natural or laboratory) and purpose of the experiment (indicative, which is further subdivided into diagnostic and control, and formative, i.e. transformative) [293, p. 350–364].

Laboratory experiment is held in specially created conditions while natural is characterized by real-life conditions, in particular educational. Therefore, mostly natural experiment is used to solve research issues of scientific and pedagogical study. It should be noted that there are two ways to prove the hypothesis in the process of experimental research – parallel and consecutive.

A parallel experiment is organized on the principle of identical groups, meaning that there are two or more identical (with adequate distribution) study groups. One group uses experimental methods, while the other (a control group) applies traditional ones. Then, the formative experiment takes place and the results of the two groups are compared.

A consecutive experiment is organized on the principle of a single research group, where the level of the pedagogical phenomenon formation/development under analysis is recorded using traditional system. Then the pedagogical innovations are introduced as part of an experiment. At the end, the results are compared.

There are also indicative stage of pedagogical experiment (understanding the current state of the subject under analysis before experimental conditions implementation, e.g. military education) and formative stage (implementation of experimental conditions, e.g. military education in the experimental group)

To find out the current level of teachers' ICC formation, an indicative stage of pedagogical experiment took place during 2018 – 2019. Analysis of its formation was carried out in accord with value-motivational, intellectual, information-technological, praxeological and subjective components [141].

Using system-action structuring of their ICC we defined the main criteria of its diagnosis. By specifying its content using methods of system-functional approach the content of each criterion, the corresponding indicators, was defined. As a result, the integrated value of the obtained results of its components allowed determining the current level of this competence formation.

During the indicative stage of the research, the following methods were used: interview, survey, questionnaire, observation, exercise method, method of written (test) control of knowledge, practical skills and abilities to use ICTs in scientific and educational activities. To assess the current level of teachers' ICC on the indicative stage, a selective group of 333 teachers was involved (Table 1.2). The general number of teachers in the military education system is 1,997. Hence, we calculated the number of people in the selective group taking into account the margin error of 5 % (confidence level is 0.95) according to the summary table [200, p. 181].

Table 1.2

Participants of the indicative stage of experiment

№	Higher military educational institution	Number of teachers	Percentage %
1	The National Defence University of Ukraine named after Ivan Cherniakhovskyi	34	10,21
2	Hetman Petro Sahaidachnyi National Academy of Land Forces	30	9,01
3	Military Academy (Odesa)	34	10,21
4	Military Institute of Tank Forces of National Technical University «Kharkiv Polytechnic Institute»	39	11,71
5	Ivan Kozhedub Kharkiv National University of Air Forces	34	10,21
6	Institute of Naval Forces of National University «Odesa Naval Academy»	32	9,61
7	Military Institute of Taras Shevchenko Kyiv National University	33	9,91
8	Serhii Koroliov Zhytomyr Military Institute	31	9,31
9	Ukrainian Military Medical Academy	32	9,61

10	Military Institute of Telecommunications and Information Technologies named after Heroes of Kruty	34	10,21
Total		**333**	**100**

In addition, the quantitative and qualitative characteristics of teachers of military education system give grounds to claim that the selective group is representative of the general number (Tables 1.3 – 1.7).

Table 1.3

Age of teachers in the system of military education

№	Age of teacher	Number of teachers	Percentage %
1	under 30 years old	59	17,72
2	30-39 years old	70	21,02
3	40-49 years old	93	27,93
4	50-59 years old	80	24,02
5	60 years old and over	31	9,31
Total		**333**	**100**

In the indicative stage of pedagogical experiment participated 59 teachers of age range «under 30 years old» (17.72%), 70 teachers in the age range 30-39 years old (21.02%), 93 teachers in the age range 40-49 years old (27.93%), 80 teachers in the age range 50-59 years old (24.02%), 31 teachers in the age range 60 years old and over (9.31%). This means that the data indicate an almost proportional selection of teaching staff, which corresponds to the general number of respondents.

Table 1.4

Scientific and teaching work experience of teachers

№	Work experience	Number of teachers	Percentage %
1	Less than 5 years	63	18,92
2	6-10 years	71	21,32
3	11-15 years	88	26,43
4	16-20 years	78	23,42
5	21-25 years and more	33	9,91
Total		**333**	**100**

Work experience of scientific and teaching activity of teachers in the system of military education meets the necessary criteria for selecting

respondents of the indicative stage of the pedagogical experiment and confirms their almost proportional selection. The number of teachers with experience up to 5 years is 63, (18.92%), 6-10 years – 71 teachers (21.32%), 11-15 years – 88 teachers (26.43%), 16-20 years – 78 teachers (23.42%), 21-25 years and more – 33 teachers (9.91%).

Table 1.5

Direction of scientific and educational activity of teachers

№	Direction of teachers' activity	Number of teachers	Percentage %
1	Technical group of subjects	111	33,33
2	Social and humanitarian group of subjects	116	34,83
3	Military group of subjects	106	31,84
Total		333	100

It was also taken into account the representation in the selective group of respondents, members of the three groups of teaching disciplines. The number of teachers of the technical group of subjects represented 111 teachers (33.33%), social and humanitarian group – 116 teachers (34.83%), military group – 106 teachers (31.84%).

Table 1.6

Teachers' position

№	Teachers' position	Number of teachers	Percentage ratio, %
1	2	3	4
1	Chief of department	20	6,01
2	Deputy chief of department	20	6,01
3	Chief of scientific department	25	7,51
4	Chief of academic laboratory	9	2,7
5	Professor of department	41	12,30
6	Associate professor of department	52	15,62
7	Senior teacher of department	75	22,52
8	Teacher of department	91	27,33
Total		333	100

Within the pedagogical experiment it was also taken into consideration a wide range of respondents' positions. In the study took part 91 teachers of departments or 27.33%, 75 senior teachers (22.52%), 52 associate professors (15.62%), 41 professors of departments (12.30%), 9 chiefs of academic laboratories (2.7%), 25 chiefs of scientific departments (7.51%), 20 deputy chiefs of departments (6.01%), 20 chiefs of departments (6.01%).

Table 1.7

Availability of academic degrees

№	Teacher's academic degree	Number of teachers	Percentage ratio, %
1	Candidate of technical sciences	45	13,51
2	Candidate of pedagogical sciences	40	12,01
3	Candidate of philosophical sciences	16	4,80
4	Candidate of medical sciences	7	2,10
5	Candidate of physical and mathematical sciences	3	0,90
6	Candidate of political sciences	1	0,30
7	Candidate of philological sciences	7	2,10
8	Candidate of psychological sciences	21	6,31
9	Candidate of military sciences	42	12,61
10	Doctor of technical sciences	9	2,70
11	Doctor of pedagogical sciences	1	0,30
12	No academic degree	141	42,34
Total		333	100

An interesting part of the experiment was the analysis of the availability of a certain academic degree among teachers in military education system. Thus, the number of teachers with a degree in technical sciences was 45 (PhD) teachers (13.51%), pedagogical sciences – 40 (PhD) teachers (12.01%), philosophical sciences – 16 (PhD) teachers (4.80%), medical sciences – 7 (candidates of sciences) teachers (2.10%), physical and mathematical sciences – 3 (PhD) teachers (0.90%), political science – 1 (PhD) teacher (0.30%), philological sciences – 7 (PhD) teachers (2.10%), psychological sciences – 21 candidate of sciences) teacher (6.31%), military sciences – 42 (candidate of sciences) teachers (12.61%), technical sciences – 9 teachers (doctors of sciences) or 2.70% respectively, pedagogical sciences – 1 teacher (doctor of sciences) or 0.30%, and 141 teachers do not have a degree or 42.34% respectively.

Moreover, teachers had undergone a preliminary survey to find out their subjective opinion about their own level of ICC formation (Table 1.8).

Table 1.8

Teachers' subjective analysis of their level of ICC formation

№	Level of teachers' ICC formation	Number of teachers	Percentage ratio, %
1	low	133	39,94
2	satisfactory	82	24,62
3	sufficient	62	18,62
4	high	56	16,82
Total		333	100

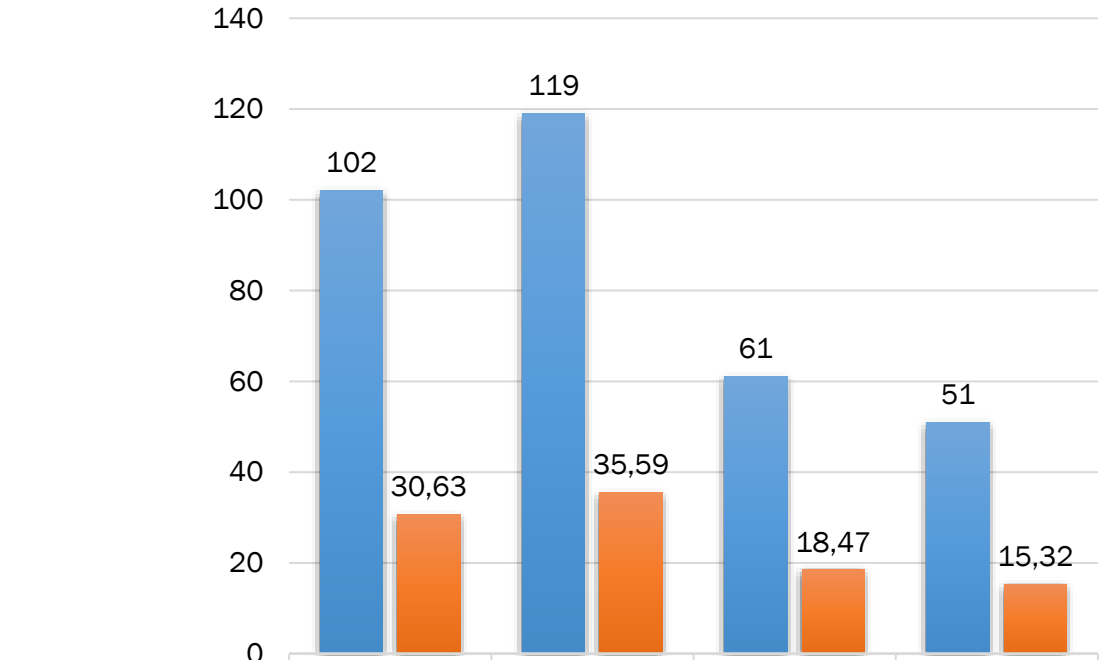
The analysis of the teachers' ICC formation included five components. To determine the level of value-motivational component formation, teachers were tested. The results are represented in table 1.9 and Figure 1.1. According to testing results, at the beginning of the experiment this component was evaluated as low by 102 teachers or 30.63%, as satisfactory by 119 teachers or 35.59% respectively. Sixty-one teacher evaluated this component as sufficient, which equals18.47%, while fifty-one teacher or 15.32% assessed it as high.

Thus, considering the total amount of low and satisfactory results, we can state that 66.22% of teachers need to develop value-and-motivational component, understand the necessity of being, on the one hand the subject of information society, and on the other hand, systematically use ICTS in scientific and pedagogical activity.

Table 1.9

Formation level of value-motivational component of teachers' ICC

Content of value-motivational component	Total number	Levels							
		low		satisfactory		sufficient		high	
		teachers	%	teachers	%	teachers	%	teachers	%
1. Values of scientific and educational activity using ICTs	333	53	15,92	161	48,35	78	23,42	41	12,31
2. Motivation to ICC development	333	151	45,35	76	22,82	45	13,51	61	18,32
Component: Value-motivational	333	102	30,63	119	35,59	61	18,47	51	15,32



	low	satisfactory	sufficient	high
Number of teachers	102	119	61	51
Percentage	30,63	35,59	18,47	15,32

Fig. 1.1. **Formation levels of value-motivational component of teachers' ICC**

To evaluate intellectual component of teachers' ICC we developed a test, which contained 154 questions, allowing us to assess the state of this component formation. It included knowledge of the following:

– theory of ICTs;

– theoretical background of the analysis and decision-making in military area using ICTs;

– technologies of modeling processes in teaching general and specific military subjects;

– theoretical background in cyber-security while using ICTs in teaching;

– up-to-date hardware and software means;

– technologies of software development according to the teaching methodology (Annex B).

The generalization of received data (table 1.10 & Figure 1.2.) allowed us to state that 50.60% (169 teachers) have low level of this component content, 20.42% or 68 teachers have a satisfactory level, 16.67% or 55 teachers have a sufficient level and only 12.31% or 41 teacher have a high level of the component content.

Thus, 71.02% of teachers urgently need developing knowledge of ICTs and its usage in scientific and pedagogical activity.

Table 1.10

Formation level of intellectual component of teachers' ICC

Intellectual component content	Total number	Levels							
		low		satisfactory		sufficient		high	
		teach-ers	%	teach-ers	%	teach-ers	%	teach-ers	%
1	2	3	4	5	6	7	8	9	10
1. Theory of ICTs knowledge	333	162	48,65	80	24,02	53	15,92	38	11,41
2.Knowledge of theoretical background of the analysis and decision-making in the military area using ICTs	333	130	39,04	94	28,23	60	18,02	49	14,71
3. Knowledge of technologies of modeling processes in teaching general and specific military subjects	333	163	48,95	74	22,22	57	17,12	39	11,71
4. Knowledge of theoretical background in cyber-security while using ICTs in teaching	333	180	54,05	47	14,11	70	21,02	36	10,81
5. Knowledge of up-to-date hardware and software means	333	197	59,16	37	11,11	47	14,11	52	15,62
6. Knowledge of technologies of software development according to the teaching methodology	333	179	53,75	76	22,82	46	13,81	32	9,61
Component: Intellectual	333	169	50,60	68	20,42	55	16,67	41	12,31

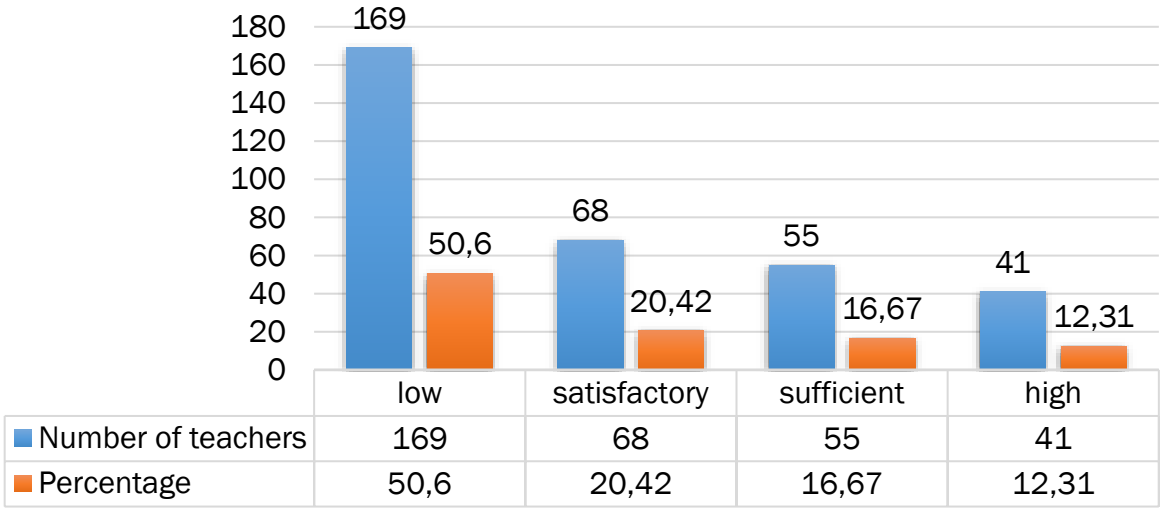


Fig. 1.2. **Formation levels of intellectual component of teachers' ICC**

To evaluate information-technological component of teachers' ICC we developed paraprofessional and professional practical tasks (Annex B), which allowed us to determine the following abilities: use of ICTs in everyday life, develop and use up-to-date hardware and software products, check their cyber-vulnerability.

Analysis of the obtained results (table 1.11 and figure 1.3.) demonstrates that teachers have this component little developed, in particular 44.29 % (148 teachers) have low level, 22.82% (76 teachers) have satisfactory level, 17.27% (57 teachers) have sufficient level and 15.62% or 52 teachers have high level.

Thus, we can state that 67.11% of teachers have either low or satisfactory level of information-technological component meaning they need to develop knowledge and skills of successful use of ICTs in their everyday life.

Table 1.11

Formation level of information-technological component of teachers' ICC

Information-technological component content	Total number	Levels							
		low		satisfactory		sufficient		high	
		teachers	%	teachers	%	teachers	%	teachers	%
1. Ability to use ICTs	333	138	41,44	72	21,62	65	19,52	58	17,42
2. Ability to develop, use up-to-date hardware & software products and	333	157	47,15	80	24,02	50	15,02	46	13,81

check their cyber-vulnerability									
Component: information-technological	333	148	44,29	76	22,82	57	17,27	52	15,62

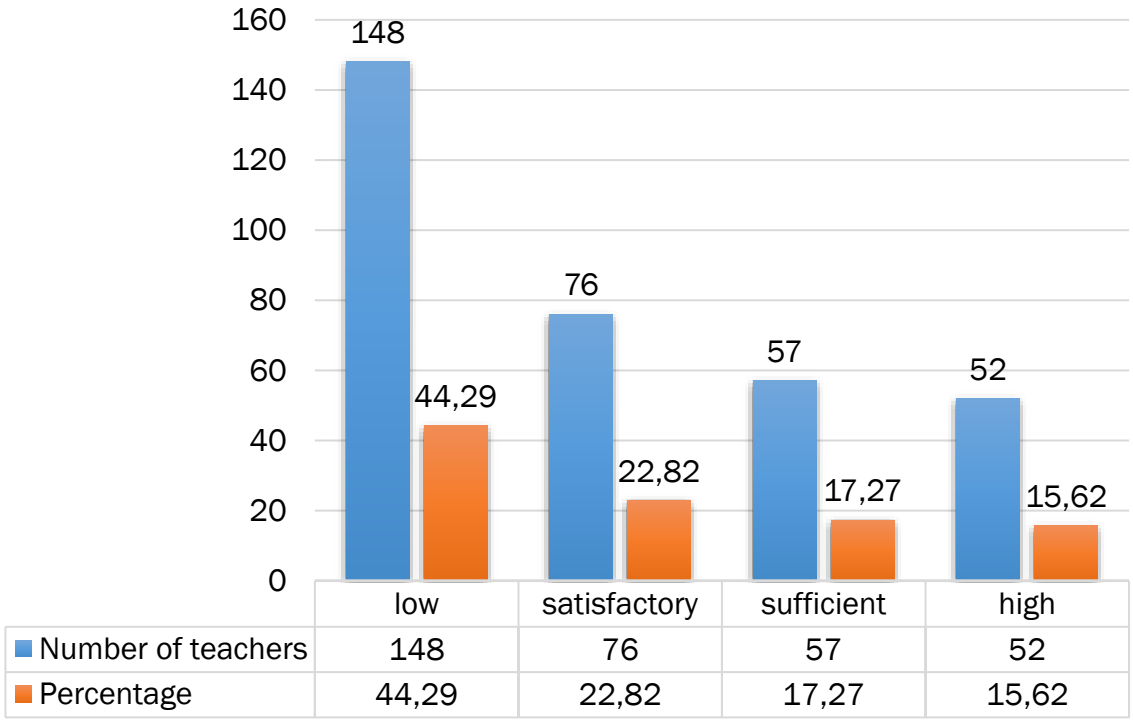


Fig. 1.3. **Formation level of information-technological component of teachers' ICC**

To evaluate the praxeological component of teachers' ICC we developed paraprofessional and professional practical tasks to determine abilities to use ICTs in scientific and educational activities, synthesize various software tools to increase the efficiency of general and special military subjects teaching, develop information software tools for application in teaching special disciplines (Annex B). Analysis of the obtained results shows that 46.15% (154 teachers) have low level, 25.23% (84 teachers) have satisfactory level, 16.62% (55 teachers) have sufficient level and 12.01% (40 teachers) have high level of this component.

Taking all the mentioned above into consideration, we can state that 71.38% of teachers need to develop their praxeological component by developing knowledge and skills of ICTs use in scientific and educational activity.

Table 1.12

Formation level of praxeological component of teachers' ICC

Praxeological component content	Total number	Levels							
		low		satisfactory		sufficient		high	
		teachers	%	teachers	%	teachers	%	teachers	%
1	2	3	4	5	6	7	8	9	10
1. Ability to use ICTs in scientific and pedagogical activities	333	141	42,34	100	30,03	43	12,91	49	14,71
2. Ability to synthesize various software tools to increase the efficiency of general and special military subjects teaching	333	160	48,05	68	20,42	63	18,92	42	12,61
3. Ability to develop information software tools for application in teaching special disciplines	333	160	48,05	84	25,23	60	18,02	29	8,71
Component: praxeological	333	154	46,15	84	25,23	55	16,62	40	12,01

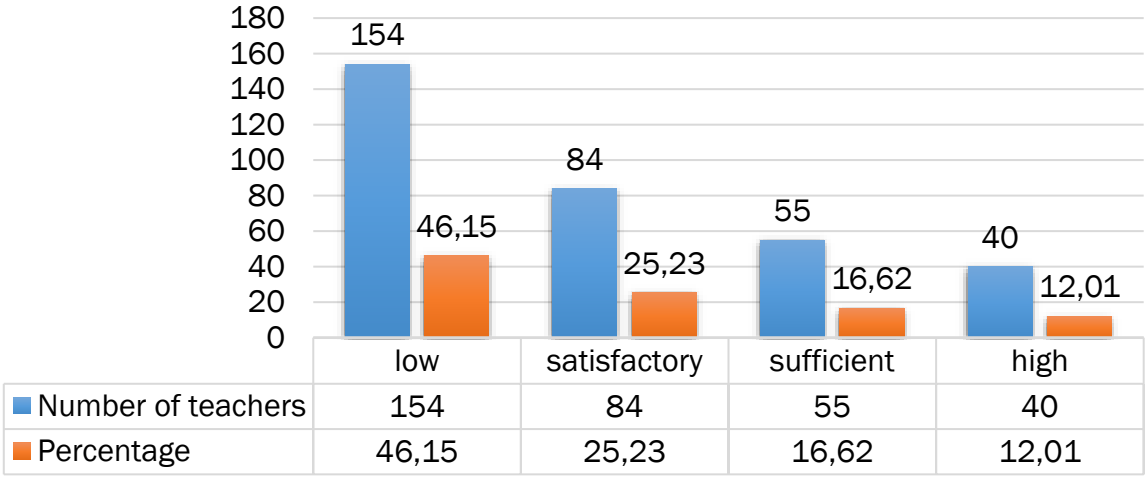


Fig.1.4. Formation level of praxeological component of teachers' ICC

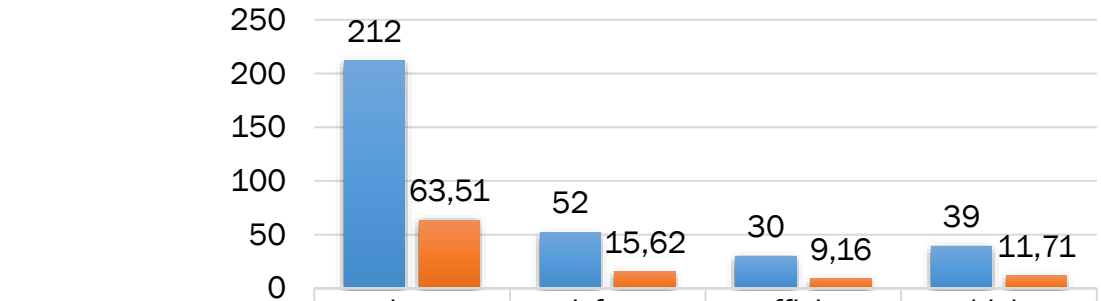
To evaluate subjective component of teachers' ICC we conducted testing that enabled us to determine the level of this component formation, in particular the scientific and educational subjectivity in information society, ability to self-assessment as a subject of information-analytical activity while teaching general and special military subjects. The generalization of the obtained results (table 1.13 and figure 1.5) demonstrated that 63.51% (212 teachers) have low level, a 15.62% (52 teachers) have satisfactory level, 9.16% (30 teachers) have sufficient level and only 11.71% (39 teachers) have high level.

Hence, 79.13% of teachers have either low or satisfactory levels of subjective component of teachers' ICC meaning they need to develop scientific and educational subjectivity in information society, their ability to make self-assessment as a subject of information-analytical activity when teaching general and special military subjects.

Table 1.13

Formation level of subjective component of teachers' ICC

Subjective component content	Total number	Levels							
		low		satisfactory		sufficient		high	
		teachers	%	teachers	%	teachers	%	teachers	%
1	2	3	4	5	6	7	8	9	10
1. Scientific and pedagogical subjectivity in information society	333	222	66,67	46	13,81	32	9,61	33	9,91
2. Ability to self-assessment as a subject of information-analytical activity when teaching general and special military subjects	333	201	60,36	58	17,42	29	8,71	45	13,51
Component: subjective	333	212	63,51	52	15,62	30	9,16	39	11,71



	low	satisfactory	sufficient	high
Number of teachers	212	52	30	39
Percentage	63,51	15,62	9,16	11,71

Fig.1.5. **Formation level of subjective component of teachers' ICC**

As a result of calculating statistical data on the formation levels of teachers' ICC components we summarized the results (table 1.14, figure 1.6) and found out that 47.04% (157 teachers) have low level of ICC components formation, 23.93% (80 teachers) have satisfactory level, 15.64% (52 teachers) have sufficient level and 13.39% (44 teachers) have high level.

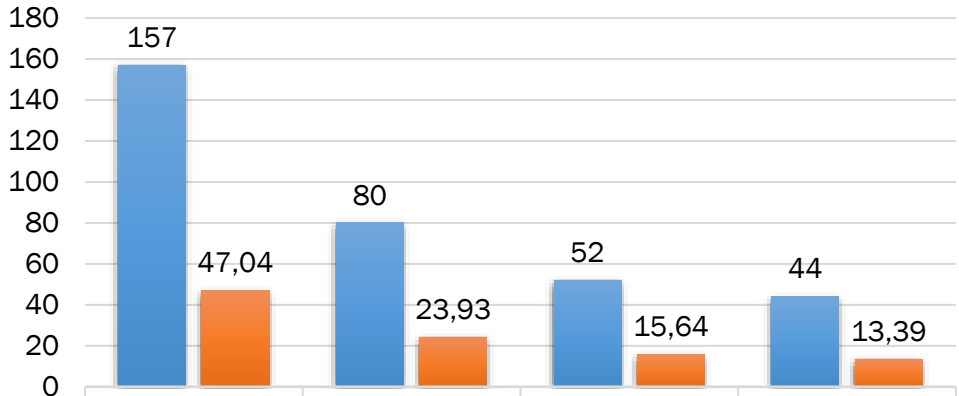
Table 1.14

Levels of teachers' ICC formation in the military education system on the indicative stage of pedagogical research

Components	Total number	Levels							
		low		satisfactory		sufficient		high	
		teachers	%	teachers	%	teachers	%	teachers	%
1	2	3	4	5	6	7	8	9	10
1. Value-motivational	333	102	30,63	119	35,59	61	18,47	51	15,32
2. Intellectual	333	169	50,60	68	20,42	55	16,67	41	12,31
3. Information-technological	333	148	44,29	76	22,82	57	17,27	52	15,62
4. Praxeological	333	154	46,15	84	25,23	55	16,62	40	12,01
5. Subjective	333	212	63,51	52	15,62	30	9,16	39	11,71
ICC formation	**333**	**157**	**47,04**	**80**	**23,93**	**52**	**15,64**	**44**	**13,39**

Consequently, we can state that 70.97% of teachers have either low or satisfactory levels of ICC formation meaning there is the need to develop

theoretical knowledge and practical skills of ICTs use, which will enable teachers successfully perform their duties in scientific and pedagogical activities in information society.



	low	satisfactory	sufficient	high
Number of teachers	157	80	52	44
Percentage	47,04	23,93	15,64	13,39

Fig. 1.6. **Levels of teachers' ICC formation on the indicative stage of pedagogical research**

Moreover, statistical data allow us to analyze teachers' subjective assessment of their ICC formation after the indicative stage of the experiment (figure 1.7). The results show that teachers were quite objective in their self-assessment of levels.

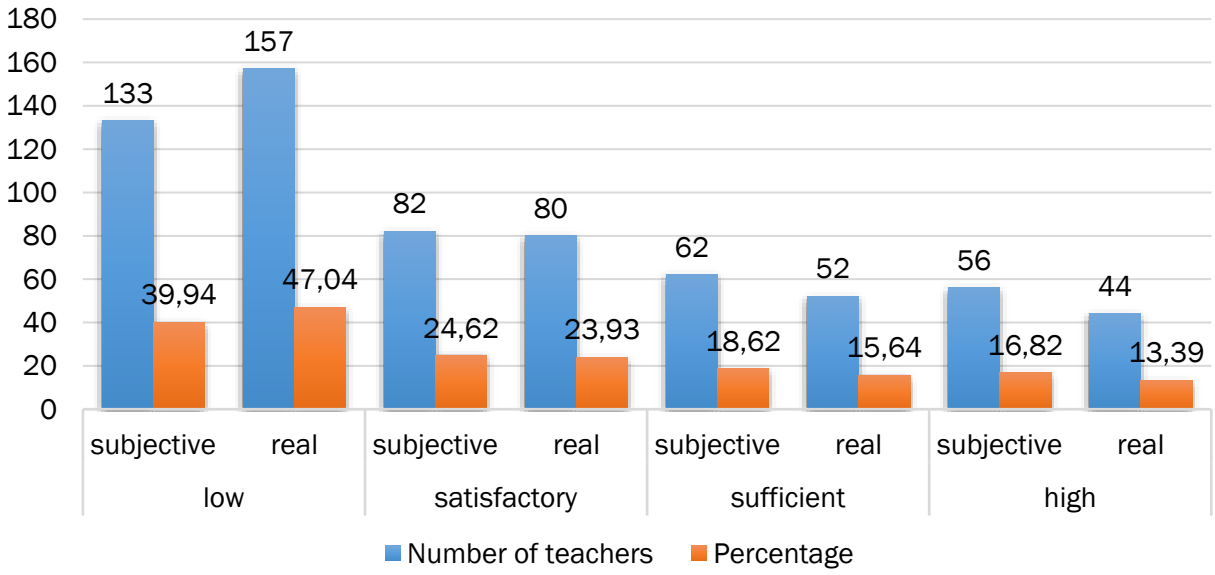


Fig.1.7. **Comparative analysis of the subjective and objective assessment of teachers' ICC formation levels**

To summarize, the statistical analysis of the data regarding teachers' of military education system ICC levels proves the relevance of the scientific and pedagogical research. Empirically we found out that 47.04% (157 teachers) have low level; 23.93% (80 teachers) have satisfactory level; 15.64% (52 teachers) have sufficient level; 13.39% (44 teachers) have high level.

Thus, considering the high number of teachers who have either low or satisfactory levels of ICC we can state that 70.97% need to develop theoretical knowledge and practical skills of ICTs use which will enable them to successfully perform their duties as subjects of scientific and pedagogical activity in information society.

Conclusions to the first section

Analysis of scientific sources and dissertations dedicated to the problem of development of information and communication competence of teachers in military education system enabled us to conclude the following:

1. Considering significant results in researching the problem, there are still many discussions on the issue of ICC formation and development. However, the problem of ICC formation among teachers of military education system was studied, which proved it is relevant to study its development according to the requirements and principles of modern approaches to the analysis of such concepts, in particular competence-based approach, subject-action, information, andragogy-based approach and context one.

2. We found out, that teachers' ICC is the necessary component of professional and pedagogical competence of teachers in the system of military education, which enables them to use modern ICTs in their scientific and educational activities. Various factors influence the peculiarities of its manifestation, among which the key one is the subjective component. It depends on teacher's personality and his ability to be the subject of scientific and educational activity in information society and military environment.

3. It was also defined the notion of teachers' ICC, that is a dynamic professional ability of teachers of the military education system to systematic and contextual application of ICTs in scientific and pedagogical activities, which is expressed in integrated unity of value-motivational, intellectual, information-technological, praxeological and subjective components.

4. We outlined the components of teachers' ICC in the system of military

education taking into consideration international approaches - value-motivational, intellectual, information-technological, praxeological, subjective and identified as well as pointed out its content.

5. According to the results of indicative pedagogical experiment we evaluated the current state of teachers' ICC formation, which demonstrated that 70.97% of teachers need to develop the theoretical knowledge and practical skills of ICTs use, which ensures they can perform their duties successfully in scientific and educational activity.

The research results of this section are reflected in the following author's publications: [138], [141], [145], [148], [149], [280].

SECTION 2
MODEL AND METHODOLOGY OF DEVELOPMENT OF THE INFORMATION AND COMMUNICATION COMPETENCE OF TEACHERS IN THE MILITARY EDUCATION SYSTEM IN DISTANCE LEARNING FORM

2.1. Features of organizing the research of development of the information and communication competence of teachers in the military education system

When developing the methodology of scientific and pedagogical research dedicated to the problem of teachers' ICC development for military education system we took into account general methodological recommendations by S. Honcharenko [97], S. Sysoieva [256], V. Yahupov [293], meaning that all available achievements of didactics and methodology of modern pedagogical science were considered.

The key *scientific hypothesis of the research* is an assumption that in military education system the development of teachers' ICC in the course of distance learning will be efficient on condition that professionally-oriented models and methodology of its development are introduced.

The methodological background of the research comprises:

1) at the level of philosophy:

– principles and categories of dialectics, the principle of unity and struggle of opposites, according to which, in military education system the process of teachers' ICC development in the course of distance learning as well as development of its relevant components is complex and contradictory;

– the principle of quantitative changes transformation into qualitative ones, as introduction of modern ICTs in the process of teachers' retraining and advanced training in military education system inevitably increases the effectiveness of their learning;

– provisions on the mutual dependence of scientific and educational activities of teachers in the system of military education on the economic, political and defense development of the state;

– philosophical principles that reveal the multifaceted nature of being, the need to study the phenomenon in its connections and interactions with other phenomena;

2) at the general scientific level of methodology:

– information-based approach, research and selection of the information aspect of military scientific and educational activities of teachers in the system of military education;

– competence-based approach, aligning teachers' ICC in military education system with the current requirements, as it is an important component of their professional and pedagogical competence;

– subject-action based approach, which is used to assess the results of teachers' ICC development in the system of military education in the process of remote advance training courses for scientific and teaching staff;

– andragogy-based approach allows finding out individual features of teachers' ICC development in the system of military education during distance learning according to their age, scientific and pedagogical needs, professionally important qualities and individual goals;

– contextual-based approach directs to paraprofessional tasks solution in the course of teachers' ICC development in the military system during distance learning advance training courses;

3) at the specific scientific level of methodology:

– activity-based approach as a specific-scientific basis of teachers' ICC development organization in system of military education during distance learning courses aimed at retraining, advanced training and justification of its development;

– humanistic-based approach, the formation of the idea of military education system teachers as subjects of scientific and educational process regarding their self-determination, self-realization and self-actualization in the information society;

– subjective and praxeological approaches as foundation for military education system teachers advance training course successful functioning through their comprehensive self-analysis, self-assessment, modeling of their learning in the course of distance learning.

Legal basis of the research is the following: main provisions of «On Higher Education» [155], «On professional development of employees» [156]; decree of the Ministry of Science and Education of Ukraine «On the approval of the field Concept of continuous pedagogical education development» [49]; Cabinet

of Ministers Decision «On the approval of National Qualifications Framework» [32]; National Strategy of Education Developments in Ukraine on the period up to the year 2021 [51]; Concept of the National Informatization Program [154], Regulation on distance learning [50], Requirements to Higher Educational Institutions and Post-graduate Educational Institutions, Scientific, Educational-and-Scientific Institutions which provide distance learning courses as well as advanced training courses for specialists according to the list of accredited specialties [48]; Decree of the Ministry of Defense of Ukraine «On the Strategic Defense Bulletin of Ukraine» [52], «On the approval of Regulation on the peculiarities of educational process organization in Higher Military Educational Institutions of the Ministry of Defense of Ukraine and Military Educational Departments of Higher Educational Institutions of Ukraine» [47], «On the approval of the Concept of Distance Learning in the Armed Forces of Ukraine» [46], «On the State Program of Development of the Armed Forces of Ukraine for the period up to the year 2020» [186].

Reference Base. In the course of the study 307 literature sources were studied. In particular, the following:

– legislative acts and normative documents;

– scientific works devoted to the subject of research;

– national and international education and science databases (*Web of Knowledge, Scopus, REDINED, ERIC, ISOC and TESEO*).

To achieve the purpose of the research and realize its tasks we used a set of the following methods:

1) theoretical:

– analysis of Ukrainian and foreign scientific and pedagogical literature sources and legal basis to find out experimental evidence in accord with its object and subject;

– synthesis, generalization and systematization to define the notion «teachers' ICC in the system of military education», substantiation of the criteria and indicators for diagnosing teachers' ICC formation in military education system;

– structural-functional and comparative-analytical methods to systematize achievements in studying the topic;

2) empirical:

– questionnaires, surveys, testing and self-assessment to determine the current level of teachers' ICC formation/development in military education system;

– pedagogical modeling to build a pedagogical model of teachers' ICC development for the system of military education in the course of distance learning;

– pedagogical experiment (indicative and formative stages) to verify the effectiveness of the developed pedagogical model;

3) statistical: the method of mathematical statistics – the G-signs test, which was used to process the obtained statistical data of the pedagogical experiment and, accordingly, to confirm (deny) statistical (scientific) research hypothesis.

Research Organization. It was conducted during 2018 – 2020 and included three stages of scientific and pedagogical research.

The first stage, *analytical and indicative* stage (took place in 2018) comprised analysis and generalization of scientific literature and sources; based on comparative analysis and generalization of the known concepts and theories we defined the object, subject, hypothesis, purpose, tasks and research program; we chose methods of comparative analysis and substantiated the conceptual and categorical apparatus of the research; we also identified the existing inconsistencies; we singled out and substantiated the criteria and indicators of diagnosing current level of teachers' ICC formation in military education system.

Main research methods: theoretical analysis and synthesis of literature sources and pedagogical practice in military education system, questionnaires, generalizations, classification, specification.

Second stage of the research, *experimental*, took place in 2018 – 2019. During this stage we developed and justified a professionally-oriented model and methodology for teachers' ICC development in military education during distance learning, including their approbation; we carried out a formative pedagogical experiment and analysis of empirical data on the impact of professionally-oriented model and methods of teachers' ICC development in the system of military education during distance learning.

The third stage, *generalization*, took place in 2020. In the course of the third stage we carried out the interpretation and registration of research results; developed methodological recommendations for the implementation of the author's methodology for the teachers' ICC development in military system during distance learning; we formulated general conclusions and identified perspectives for further research; the results of the research were implemented in the scientific and educational activities of higher education

institutions.

The reliability of the research results is provided by the methodological and theoretical validity of the study main provisions, compliance of research methods with its purpose and tasks, introduction of the main research results into pedagogical practice and educational process, quantitative and qualitative analysis of theoretical and empirical material, discussion of the obtained results during scientific conferences.

2.2. Model of development of the informational and communicative competence of teachers in the military education system in the course of distance learning

The field of education, more than ever, needs pedagogical models that allow simulating certain educational processes taking into consideration innovative scientific paradigms. However, there is no generally accepted or universal pedagogical pattern for efficient learning process modeling and obtaining a guaranteed expected result.

As a result, modeling in pedagogical theory and practice is a powerful method, which is used at different stages of pedagogical research. The philosophical dictionary defines modeling as «an indirect method of objects of knowledge scientific research by studying their models (objects which directly, for some reason, are impossible, complicated or impractical to study)» [206, p. 393].

According to I. Pidlasyi [207, p. 66], a scientific model is «a mentally represented or materially realized system that adequately reflects the subject of research and is able to replace it providing the model analysis to obtain new information about this object».

He adds [207, p. 67] that the use of modeling in pedagogy is necessary to solve the following tasks:

– structure of educational material optimization;
– educational process planning improvement;
– cognitive activity management;
– educational process management;
– diagnostics, forecasting, training design.

Additionally, modeling method gives the possibility to realize the following aims [207, p. 67]:

– heuristic (classification, schematic representation, search for new

principles and theories, interpretation of empirical data etc.);

– mathematical (solving mathematical tasks by building algorithms, flowcharts, dependence charts, etc.);

– experimental (empirical testing of the hypothesis using appropriate models).

R. Atakhanov and V. Zagviazynskyi [297, p. 121] agree that «psychological and pedagogical processes are complex: they are dynamic, multi-factor, in some cases – unique, always confined to man. As a result, the chosen research methods must be adequate, meet moral and ethical standards, humane values».

Thus, an important point in pedagogical research organization is to take into account the relationship between the possibility and necessity of using full range of their tools, i.e. compliance with the principles of their optimization [209, p. 31–32]:

– the principle of minimality;

– the principle of specificity;

– the principle of consistency and parallelism;

– the principle of subordination;

– the principle of completeness.

Researchers [10] emphasize that the model is a systemic pattern that reproduces reality in a more abstract way, almost schematically, and serves as a reference point.

Behar [9] mentions that to build a pedagogical model it is necessary to determine its elements, in particular its pedagogical architecture which is the basis of the model structure and the strategy of its application i.e. the dynamics of the pedagogical model, which depends on the context and variables that are part of the learning process. Accordingly, the pedagogical architecture consists of the following aspects:

– organizational (justification of learning process planning, which includes learning objectives, organization of time and space, expected learning outcomes;

– content (refers to content which includes learning materials and ICT tools, such as learning objects, specialized software);

– methodical (presupposes activities, interaction, assessment procedures and organization of all these elements in the didactic order);

– technological (choice of the platform and its functionality, means of communication etc.).

Therefore, to develop an effective pedagogical model, it is necessary to

take into account important aspects of paradigmatic changes, especially in the course of distance learning.

Analysis of scientific literature shows sufficient interest of researchers to the problem of pedagogical models development, e.g. M. Anisimov [4], N. Bilyk [15], T. Campbell, P. S. Oh, M. Maughn, N. Kiriazis & R. Zuwallack [34], O. Kravchenko [131], M. Lazarev [157], E. Lodatko [164], O. Meshchaninov [173], A. Semenova [230], W. Walat [270], M. Yakubovski [294], O. Yezhova [296] and others.

To conceptual issues of pedagogical modeling devoted the works of T. Campbell, P. S. Oh, M. Maughn, N. Kiriazis and R. Zuwallack. They characterized it as the main function of the process of education, which in its turn affects the understanding of scientific and pedagogical practice, improvement or development of the researched object in general [34].

P. Oh and S. Oh, offered **five types of pedagogical modeling** in order to better understand it:

– *research modeling* (analysis of an existing model properties by interacting with the model. By changing parameters observe the effects);

– *expressive modeling* (discussion and proposal of own ideas to describe or explain scientific phenomena, by creating new models or using existing models);

– *experimental modeling* (query modeling, where hypotheses and predictions about models are formed and tested through experiments with phenomena);

– *evaluative modeling* (comparison of alternative models related to the same phenomenon or problem, evaluation of their advantages and limitations, and choice of the most appropriate options to explain the phenomenon or to solve the problem);

– *cyclical modeling* (participation of scientists in the current processes of development and testing of the model, which improvement, evaluation and implementation takes a long time) [189].

According to R. Sierra [240], pedagogical model is a theoretical research tool designed to perfectly reproduce the process of learning. He argues that pedagogical model is a formal theoretical structure that is scientifically and ideologically based on the educational process that promotes development, interpretation, design and adjustment of pedagogical reality at different education levels, and meets specific needs.

However, the researchers [44] define pedagogical model as an ideal image or a simplified object for research, which performs a heuristic function

as it allows detecting, interpreting and explaining new connections and qualities of an object with the abstraction of all those elements and relationships that are considered essential and systematic in the simulated object. It contains significant relationships of the object and scope that are structured.

They emphasize that in order to model an object, it is necessary to clearly define the goal. At the same time it is necessary to reveal the nature of the object of modeling and define theoretical and methodological provisions that will facilitate their modeling in practice.

R. Florez [71] notes that model is a mental structure, which enables pedagogical teams to adopt or define how their concepts of pedagogical practice can be implemented in the educational process of an educational institution.

In other words, the model allows researchers to clearly reflect the ideas of pedagogical theory, to consistently achieve educational goals in a certain educational institution, which are defined by the educational community and leaders of educational processes who are developing in it.

Thus, the use of a particular pedagogical model in an educational institution is necessary to meet the needs of the context, a certain scientific community, and a historical moment in accordance with the challenges that arise in a certain social, economic and political situation. In case the educational process does not use recent achievements of pedagogical theory and practice, then educational process will lose its meanings and become ineffective [276, p. 23].

According to V. Valat, there is the need for systematic purposeful implementation of modern ICTs in all possible variations in the education system, for instance multimedia [269], to ensure its quality at all levels [272], including modeling textbooks [270].

Consequently, foreign and Ukrainian scientists point out the relevance of the scientific direction of research and its heuristic aspect. As an example, they use standard approaches and components in pedagogical modeling which are important for understanding main aspects of modeling ICC development. However, they also have distinctions, taking into account different directions of pedagogical modeling and the conditions in which certain models are implemented.

Nevertheless, it should mentioned that there lack scientific works, devoted to pedagogical modeling of teachers' ICC development for military education system in the course of distance learning. In this regard, it is

important to develop a professionally-oriented model of its development according to leading ideas of information-based, competence-based, subject-action based, andragogy-based and contextual-based methodological approaches.

Currently, the method of pedagogical modeling is one of the main methods of scientific study of pedagogical phenomena and systems, which are complex, multi-faceted and poly-structural. Any method of scientific research is based on the idea of modeling, both theoretical when different abstract models are used, and experimental when it is tested.

To substantiate the model of teachers' ICC development for military education system in the process of distance learning, we will consider approaches to defining such important concepts for our study as «modelling» and «model». By modeling scientists mean the following:

– construction and study of real objects and phenomena models and objects that are designed to determine or improve their characteristics, construction methods rationalization, their management [82, p. 683];

– a method of studying phenomena and processes based on the replacement of a certain object of study (the original one) with another similar to it (its model) [235, p. 12];

– means of pedagogical research, as it allows scientists to simulate real and constructed systems with the help of analogues, reproducing original objects and systems' properties in their organization and functioning [253, p. 165].

According to V. Yahupov [290, p. 146], pedagogical modeling makes it possible to create a model of a specialist based on his competencies, justify the model of professional competence, as well as create a model of its formation in the process of getting professional education.

Within our study, **pedagogical modeling** is considered as a research method for teachers' information and communication competence development in military education system, resulting in an appropriate pedagogical model. However, it should be pointed out that in the process of building a certain model, scientists have got to ignore some non-essential elements.

S. Honcharenko [97, p. 120] considers that no model, even a very complex one, can give a comprehensive picture of the object of the study and accurately predict its development or describe trajectory. Thus, scientists have to balance on the boundaries between comprehensiveness and validity when constructing models [97, p. 120].

We agree with the above mentioned view and argue that pedagogical modeling does have features associated with the ambiguity and vagueness of pedagogical notions, practical lack of generally accepted procedures for diagnosing the results of changes in various pedagogical phenomena.

E. Lodatko [164] reasonably outlines that pedagogical modeling has the following features:

– ambiguity and vagueness of pedagogical notions;

– complexity, constant variability and topicality of pedagogical phenomena, objects and processes;

– the availability of criteria and means determine the «level» of set goals achievement, measure the results of processes realization, determine qualitative evaluation of pedagogical phenomena, personal achievements etc.;

– socio-cultural nature of the object of the study, where multidimensional nature of its manifestation in real-life poses difficulty of its formalization.

The Dictionary of the Ukrainian language [82, p. 683] defines the term «model» as a provisional scheme of any process or object which is used in research by its representative.

In the Encyclopedia of Education [63, p. 516], the notion of «model» is defined as an imaginary or materially realized system which reflects the object of the study and is able to change this object so that its analysis provides new data about the outlined object.

V. Yahupov [289, p. 31] defines «model» as a sign system which enables researchers to reproduce the didactic process as a subject of study, show the integrity of its structure, functioning and preserve this integrity at all stages of the research.

According to I. Ziaziun [303, p. 209] «model» is an artificially created sample in the form of a scheme, physical structure, symbolic form or formula, which being similar to the studied object (or phenomenon), reflects and reproduces in a simpler form structure, properties and interrelationship between the elements of this object.

V. Bykova [19, p. 232] argues that the model is a certain representation of the system, which reflects, characterizes and can reproduce features of this system ensuring achievement of model construction and use objectives.

Additionally, V. Bykov notes [26, p. 13–14] that the model can be represented on the basis of a generalized model of the problem, which includes two relatively independent but dialectically interdependent and interconnected parts: the formative (includes problem description of the field and tasks formulation) and implementing (effective part of the task, its

processor, which includes methods and tools used or intended to be used to solve this task or class of tasks).

Thus, **the pedagogical model** is a set of interconnected components that form a single entity and reflects the educational process common goal regarding the implementation of a specific pedagogical plan with the formation of pedagogical emergence. Accordingly, the peculiarity of pedagogical modeling is that it creates a conceptual model of the educational process (phenomenon or object), which can be used to predict its formation, development and improvement.

Hence, modeling of the teachers' ICC development for military education system in the course of distance learning as a complex pedagogical process, involves the use of certain methodological approaches, among which are the following: informational, competence-based, subject-action based, andragogy-based and contextual-based. They are closely interconnected and to some extent interdependent.

Information-based approach envisages information saturation of the content of teachers' information and communication competence, where we should distinguish both conceptual and content aspects of its development. The essential content should be provided in theoretical and practical educational material. The development of teachers for military education system in the conditions of postgraduate education (self-education) involves the development of the training content in the field of information and communication technologies, which is the basis for their information and communication competence development. In practice, this is the program of its development.

Competence-based approach focuses on the results of education, the readiness, ability and willingness of the specialist to act professionally in various problematic professional situations, including educational ones.

According to V. Radkevych [214, p. 4], the competence is a method of modeling the results of professional education and training, its presentation in the form of quality standards for the training of skilled employees. It should be noted that the competence-based approach does not oppose the traditional knowledge approach, which continues to be used in professional education, but on the contrary significantly expands its content with personality-oriented learning material.

The feature of the competence-based approach in professional education and training is its humanistic, humanitarian and practical orientation on ensuring professional development and self-affirmation of the skilled

employee personality when acquiring the necessary for successful operation in the society competencies that increase the level of their social protection in a market economy.

Subject-action based approach in its subjective component assumes that the center of education is always the teacher. Within our study, a teacher of military education, his/her attitude, values and motivation for teaching, unique mental composition as a subject of social, professional and educational life.

According to V. Kushchov and V. Yagupov [284], the problem of the subject-action based approach to military specialists training is relevant due to the following reasons:

– higher military education must meet the individual's intellectual needs;

– it should form the student's personality as a subject of creative educational activity;

– it should form the personality of the future military specialist as a subject of creative military-professional activity. These reasons are its main tasks.

The andragogy-based approach allows finding out individual features of teachers' ICC development for the system of military education in the course of distance learning according to their age, scientific and pedagogical needs, professionally important qualities and individual purposes.

According to L. Lukianova [1, p. 6], transience changes in modern society objectively determine the need for person's formation capable of perceiving and creating changes, oriented on understanding social changes as a natural norm. An important factor contributing to the solution of this problem is adult education, the functioning and development of which has its own content specifics, which is characterized by the contingent, innovative approaches and set of tasks.

It should be emphasized that the key principles of this approach are [1]:

– priority of independent learning, value-motivational points of reference of the learner and his/her responsibility;

– cooperation, mutual respect and communication skills of participants;

– the use of positive social and professional experience and learner's practical knowledge, skills and abilities which involves the use of active learning methods that stimulate creative work of students;

– subject-subject relations, interaction of participants in the learning process regarding joint planning, evaluation and adjustment of learning content in accord with their professional experience;

– voluntary nature, the desire to learn, ability to connect own experience

with what is being studied and feel the value of learning;

– individual and differentiated approaches to learning, which takes into account personal needs and socio-psychological characteristics of an individual that affect professional activity;

– practice-oriented learning, connection of theory with practical professional activities;

– systematic learning, compliance with the objectives and content of training its forms, methods, means and results; continuity and regularity of study;

– learning outcomes actualization, fast and appropriate use in practice;

– adjustment of experience and personal attitudes, direction of participants undergoing training to review their professional activities in order to introduce innovations;

– self-development and self-learning, the focus of training on the improvement of personality, formation person's abilities for self-learning.

Contextual-based approach «directs» organizers of military education to develop educational material according to the interests of teachers' professional activities, especially their educational activities become contextual. This will stimulate their cognitive interest and activity, as this process takes place in the context of their educational activities within the disciplines they teach.

We believe that contextual-based approach provides practical focus on teachers' professional activities, which is a powerful motivating factor in the advanced training system. It is based on the following principles:

– subjective teachers' interest in educational activities if there is an appropriate psychological and pedagogical support;

– modeling of future pedagogical activity conditions;

– ensuring the relationship between the subjects of educational process, teachers and those who receive education;

– integration of modern pedagogical training technologies;

– applied orientation of teachers advance training.

A. Verbytskyi [265, p. 53] quite appropriately stresses that contextual education is the type of education where the language of science and the entire system forms, methods and means of teaching (traditional and new ones) gradually simulates the subject and social content of future professional activities of those who are taught.

Thus, when organizing contextual-based learning, the key idea is not to transfer information, but to develop learners' abilities to competently perform

professional functions, solve problems and tasks, master holistic professional activities. This approach creates the link and development of activities from the past to the future, from studying to work [265, p. 45].

Consequently, within our research pedagogical modeling contains the following stages:

1. Analysis of the problem of building a model for the development of teachers' information and communication competence for military education system in distance learning, defining its place, role and functions in the system of their training and advance training.

2. Systematic understanding of teachers' information and communication competence in the system of military education, such as: outlining its structure, content and definition of semantic and methodological logic; development and substantiation of diagnosis criteria and indicators.

3. Description of pedagogical model blocks for teachers of military education system information and communication competence development, including the following: conceptual, content, subjective, methodical and result blocks. It also includes understanding of interrelations between the above mentioned blocks, such as logical, content, functional, technological and result.

4. Model development:

– on the basis of theoretical and empirical research on the subject of the study, (historical, methodological, methodical, empirical, and experimental data is defined, scientific tasks are determined, including the defined subject of modeling, development of information and communication competence of teachers for military education system;

– highlighting main pedagogical characteristics of teachers' information and communication competence development, which is specified in its content, methods, technologies and main stages;

– substantiation of the methodology for indicative and formative stages of the experiment and development of their results evaluation criteria;

– understanding cause-and-effect relationships of pedagogical modeling, the effect of model implementation in the educational process to develop teachers' information and communication competence in military education system using distance learning training.

Taking into consideration the specificity of teachers' information and communication competence in military education system, we developed a pedagogical model (Fig. 2.1) of its development, which contains tasks for its components development according to the purpose. We'd like to briefly analyze the

purpose and content of its structural components in distance learning education.

Conceptual block makes it possible to determine the purpose and subordinate tasks for the teachers' information and communication competence development in military education system taking into account leading provisions of the following modern methodological approaches:

– development of value-motivational component (values of scientific and educational activities including the use of information and communication technologies; motivation for the development of information and communication competence);

– development of intellectual component (knowledge of the theory of information and communication technologies; knowledge of theoretical background for analysis and decision-making in the military area; knowledge of technologies for processes (phenomena) modeling in teaching general and special military disciplines; knowledge of theoretical principles of cyber-security when using information and communication technologies in teaching general and special military disciplines; knowledge of up-to-date hardware and software; knowledge of technologies for software development in accordance with a certain teaching methodology);

– development of information-technological component (ability to use information and communication technologies; ability to develop and use up-to-date hardware and software, and testing them for cyber vulnerabilities);

– development of praxeological component (ability to use information and communication technologies in scientific and educational activities; ability to synthesize various software tools to improve the effectiveness of teaching general and special military disciplines; ability to develop information software to use in teaching certain general and special military disciplines);

– development of the subjective component (scientific and pedagogical subjectivity in the information society; ability to self-assessment as a subject of information and analytical activities while implementing the functions of a teacher of certain general and special military disciplines).

Content block reflects the content of information and communication competence of teachers in military education system. It contains necessary requirements for its development taking into account modern achievements in psychological, pedagogical and methodological areas, information sphere; it contributes to the consistency, and continuity of its development.

Subjective block ensures the interaction of at least two subjects, the teacher and the student when organizing distance learning. Therefore, before you organize it you need:

– clearly articulate what students need to learn etc.;

– provide a student with the function of a subject of educational activities in the process of distance learning (autonomous, independent, responsible for his/her results);

– provide the student with educational materials in the information environment, which he has to master;

– carefully organize and promote joint learning activities of students in the process of distance learning.

Consequently, careful and gradual implementation of all of the above mentioned will bring a positive result of students distance learning. Moreover, the subject of learning process has to fully master the structure of his/her educational activities, especially in the process of distance learning taking into account ones motives and goals to achieve the result, ability to evaluate, reflect and correct it. Thus, one identifies the main qualities of the subject: self-awareness; self-regulation; autonomy; the ability to take responsibility for the actions (deeds) and the likely outcome of one's actions.

Methodical block provides gradual development teachers' information and communication competence in military education system, which is realized by a certain order of the stages of its development. This block contains a set of various forms, methods and means for teaching and learning organization, which are necessary to achieve the required level of teachers' information and communication competence development. They allow involving all participants in pedagogical training in joint activities keeping in mind personal, scientific and pedagogical interest, needs, opportunities and justifying the order of information and communication competence components development.

Diagnostic and result block includes the result of the information and communication competence development and diagnosing the levels of components development in teachers of the military education system using certain criteria and indicators (value-motivational, cognitive, technological, functional, reflective).

The main function of this block is to determine the current dynamics and levels of information and communication competence development with the help of the developed methodology for its diagnosing (low, satisfactory, sufficient, high) considering the following components: value-motivational, intellectual, information-technological, praxeological and subjective. The information about the established levels of professional competence is analyzed to modify the process of its development. Changes are made by adjusting the tasks, content of training,

organizational forms and methods of teachers' ICC development for military education system during retraining and advanced training courses.

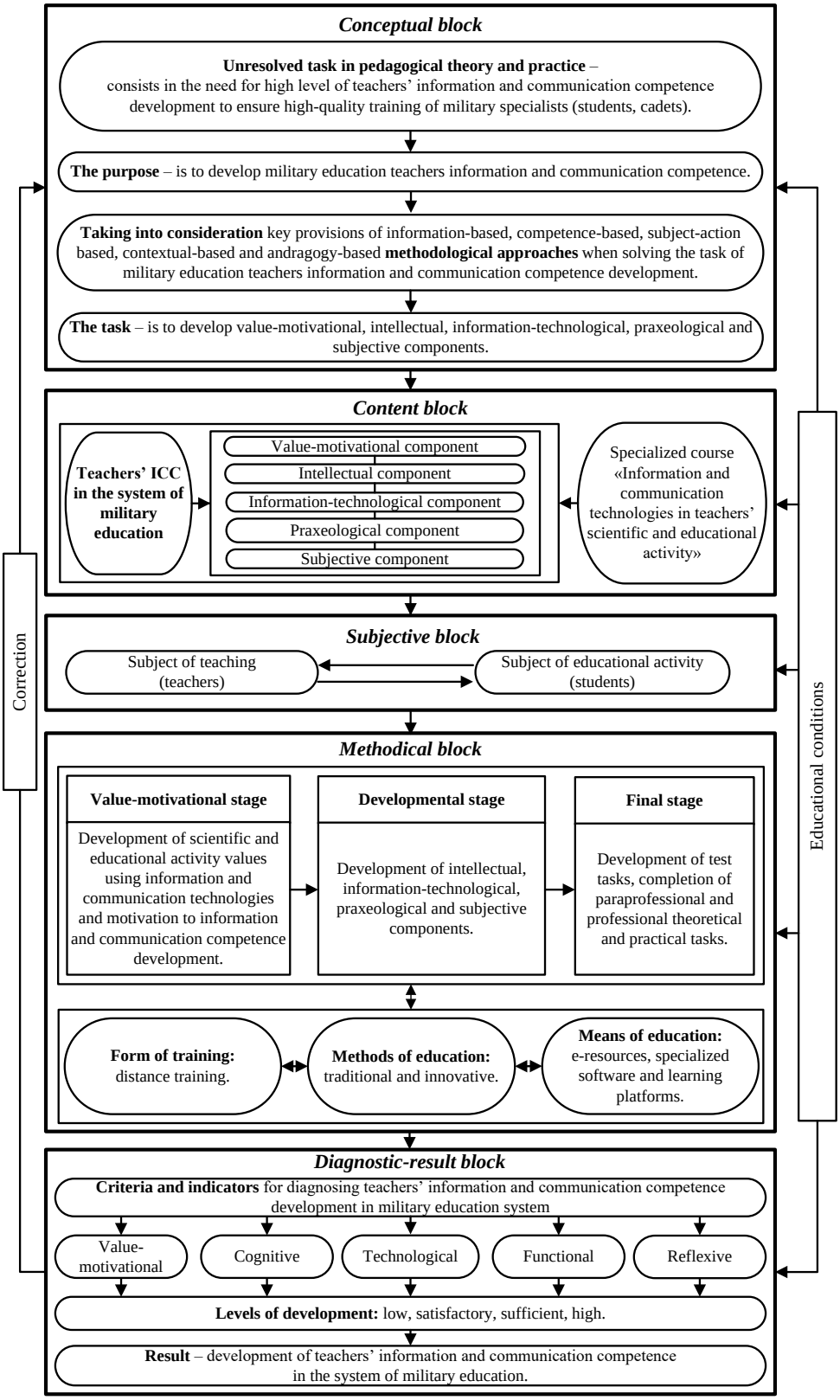


Fig. 2.1. Teachers' ICC development model in military education system

To ensure the effectiveness of all blocks of the model, we defined the following educational conditions for the teachers of military education system information and communication competence development in distance learning:

– integration of distance learning technologies in the process of professional teachers' training in military education system using modern information and communication technologies;

– motivation for information and communication competence self-improvement during advanced training;

– pedagogical modeling of teachers information and communication competence development for military education system in the course of advanced training.

Thus, **educational conditions** of teachers' ICC development can be defined as a set of objective measures (content, organizational forms and methods) aimed at its development.

Therefore, pedagogical modeling is an actual scientific and pedagogical problem. To the solution of this problem devoted works of Ukrainian and foreign scientists. The analysis of literature enabled us to clarify the content of the basic concepts of pedagogical research, «modelling» and «model».

It was found out that modeling the development of information and communication competence of teachers of military education system during distance learning, as a complex pedagogical process, involves the use of certain methodological approaches, among which there are information-based, competence-based, subject-action based and contextual-based.

We developed and substantiated the pedagogical model of teachers' ICC development for the system of military education in the course of distance learning, including definition of educational conditions of its development.

It was found out that the pedagogical model of teachers' ICC development for military education system in the process of distance learning is a reflection of goals, tasks, scientific approaches, principles, conditions and components, process organization, criteria and indicators for diagnosing the levels of its development and understanding the links between them.

2.3. Methodology of development of the informational and communicative competence of teachers in the military education system in the course of distance learning

Currently, in the context of building a modern system of military education in Ukraine, the results of researches in pedagogical science are becoming particularly important. Pedagogical science should justify educational process in higher military education system in the information society, develop innovative technologies and methods of training military professionals, inclusive of ICTs use. One of the promising areas of pedagogical research, in both theoretical and practical aspects, is the development of a comprehensive author's methodology of teachers' ICC development for the system of military education in the course of distance learning. This methodology should follow the current trends in military science and best practices, including information trends.

The decree of Ministry of Defense of Ukraine from 21.12.2015 № 744 «On the approval of the Concept of Distance Learning in the Armed Forces of Ukraine» [46] defines the main direction of distance learning development as one of the key organization forms of education which proves the relevance of our research.

The Dictionary of the Ukrainian language interprets the notion of «methodology» as «the study about teaching methods of a certain subject» [82, p. 664].

However, V. Yahupov, defines methodology as specific forms and means of using methods which allow deeper understanding of various pedagogical problems and their solutions [288, p. 357].

We agree with the opinion of S. Honcharenko, who defines the concept of «methodology of subject» as a branch of pedagogical science that explores the patterns of a particular subject study. The content of the methodology includes establishing the cognitive and educational value of the subject, its place in the education system; definition of tasks of a certain subject and its content; development of methods, methodic means and organizational forms of education in accordance with the tasks and content of education [98, p. 206].

Thus, methodology in pedagogy is a substantiated methodological system of teaching and training methods, types of classes, methodological techniques, means of teaching and training, forms of classes and educational activities organization aimed at solving specific pedagogical problems of formative, developmental and other character, improvement of certain personal, subjective, mental, professional and other qualities of those who are learning.

The results analysis of interpretations of the notion «methodology» in pedagogy makes it possible to conclude that the methodology of teachers' ICC development for the system of military education is a set goals, tasks, content, forms of education organization, teaching methods, types of training sessions and teaching tools that are gradually, contextually and consistently applied and implemented during certain stages of ICC development.

Moreover, it should be based on leading methodological approaches, inclusive of system-based, competence-based, information-based, subject-action based, andragogy-based and contextual-based [138, p. 10–16].

It should be mentioned that modern methodological approaches form a conceptual basis for defining the purpose, objectives, principles, content, teaching methods, types of classes, tools and organizational forms of learning to develop their competence, i.e. main components of methodology which are creatively applied in teachers' ICC development for the system of military education.

The purpose of the methodology is to develop teachers' ICC for the system of military education, which can be achieved by reaching main and partial goals of its development.

According to the goal set, we outlined **main tasks for the teachers' ICC development** taking into consideration the leading provisions of modern methodological approaches, including the following:

– development of value-motivational component (values of pedagogical activity using ICTs; motivation for the ICC development);

– development of intellectual component (ICTs theories; theoretical foundations of analysis and decision-making in the military area; technologies for modeling processes (phenomena) in teaching general and special military disciplines; theoretical provisions of cyber-security in the use of ICTs in teaching; hardware and software means, technologies for developing software in accordance with the methods of teaching a particular discipline);

– development of praxeological component (abilities to effectively use ICTs in educational activities; systematic development and use of modern hardware and software in teaching general and special military disciplines and determine their cyber vulnerability);

– development of information technology component (abilities to systematically and contextually use ICTs in educational activities; synthesize various software tools to increase the effectiveness of teaching specific disciplines; develop information software tools to apply them in teaching);

– development of subject component (pedagogical subjectivity of a

teacher in the information society; the ability to objective self-assessment in educational activity when performing job functions of a teacher of general and special military disciplines).

To develop these components it is necessary to follow the pedagogical requirements and principles of education in higher military education [266, p. 230] considering the principles of distance learning.

The principles of training in higher military education include the following:

– scientific-based learning envisages that all facts, knowledge, regulations and laws that are taught must have scientific ground and follow the latest achievements in science and technology in general, and in the military area in particular;

– systematic and consistent learning, systematic and gradual presentation of educational material and systematic work of cadets (students) with it; depending on the content of a certain subject topic and the specificity of its goals the teacher uses a certain type of classes enabling cadets (students) progress from simple reproduction to independent creative activities with the learnt material, including direct modeling certain military and professional situations using ICT tools;

– accessibility of education, envisages following rules: from simple to complex; from known to unknown; from close to the distant. In also includes taking into account the level of development of teachers, cadets (students), their individual characteristics. It also requires calculation of the cost of time and labor, the intensity level of mental and physical labor of those who are studying;

– connection of training with current military practice, grounds on the objective links between science and military affairs, modern military theory and practice;

– consciousness and activity in learning, which determines the subjective role and position of both teachers and cadets (students) in the educational process. This requires awareness and self-stimulation of their pedagogical and educational activities and results-based management; The principle envisages formation of cadets (students) positive attitude to getting military specialty, interest in educational material, close connection of training with military practice and its practical application, the problem-oriented training, differentiated approach, use of modern information technologies and teaching tools;

– visualization in learning promotes conscious and holistic visual

perception of educational information by teachers, cadets (students), its understanding and learning, cultivates observation, attentiveness and develops practical thinking;

– firmness of knowledge acquisition and practical skills formation includes repetition of educational material by learners, its memorization in combination with the learnt; highlighting the main ideas during the repetition; use of various methods, organizational forms of training and types of training sessions;

– individualization of training allows a cadet (student) to creatively and in individual pace master educational material in the conditions of joint educational activity taking into consideration the level of one's intellectual and military-professional development, individual cognitive and practical needs, interests, motivation, values of military-professional activities, will and ability to work;

– emotionality of learning involves the teacher's influence on the formation of cadets (students) emotional sphere as a military professional, which directly activates their educational and cognitive activities, prevents the emergence of those that negatively affect it by logical and lively teaching the discipline, giving interesting examples and using various visual means etc.

Nevertheless, it is necessary to creatively follow pedagogical requirements and rules of specific recommendations on distance education (V. Bykov) [24], such as:

– interactivity (involves a dialogue between the teacher and the user);

– adaptability (ensures individual pace of educational activities for cadets (students), offers independent choice of course for cadets (students), time for course studying, the period of consultations, exams and tests, frequency and intensity of students' educational activities);

– leniency (consists in centering the educational process around an individual, creating favorable and comfortable learning conditions; mastering the military profession through the realization of individual's creative potential, civic, moral and intellectual qualities which ensures cadets' (students) security and provides safe and comfortable conditions for getting professional education);

– priority of pedagogical approach (the design of distance learning is planned in the course of modeling educational process taking into account the contingent of those who receive education, justification of particular concepts for certain phenomena formation, development and improvement, creation of

didactic models of those phenomena which are planned to implement);

– pedagogical relevance of modern information technologies application (requires pedagogical evaluation of every stage of distance learning design to find out their effectiveness; first and foremost the content of educational courses and educational services that are going to be provided);

– choice of educational content (on the one hand, educational content must meet the regulatory requirements of the State educational standard and the labor market. On the other hand, it must follow specific learner's requirements, in our case teachers and cadets (students) of military education system);

– ensuring information protection which is transferred in course of distance learning via technical system (presupposes implementation of organizational and technical means for safe and confidential storage, transmission and use of various data and information in the educational process);

– compliance with the initial level of education (requires certain level of knowledge, skills and abilities of both teachers and cadets (students);

– relevance of information technologies to the goals, content and methods of training (suitability of information technologies for distance learning models in the system of military education);

– flexibility and mobility (creation of information networks, databases and information banks for distance learning in military education system, which allows adjusting, complementing and improving the program of education; preservation of education information invariant);

– relevance of distance learning to existing organizational forms of education (designed distance learning can give the necessary social, economic and educational effect provided that created and implemented information technologies will not become an alien element in the traditional education system, but will be naturally integrated into it);

– cost-effectiveness (envisages the rational use of financial and material resources, financial and technological calculation of the effectiveness of distance learning advance training in the system of military education).

Teaching methods and types of training sessions used in the methodology. For distance training, like for full-time education, both traditional and active teaching methods are used [291]. For example, the following traditional teaching methods:

1. **Oral teaching**, which is divided into verbal-informational, verbal-

heuristic, verbal-problematic and verbal-research. It includes different types of narration, explanations, storytelling and lectures.

2. **Discussion of learning materials** is divided into verbal-informational, verbal-heuristic, verbal-problematic and verbal-research. It includes various types of conversations, seminars, discussions, brainstorming, intellectual warm-ups, analysis of certain situations etc.

3. **Demonstration** is divided into visual-information, visual-practical, visual-heuristic, visual-problematic and visual-research. It includes demonstration, illustration, observation in the form of personal demonstration to subordinates these or other techniques and actions, demonstration of actions of individual soldiers, groups and units, demonstration of natural and figurative means of visualization, demonstration of films etc.

4. **Practical methods** are divided into practical-reproductive, practical-heuristic and practical-research (problem). These include practical classes, group exercises, laboratory works, exercises, maintenance of military equipment and weapons, command and staff exercises, shooting, driving military vehicles etc. For example, the main types of training sessions in higher military education institutions, in which officers are trained for units and units of communication are tactical combat training, partial and complex training, tactical special training and exercises, command post exercises, military training. Thus, the methods of teachers' ICC development should be adapted to the specificity of general and special military disciplines.

5. **Self-study**, which is divided into all types of classes that were mentioned above, namely verbal-visual-practical-informational. It includes: work with printed sources; self-study of technical equipment; independent training; watching movies and TV independently; work with information sources and the Internet etc.

In addition, self-study should be considered in more details, as it allows developing learner's subjectivity without which learning in the process of distance learning is not possible.

Self-study forms a habit of learning, provides additional time for further study and encourages student's initiative. However, it is necessary to direct and monitor self-study process in order to reach progress in the process of learning.

Additionally, self-study gives freedom of choice and alternatives, i.e. the student chooses the most appropriate method for him/her to perform appropriate tasks on the topic, which creates a prerequisite for being

motivated [202].

D. W. Johnson [114, p. 97] points out that each student must work independently according to a clearly established criterion, must receive its own materials and space, perceive the task as important, disregard other students and use the teacher's help as a resource. Therefore, the ability to work individually without the help of other students is developed.

As a result, we can distinguish the following conditions of self-study:

1. The teacher states tasks in the order of their solution, determines the time to perform the task and gives freedom to work on the issue.

2. Any task should contain information about source for reference.

3. Any task should also have a method how to solve it (written, oral, plan, drawing or scheme).

4. The task for self-study should be articulated clearly and meaningfully.

It should be pointed out that the purpose of setting tasks for self-study is to achieve the goal which is set at the appropriate stage of the process of learning. When preparing a task for self-study it is necessary to take into account the following features:

– setting goals in accordance with the declared final result;

– setting tasks according to the degree of complexity;

– setting tasks according to the number of sources of information;

– creating optimal conditions for creative work.

One should note that the goals of self-study are:

1. Free development of the student, which will be adapted to new living conditions, encouragement of initiative and creativity.

2. Encouragement of independence in educational activities (own pace, style, interests, motivation and values of professional development).

3. Little involvement of the teacher in the independent training of the student.

4. Arrangement of the time for educational information access.

5. Improvement of students' learning activities quality as a result of boosting motivation and interest.

6. Continuous evaluation of progress in educational activities and adjustment of its content.

7. Everything that the student learns during self-study activities becomes a personal belief. It ensures thorough, valuable, competent and creative preparation for training classes and advanced training.

Consequently, we can conclude that self-study is designed to achieve

educational goals and is determined by the teacher on the basis of educational features for advanced training in distance learning, including:

– time limit;

– the complexity of the curriculum;

– the level of training and individual characteristics of students;

– real conditions of the educational process.

It should be pointed out that self-study ought to take into account the fact that students have individual characteristics in the degree, qualities of intelligence, temperament, character and most importantly, motivation to improve skills.

Thus, the teacher must take into account all individual students' characteristics in the course of training process to determine the criteria for setting goals of their self-study and its evaluation.

The criterion for setting goals of self-study should be based on their clear articulation, which indicates its purpose and simplifies objective assessment.

Depending on the training course one can define certain types of tasks for self-study:

– finalizing knowledge acquisition (often the teacher notes that when doing self-study tasks, most students make mistakes, hence, there is a need to provide necessary theoretical support);

– encouraging knowledge acquisition and consolidation of practical skills and abilities (after completing certain tasks, the teacher decides that it is necessary to consolidate the acquisition of knowledge in practical exercises);

– enhancing knowledge (during self-study the teacher notes that students easily achieve the proposed goals, and then increases the complexity of tasks).

It should be stressed that the tasks for self-study are set in accordance with the competencies that must be acquired by the student. Therefore, self-study can be aimed at defining the following tasks:

– refreshment of knowledge (when the teacher understands that the student has some gaps when doing self-study tasks. As a result, the teacher offers the student useful materials to fill knowledge gaps);

– consolidation of knowledge (the teacher offers the student to solve problems and synthesize different knowledge in practice);

– stimulating motivation to acquire new knowledge (the teacher offers interesting self-study tasks that stimulate the student's learning activities).

Consequently, special attention should be paid to the number of hours for self-study in each discipline and topic. The distribution of the number of hours largely depends on the specific features of a certain academic group of students (initial knowledge, guidelines).

In addition, we need an effective pedagogical strategy to achieve the expected result of self-study. The most important point, to our mind, is continuity, consistency, context and practical orientation. The teacher has to take into account types of competencies that have been formed by previous learning topics and know how to further enhance their consolidation, development and improvement. The form of self-study should be chosen in a way to ensure the continuity of the development of relevant competencies.

Therefore, time for self-study has to be accurately planned in the process of distance learning, taking into consideration the curriculum. Additionally, the teacher must monitor students in the process of self-study to avoid mistakes, possible dangers, when training certain tasks, in particular in the course of doing them in the wrong way.

Assessment of self-study should be well planned. At the initial stage, it is necessary to clearly define the object and aims of evaluation, the scope and timing of a particular task, forms, methods and strategies that will be used to achieve the result.

6. **Methods of control and self-control** in learning include the following types of training classes:

– individual interview;
– survey;
– written tests;
– quizzes;
– mid-course tests;
– automated control;
– self-control;
– final exam etc;

It should be pointed out that after determining the structure of the distance course, the teacher should use the best combination of teaching methods and techniques for course teaching. In this regard, the process of distance learning involves combination of the following teaching methods (Table 2.1):

1. Explanatory methods contribute to the acquisition of new information in

the process of distance learning. They include presentations, case studies, real-life examples, demonstrations.

2. Practical methods contribute to the intensification of distance learning, in particular, students use them to do tasks and develop new knowledge, skills and abilities. Application methods include practice demonstrations, educational materials, case-based or case-specific exercises, role-plays, simulations, guided research, and projects.

3. Cooperation and joint work methods emphasize the social aspect of learning and involve students in the exchange of knowledge while interacting with each other. These include online-guided discussions, collaboration and equality learning method.

Table 2.1

Teaching methods

Explanatory	Practical	Cooperation and joint work
– presentations; – case studies; – real-life examples; – demonstrations.	– methods of practice demonstration; – educational materials; – case-based exercises; – role-plays; – simulations and games; – guided research; – projects.	– interactive discussion; – collaboration and joint work; – teaching method of equality.

Each method can be implemented and presented in different formats, using different types of ICT tools. For example, a presentation can be presented as a *Power Point* file or as a recorded (or live) video presentation. An online discussion can be held on a forum or via the *BigBlueButton*.

The format is chosen considering additional factors related to the specificity of distance learning, technological and organizational constraints (such as budget) and available time.

Let's analyze them in more detail:

1. Explanatory methods

They require students to listen, read and watch. Hence, the information provided by the teacher on a particular topic in the course of distance learning may be supplemented with tests and exercises to assess the memorization and / or understanding of its content.

Students use explanatory methods to obtain information, but they can be combined with other methods to create different types of content information

for the distance learning course. Typically, explanatory component is used to provide guidance and basic concepts before moving on to more practical and complex stages of students' learning activities. Presentations, especially in video formats, can also be used to sensitize and influence the attitude of students in the process of distance learning.

Explanatory methods include:

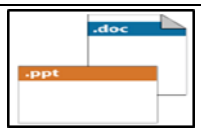
– presentations (organized information on a particular topic);

– case studies (real, significant cases related to the educational topic);

– real-life examples (examples of certain situations with comments and clear references to the theory);

– demonstrations (illustrations of how the task can be performed).

In distance learning, they can be implemented and presented in the following formats:

	simple content, such as *PowerPoint* documents and presentations, without interactivity;
	interactive training sessions using text, images, audio, animations and practice;
	presentations developed by an expert or instructor that are broadcast in real time or recorded so that students can watch them at any time. Classes can be recorded in both video and audio formats (podcasts);
	webinar and virtual class. The teacher presents the content to a group of students who are simultaneously connected to the distance learning platform. Students can interact with the teacher (instructor), ask questions and receive feedback via video conferencing, audio call or chat. The teacher can use special software called «virtual room software». These applications usually include a number of synchronous tools such as whiteboard, application sharing, audio conferencing and chat. Students can use these tools to interact with the teacher and other students, ask and answer questions, vote etc.

2. Practical methods

Practical methods involve learners in distance learning activities, which can range from simple exercises (such as practice demonstration) to more complex learning activities such as modeling or research. When using them the teacher should provide recommendations and facilitate students' educational and cognitive activities.

Practice demonstration

This method is used to teach the appropriate procedure. This is usually a software procedure, such as how to generate a map using geographic information system (GIS) software, the use of directive learning. The procedure is first demonstrated by a teacher or instructor, and then students are asked to work out the appropriate procedure by interacting with the teacher and software.

In distance learning, this method can be implemented and presented in two formats, as shown below:

	interactive remote classes using a combination of animation and operational modeling (based on the order of operations), which allow students to interact with the system and receive feedback on its functioning;
	a virtual room where a teacher shows practical actions using software exchange tools, which allows students training appropriate actions.

Course materials

Course materials in the process of distance learning provide timely access and information reception, i.e. acquisition of the necessary knowledge. They usually give important answers to particular questions, which allow students to consistently complete learning tasks within a distance course. For example, students may be provided with information material to help them develop a conceptual learning plan or a certain learning topic.

This can be realized and presented using the following format:

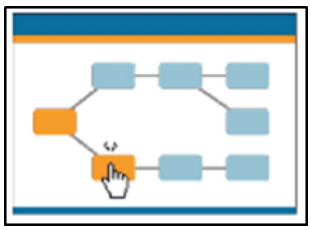
	printed documents such as checklists, technical dictionaries and manuals. Online help or more sophisticated interactive online systems.

Case- based exercises and scenarios

Case-based exercises are used to develop cognitive skills and abilities in a particular field of knowledge. Teachers usually demonstrate to students how to apply knowledge in a certain practical situation. This method is usually based on a script, such as a complex situation, where students are required to make a decision by choosing different options.

For instance, students may need to choose the best method of educational network cyber-security assessment using specialized software. They are given an overview of various evaluation methods, criteria and information about particular specialized software. Then the teacher comments on the students' results.

This teaching method can be realized using the following presentation formats, as shown below:

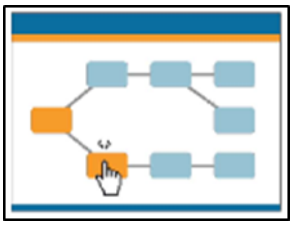
	linear distance classes using text, images, audio, animation and practice (questions and feedback); feedback is provided to students by commenting on the appropriateness of their choice, after which they move on to the next typical situation;
	remote simulation based on multipath scenarios (they are also called experimental simulations); each student's choice creates results that generate feedback. Feedback is provided through a further situation that gives more options;
	individual distance learning classes, which present a complex situation with information and tools needed to develop a solution to the problem; each student is invited to develop their own solution, using available information. The teacher can provide feedback during or at the end of a certain learning task;
	activities performed by a group of students; it also provides an opportunity to practice interpersonal culture of interaction (e.g. negotiation skills).

Role play

It is used to develop cultural, interpersonal interaction. Students are encouraged to use principles related to behavior (e.g. communication principles) in a certain pedagogical situation.

For instance, students can be divided into groups of two: one appointed as an expert in the use of specialized distance learning software, and the other as a teacher of a particular discipline. The expert should persuade the teacher to take appropriate measures based on his recommendations to improve the effectiveness of students' learning activities. After modeling the situation, the teacher analyzes and comments on the effectiveness of the situation.

In distance learning, this method can be implemented and presented in the following formats, as shown below:

	remote simulation based on multipath scenarios (they are also called experimental simulations); each student's choice creates results that generate feedback. Feedback is provided through a further situation that gives more options;
	role-plays conducted as a group learning activity, using means of communication, such as chats, audio or video conferences and forums; a specific role is assigned to each student. Students interact with each other to achieve particular goals and/or common goals.

Symbolic simulations and games

Symbolic modeling is used to develop a scientific understanding of complex systems (e.g. distance learning systems) or the ability to automatically control complex learning processes. Students can interact directly with the system, i.e. to work out appropriate algorithms for individual educational tasks solution.

For instance, if students need to analyze the effectiveness of distance learning introduction in the process of education in an educational institution, they can analyze the relevant parameters of its functioning, i.e. consider its specificity.

In distance learning, this method can be implemented and presented in the following format:

	symbolic simulations based on the system mathematical model, simulating a natural, social or economic system. Hence, educational games are simulations that include a competitive component, a complex goal, a set of rules and a set of restrictions.

Guided research

The teacher gives the task to study a certain topic. He can guide the student in gathering and structuring information necessary for the research. For example, students may be tasked with analysis of *Moodle* distance learning system. Thus, the teacher provides students with suggestions on how to find necessary information and how to illustrate it using various software products for its interactive perception.

In distance learning, this method can be implemented and presented using the following format:

	forums, emails, chats, audio and video conferences for communication between teachers and students. To present results one can use Wiki, blogs and shared documents.

Projects

The teacher or instructor gives the task to develop a distance course or project, using the learnt principles and concepts. For example, students can be asked to develop technical requirements for a future distance course, i.e. its structure, presentation format etc.

In distance learning, this method can be implemented and presented using the following format, as shown below:

	forums, emails, chats, audio and video conferences for communication between teachers and students. To present results one can use Wiki, blogs and shared documents.

3. Cooperation and joint work

This method is based on a dialogue and discussion between the teacher and students. It adds social aspect to the learning experience, using the principles of social constructivism and collaborative learning. They allow students to benefit from the support of colleagues in educational activities, and enable them to get each other's feedback on joint activities.

Web-administered discussions

Administered discussions are designed to facilitate learning activities and improve students' knowledge and skills. The teacher asks students questions to encourage and focus on critical thinking. These discussions usually complement other methods, such as presentation, research, or practical exercises.

Administered discussions also facilitate communication and knowledge sharing among students. For example, after individual researches on the effectiveness of information systems in the process of education, students can be asked to describe how these systems work and what their features are.

In distance learning, this method can be implemented and presented using the following format, as shown below:

	forums, emails, chats, audio and video conferences.

Joint work

Students work together to complete different types of learning activities, such as task/project evaluation, analysis or development. This method requires them to cooperate, listen to each other, discuss and negotiate; they develop a culture of interpersonal interaction.

For instance, students can be divided into small groups and instructed to assess the impact of distance learning using the principles learned during the course.

Each group has to provide an evaluation report about the result of task solution. In distance learning, this method can be implemented and presented using the following format:

	forums, emails, chats, audio and video conferences for communication between students. To cooperate with each other one can use Wiki, blogs and shared documents.

Teaching method of equality

Students watch and support each other. They have an opportunity to learn to work with each other and practice relevant learning skills. This method is useful for working out certain joint training projects.

For instance, each student may be asked to review other student's performance report and make suggestions for addressing particular gaps

taking into consideration the principles learned during the course.

In distance learning, this method can be implemented and presented using the following format:

	forums, emails, chats, audio and video conferencing, wikis, blogs and shared documents.

However, in most cases, two or more teaching methods are combined in the process of distance learning by using different formats types for their presentation.

Therefore, it is necessary to analyze main advantages and disadvantages these methods use in the process of distance learning.

Explanatory methods:

1. *Technique* – presentations, case studies, real-life examples and demonstrations.

The purpose is to promote knowledge acquisition (mostly conceptual and factual knowledge), orientation, motivation and change of an attitude.

1.1. *Presentation format* – simple learning resources (documents and presentations).

Advantages – fast development.

Disadvantages – lack of passive learning activities.

1.2. *Presentation format* – interactive distance learning.

Advantages – flexibility, allows using different methods.

Disadvantages – low/medium interactivity, in particular the risk of passive learning (to avoid this risk requires proper use of teaching methods and ICT tools).

1.3. *Presentation format* – webcast (video tutorials and podcasts).

Advantages – ease of development.

Disadvantages – Internet connection needs to be considered.

1.4. *Presentation format* – webinars (video conferencing and audio conferencing, chat).

Advantages – creates interaction between a teacher and a student.

Disadvantages – a teacher must be ready to teach on the Internet and use appropriate supporting ICTs taking into consideration students' possibility to connect.

Practical methods:

1. *Technique* – a method of practice demonstration.

The purpose is to develop procedural skills.

1.1. *Presentation format* – a combination of animation and remote simulation.

Advantages – allows students to practice.

Disadvantages – it is mainly used for software.

1.2. *Presentation format* – virtual rooms (using shared access to ICT, applications.

Advantages – allows students to practice.

Disadvantages – Internet connection needs to be considered.

2. *Technique* – course materials.

The purpose is to provide timely information and instructions.

2.1. *Presentation format* – printed documents such as checklists, technical dictionaries, templates and manuals.

Advantages – helps to obtain the necessary information in place.

Disadvantages – expert systems require complex design.

2.2. *Presentation format* – online help and expert systems.

Advantages – helps to obtain the necessary information in place.

Disadvantages – expert systems require complex design.

3. *Technique* – case-based exercises.

The purpose is to develop cognitive skills.

3.1. *Presentation format* – interactive distance learning.

Advantages: a good level of interactivity.

Disadvantages – time-consuming structure and design.

3.2. *Presentation format* – remote simulation based on multipath scenarios.

Advantages: highly interactive.

Disadvantages – time-consuming design, multimedia simulations can be expensive to use, require support of an online teacher or instructor.

3.3. *Presentation format* – individual learning activities.

Advantages: highly interactive and personalized.

Disadvantages – design takes a lot of time, requires support of an online teacher or instructor, Internet connection needs to be considered.

3.4. *Presentation format* – group activities on the Internet.

Advantages: highly interactive, social aspect.

Disadvantages – design takes a lot of time, requires active support from

an online teacher, Internet connection needs to be considered.

4. *Technique* – role-plays.

The purpose is to develop interpersonal skills and stimulate a change of attitude to the situation.

4.1. *Presentation format* – interactive distance learning.

Advantages: a good level of interactivity.

Disadvantages – time-consuming structure and design.

4.2. *Presentation format* – electronic modeling based on multipath scenarios.

Advantages: highly interactive.

Disadvantages – time consuming structure and design, multimedia simulations can be expensive to use.

4.3. *Presentation format* – group activities on the Internet.

Advantages: highly interactive and social aspect.

Disadvantages – design takes a lot of time, Internet connection needs to be considered, requires active support of an online teacher.

5. *Technique* – simulations and games.

The purpose is to develop deep understanding of complex systems.

5.1. *Presentation format* – symbolic modeling.

Advantages: highly interactive, allows practicing high level of cognitive efficiency (apply, analyze).

Disadvantages – time and cost of developing and implementing the appropriate system, requires active support of an online teacher.

5.2. *Presentation format* – educational games.

Advantages: highly interactive, allows practicing high level of cognitive efficiency (apply and analyze).

Disadvantages – time and cost of developing and implementing the appropriate system, requires the active support of an online teacher.

6. *Technique* – guided research.

The purpose is to actively develop knowledge.

6.1. *Presentation format* – forums, e-mail, chat, audio and video conferences, wiki, blog and shared documents.

Advantages: practice and cognitive efficiency.

Disadvantages – requires active support from an online teacher.

Joint work:

1. *Technique* – work on the project.

The purpose is to actively build knowledge.

1.1. *Presentation format* – forums, e-mail, chat, audio and video conference, wiki, blog and shared documents.

Advantages – a high level of cognitive efficiency.

Disadvantages – requires active support of an online teacher to provide help and feedback.

2. *Technique* – interactive discussion.

The purpose is to stimulate critical thinking and reflection, to promote communication among students, develop cultural interpersonal interaction, to stimulate change of attitude.

2.1. *Presentation format* – forums, e-mail, chat, audio and video conference.

Advantages – socialization and knowledge exchange.

Disadvantages – less effective than joint project work to achieve learning objectives; Internet connection needs to be considered.

3. *Technique* – joint work.

The purpose is to stimulate critical thinking, develop skills necessary to solve situational problems, develop cultural interpersonal interaction, to stimulate change of attitude.

3.1. *Presentation format* –forums, e-mail, wiki, blog, chat, audio and video conference and shared documents.

Advantages – allows students to clearly explain their actions through argumentation.

Disadvantages – you need active support of an online teacher to provide help and feedback, Internet connection needs to be considered.

4. *Technique* – method of equality.

The purpose is to stimulate critical thinking and reflection, develop cultural interpersonal interaction, to stimulate change of attitude.

4.1. *Presentation format* – forums, e-mail, wiki, blog, chat, audio and video conference, shared documents.

Advantages – well suited for training projects.

Disadvantages – Internet connection needs to be considered.

Combination of various teaching methods and types of training for teachers' ICC development in the system of military education contributes to the development of subject actions, the development of modus-operandi inherent in their scientific and eductional activities using ICTs. The development of their ICC is impossible without a pedagogically balanced use of various types of training classes. It is also advisable to use all traditional types

of training classes in the process of their distance learning. A mandatory methodological requirement is their adaptation to the ICT system and its application, taking into account the educational needs and capabilities of teachers in military education system.

Teaching tools. In methodology it is advisable to use all the tools used in the process of education, including ICTs: computerized educational systems in regular and multimedia versions; laboratory distance workshops; simulators; electronic libraries with remote access; didactic materials based on expert systems for educational purposes; didactic materials based on geographic information systems etc.

It should be noted that the appropriate means of distance learning can be used in different ways depending on the method of teachers' remote communication in the system of military education. They can usually use either synchronous or asynchronous communication modes.

Thus, when teachers and students communicate in different places at the same time, such communication is called synchronous, while asynchronous is communication that takes place at a different time according to the student's individual plan (Table 2.2).

Table 2.2

Differences between synchronous and asynchronous modes

Parameter	Synchronous	Asynchronous
Motivation for teaching activity	To a large degree	To a small extent
Possibility of interaction	Yes	No
Feedback	Direct	Indirect
Students' support	Direct	Indirect
Student's isolation	small	large
Flexibility	No	Yes
The breadth of technological infrastructure	Great	Little
Support cost	Great	Little
Waiting time and time for student control	Minimal	Huge
Motivation for «contact» with course materials	To a large degree	To a small extent

Thus, we will consider the learning tools that are used in synchronous and asynchronous communication.

1. Synchronous communication mode:
– telephone connection;
– audio conference;
– video conference;
– conference using the «board»;
– chat-type applications.
2. Asynchronous communication mode:
– fax;
– videos;
– audio recordings;
– e-mail.

It is worth mentioning that the speed of learning activities will not get better or faster just by introducing modern ICT tools or replacing one learning tool with another. Effective use of ICTs in education requires reflection, experimentation and a willingness to spend the time needed to develop and improve strategies until they are effective. Patience is important and it takes time to see the results of appropriate efforts.

In addition, ICTs, including radio and television, as well as new digital technologies such as computers and the Internet, have been recognized as potentially powerful tools for changes in the system of education, including the military. With its proper use, there is an opportunity to expand access to education and increase its relevance.

ICTs are more than just technologies. It is a mean without which it is impossible to perform everyday scientific and educational or other activities. We can state that there is dependence on them, and it is obvious. For example, radio and television have been used for more than forty years for open and distance learning, although printing remains the cheapest, most accessible, and therefore the most dominant delivery mechanism in both developed and developing countries. The use of computers and the Internet is still emerging in developing countries due to limited infrastructure and associated high access costs.

Modern ICTs are potentially powerful tools that can expand education opportunities. They allow asynchronous learning which is characterized by a time delay between receiving information and its learning. Distance learning materials, for example, may be available 24 hours a day, 7 days a week. In addition, some ICT tools, such as video technology, allow simultaneous information delivering to students that are geographically located in different

places.

As a result, teachers and students no longer have to rely solely on printed books and other materials on physical or printed media stored in libraries (available in limited quantities) for their educational needs. Thanks to the Internet and the World Wide Web, access to many educational materials on almost any information resource can now be accessed from anywhere at any time of the day by an unlimited number of people. This is especially important for many educational institutions in developing countries, as well as in some developed countries that have limited and outdated library resources. ICTs also facilitate access to supervisors, mentors, researchers and other professionals individual resources around the globe.

In this regard, improvement of the education and training quality is crucial, especially when education is expanding. ICT tools can improve its quality in several ways:

– by increasing students' motivation and involvement;
– encouraging basic skills acquisition;
– increasing the level of teacher training.

It should be mentioned that ICTs are transformational tools that, if used properly, can help create an e-learning environment targeted at a certain category of learners, such as *Moodle* distance learning system.

Multimedia and specialized software, which combine text and sound, can also be used to provide complex and authentic content for a certain distance learning course, which will increase students' motivation in the process of learning. Interactive learning also uses sound effects, songs, dramatizations, comic scenes to attract students to take an active part in learning activities. Moreover, ICT tools such as NCs with an Internet connection can also increase students' motivation by combining richness of media and interactivity of other ICTs with the ability to communicate with other students.

It's worth mentioning video conferencing, a powerful ICT tool which enables students' interactive remote communication. It works using several different technologies. Some of these technologies are hardware, while others involve specialized software.

Thus, one can use a special training room (studio) or a desktop PC equipped with a webcam or even a smartphone or tablet with video calls apps to communicate [213].

It should be noted that over the last decade, video conferencing has become a popular and reliable tool to deal with large distances, especially in

cases when travel is inexpedient or undesirable. Understanding of what is needed for video conferencing and its application has become one of the main research topics for scientists around the globe, for instance:

– the effect of using video conferencing in the classroom [227];

– the potential of video conferencing as a tool to support distance learning [87];

– the effectiveness of video conferencing in terms of students' perception of lecture content [70];

– the impact of video conferencing on the students' learning activities [41];

– system utilities application in creating video conferences [260];

– the impact of video conferencing various scenarios on peer education effectiveness [219];

– distance learning using interactive video conferencing in pharmacotherapy courses [168];

– use of video conferencing as a tool to support distance learning [273];

– comparative analysis of the effectiveness and students' satisfaction of the video conferencing use and face-to-face training in training courses for medical students [121];

– support of joint educational activities in a video conference [66];

– comparative analysis of the use of video conferencing and face-to-face lectures in training future doctors for exams in clinical practice [11];

– the effectiveness of interaction with native speakers via video conferences to develop students' language skills [276];

– the impact of video conferencing on students' interaction and communication [86];

– development of foreign language competence with the help of video conferences [116];

– development of cultural competence of students with the help of video conferences [115];

– the effectiveness of students' training in the course of team sessions [62];

– the use of video conferencing as a tool to facilitate communication between teachers and students [169];

– remote cooperation between students with the help of video conferences [135];

In this regard, it can be stated that the use of video conferencing in

learning process is a topical issue for the research, in particular during distance learning of teachers in the system of military education.

It should be emphasized that a video conference realizes the key elements of students' joint learning activities – communication [102] and encouragement to take part in this activity [204]. Hence, in the process of distance learning the key to effective communication and motivation to learn is video conferencing.

We also agree with the scientists [153] & [275], who argue that an important aspect in the process of distance learning using video conferencing is building a truly joint audience for educational activities.

It is worth mentioning that, as a rule, it is the main problem of distance learning, when everything is really purely formal, contradicting what is required by pedagogical practice. It should be emphasized that the construction of joint learning activities in the process of distance learning is a really difficult task, even in face-to-face conditions. This happens due to many factors in the process of organization and the available hardware and software infrastructure, both from the side of teachers and students. This results in a stable video connection and enables joint learning activities of teachers and students.

Therefore, to solve this problem it is necessary to use the experience of scientists in video conferencing application during distance learning. In particular, we need to focus on providing and involving the subjects of joint educational activities in the use of videoconferencing in its various manifestations [162].

It should be emphasized that modern ICTs have reached such level of stability, ease of use and accessibility that it allows using them in different learning scenarios, not just research projects [224]. Thus, modern hardware and software systems provide improved video and audio communication quality and thanks to more effective compression can operate with different types of Internet connections.

It should also be noted that high processing capacity and cheaper peripherals such as webcams allow participating in video conferencing with special software and a personal computer without any special expensive equipment.

As a result, many companies are developing specialized software for video conferencing, such as:

1. S*kype* – (USA).

2. *Discord* – (USA).
3. *Cisco Webex* – (USA).
4. *Polycom* – (USA).
5. *Vidyo* – (USA).
6. *Zoom Video Communications* – (USA).
7. *Skype* – (USA).
8. *BigBlueButton* – (Canada).
9. *Hangouts Meet* – (USA).
10. *BlueJeans* – (USA).
11. *StarLeaf* – (UK).
12. *Lifesize* – (USA).
13. *UberConference* – (USA).
14. *Microsoft Office Live Meeting* – (USA).
15. *Paltalk* – (USA).
16. *GoToMeeting* – (USA)

These software products are becoming popular and we can state that they are used in all leading institutions of higher education, including educational institutions of the system of military education.

Moreover, the COVID-19 pandemic proved the relevance and practical importance of advanced ICT tools introduction in the process of education in higher education institutions, including distance learning technologies which were implemented during quarantine restrictions in Ukraine. Hence, from March to May 2020, The National Defence University of Ukraine named after Ivan Cherniakhovskyi planned, organized and implemented a comprehensive distance training of both intramural and extramural students of operational-tactical and operational-strategic levels and retraining and advance training courses. Particularly, *Moodle* distance learning platform and the integrated video communication plug-in *BigBlueButton* were used, which allowed responding quickly and efficiently to the challenges of quarantine restrictions in Ukraine.

Typically, video conferencing participants use a web application or specialized software to interactively communicate with students in virtual rooms. This approach is the simplest, cheapest and way easier to use and provides easy access to shared course materials. It is worth mentioning that with the development of Internet bandwidth, available resources now enable greater interaction and transmission of large amounts of data via video conferencing [42].

Thus, the use of video conferencing in joint learning activities can provide greater interactivity of learning activities in the course of learning process. It is possible by transferring various video and audio learning materials, data in real time, rather than simply uploading the presentation to the distance learning platform.

It is worth noting that video conferencing consists of three main components:

– hardware and software;

– network that transmits signals between the subscribers;

– conference environment.

Hardware and software is required to start a video conferencing session includes a camera, a microphone, a computer and some additional peripherals [83].

Let's analyze some of them:

1. A camera is required to record video images and convert them in a machine code (signal). The location of the camera should be ideal to provide a realistic view of the event that is reproduced. Video-image has to be of good quality, clear, with low visual noise.

2. A microphone is needed to transmit voice. Microphones are usually extremely sensitive and should be placed away from equipment that can produce background noise, such as projectors.

3. A computer is necessary to create, process and transmit data within a video conferencing session, and ensure its functioning in general.

Network

Video conferencing subscribers communicate directly via the Internet and data protocols. When connecting, various video and audio processing protocols are used.

Conference environment

Light is an easy way to improve video image quality. If the room is not specially built or equipped for video conferencing, it may affect its quality [224]. As a result, the image will lack color saturation.

Therefore, we need to consider advantages and disadvantages of using video conferencing.

Advantages of video conferencing:

– exchange of presentations;

– access of teachers, experts and specialists to certain training sessions;

– rational use of time (eliminates time spent on the commuting and significantly saves expenses);

– a large number of video conference participants who in other case could not join;

– video conferences can be recorded and saved for further sharing among students via the Internet.

Disadvantages of video conferencing:

– can make students lazier, as they can have their classes at home without supervision from the side of a teacher, especially due to lack of self-discipline;

– loss of connection may deteriorate the quality of image and sound.

– the atmosphere of face-to-face meeting is lost;

– emotional excitement that increases on the one hand due to the need to explore and use new and unfamiliar to the student ICTs, and on the other hand – lack of prior acquaintance with other candidates, i.e. video conferencing is more effective when participants already know each other;

– cyber-security of video conferencing session.

Thus, video conferencing is used in both formal and informal learning contexts to facilitate discussions between teachers and students, as well as for remote access by experts.

In the process of distance learning, video conferencing is a useful tool that provides direct learning and support to students minimizing their isolation.

Forms of organization of distance learning encompass forms of organization and implementation of remote advance training courses for teachers in the process of education, where participants interact mainly over distance which does not involve direct learning interaction face to face. It means that participants are territorially outside the scope of possible direct educational interaction and their personal presence in the process of learning in educational institution is not mandatory [24].

The process of interaction between participants is usually synchronous (remote contact with the teacher, in real time) or asynchronous (non-contact interaction mode with the teacher).

Therefore, in teachers' advanced training pedagogical practice in distance learning mode, one can creatively adapt and use the following well-known types of classes: lectures; seminars; laboratory classes; tests; mid-course tests; exams; consultations; self-study etc. But they have to be adapted to distance learning in both contact and non-contact phases of learning.

It is best to use active learning methods that can be implemented by using computer networks, audio, video and other telecommunications, including the Internet (Table 2.3).

Table 2.3

Types of classes to develop teachers' ICC in military education system using distance learning

Stage	Aim	Task	Method, technique	Type of class
1	2	3	4	5
Value-motivational	To develop and enrich values and motivation for ICC development	To develop value-motivational component of ICC	questionnaires, testing, incentives, interviews, discussions etc.,	All types of classes in higher military education
Developmental	To develop theoretical and practical knowledge on the use of ICTs in educational activities, practical skills and ability to apply them in their activities	To develop intellectual, information-technological, praxeological, subjective components of ICC	Self-study of course materials, conversations, discussions, method of exercises, method of oral control, self-control, method of written (test) control	All types of classes in higher military education
Final	successful implementation of the previous stages of ICC development methodology; pedagogical diagnosis of the levels of teachers' ICC development	To complete teachers' ICC development in military education system; to find out the levels of teachers' ICC development	method of written (test) control of knowledge, practical skills and abilities to apply ICTs in educational activity	Practical and test classes

Thus, the use of ICTs in teachers' ICC development during distance learning affects all system components of its methodology, which allows solving much more complex and applied pedagogical problems and problematic situations in its development, improving their creative intellectual and practical potential, critical and at the same time pedagogical thinking, independence in acquiring knowledge, working with various sources of educational information.

Within our study, all the above mentioned elements of ICC development methodology are located in the value-motivational, developmental and final stages, each has its own tasks and at the same time provides specific educational results considering research purpose and hierarchy of stated goals for teachers advance training in the course of distance learning. Its

implementation should be carried out by training teachers within a distance course «Information and communication technologies in teachers' scientific and educational activities» (62 hours, 2 weeks).

Therefore, we will analyze each stage of the methodology for teachers' ICC development in military education system during distance learning.

Value-motivational stage is aimed at developing and enriching values of ICC development by solving the following tasks: development of a positive attitude of teachers to ICTs and its systematic application in teaching; enrichment of the axiological sphere of their consciousness and self-awareness about ICTs, its nature among the categorical concepts of the universe, transformation of ICTs essential characteristics in the formation of information society: value orientations of teachers pedagogical existence in information society as subjects of professional educational activity; promotion of their awareness of value aspects of ICTs use and clarification of the practical application peculiarities of ICTs in teaching.

Additionally, this stage is aimed at improving motivation for ICC development by solving the following tasks: developing motivational attitude of teachers to educational activity, which includes enrichment of guidelines for the systematic use of ICTs in educational activities; development of teachers' desire to enrich their own information and communication potential as subjects of educational activity.

Thus, teachers must be aware of the value-motivational aspect of ICTs use in teaching, have a clear idea of where they can and should use, and understand the benefits of developing their ICC as teachers in information society and the system of military education.

The developmental stage is aimed developing theoretical and practical knowledge of ICTs use in the process of education, practical skills and abilities to creatively apply them in teaching. In particular, main attention is paid to the development of the ability to search for and analyze information, synthesize and compare it, abstract, generalize and specify it using ICTs, taking into consideration the specificity of teaching general and special military disciplines. Particular attention should be paid to the development of flexibility and critical practical, military and professional thinking; development of a set of skills for working with hardware and software and its systematic and creative use in teaching; advanced nature of the practical application of ICTs for the design and modeling of paraprofessional situations in military activities.

Final stage hypothetically assumes that the successful implementation of

the previous stages of the methodology of ICC development will contribute to the development of all its components. Teachers are able and willing to creatively use ICTs in teaching. Hence, to confirm this hypothesis, it is necessary to diagnose its development, which will give an opportunity to assess the effectiveness of the proposed method.

Thus, the development of teachers' ICC for the system of military education is an urgent scientific and pedagogical task which involves the use of appropriate specialized methods of its development. During the specialized course «Information and communication technologies in teachers' scientific and pedagogical activities» design and implementation we adhered to the principles of appropriate methods of teachers' ICC development in the process of distance learning. Therefore, consistent study of distance learning topics using ICTs is a necessary pedagogical condition for the effective implementation of the methodology for ICC development.

2.4. Scientific substantiation of indicators and criteria for assessing the development degree of the information and communication competence of teachers in the military education system

Analysis of scientific literature and researches devoted to the study of ICC shows that to the issue of determining criteria and indicators for ICC development diagnosing dedicated their works both Ukrainian and foreign scholars, for instance A. Calvani, A. Cartelli, A. Fini & M. Ranieri [33], J. Cantabrana, M. Rodriguez & M. Cervera [35], D. Carless, G. Joughin & M. Mok [36], S. Carretero, R. Vuorikari & Y. Punie [39], H. Degtiariova [55], H. Fedoruk [68], S. Hooper & L. Rieber [100], P. Hrabovskyi [103], A. Kocharian [124], H. Poldoja, T. Valjataga, M. Laanpere & K. Tammets [208], A. Sanchez & M. Ruiz [226], N. Soroko [244], O. Spirin [249], I. Tymofieieva [262] etc. Results of their scientific papers contain conceptual, theoretical and methodological aspects of diagnostic tools substantiation for the subject of scientific research, diagnosing teachers' ICC in the system of military education.

Researchers, [35] focused on diagnostic tools development necessary to assess teachers' ICC, point out the complexity of this process, which is caused by the multidimensional nature of the process and stress that it is important to follow the following aspects:

– diagnosis should encompass all components of the ICC;

– levels of competence development should be clearly defined and characterized;

– the validity of the developed tasks for diagnosis;

– tasks should reflect the connection with relevant indicators of the criteria.

In our opinion, these requirements are universal and following them means to have researchers' methodological culture.

D. Carless, G. Joughin & M. Mok [36] focus their attention on the accuracy of the indicators selection for professionals' ICC assessment, which allows identifying content-related issues linked with its assessment, including levels of knowledge, i.e. each criterion must contain sufficient number of content-related indicators for the measured phenomenon.

A. Sanchez & M. Ruiz [226] point out that the assessment of professionals' ICC can be carried out using criterion-oriented testing, which reflects ICC structure and selected criteria for its diagnosis, i.e. the criteria should reflect the structure of ICC and only then there is the possibility to fully diagnose it.

A. Calvani, A. Cartelli, A. Fini & M. Ranieri developed a structured test with appropriate types and levels of complexity. It consists of a set of drawings that reflect the subject's awareness of emotional and social impact on ICTs use [33]. These researchers point out that to determine the levels of ICC formation or development one need to use tests of different complexity.

S. Carretero, R. Vuorikari & Y. Punie provide an analysis of 22 tools used to assess the ICC according to the DigComp concept in different European countries. They grouped them into three categories:

– efficiency evaluation (individuals are monitored by an observer or software; at the same time they are dealing with real problems using up-to-date software);

– knowledge evaluation (an individual responds to well-designed test tasks that measure both declarative and procedural knowledge);

– self-assessment (an individual is asked to evaluate his/her knowledge and skills using questionnaires, which can vary from structured scales to arbitrary reflection and self-reflection) [39].

In our opinion, such an approach allows systematically addressing professionals' ICC diagnosing and clarifying problematic aspects of its content.

H. Poldoja, T. Valjataga, M. Laanpere and K. Tammets developed an interesting web tool DigiMina which supports teachers in creating and sharing their competence profile. DigiMina also evaluates teachers using efficiency

indicators based on the NETS competency model for teachers, designed by ISTE [208].

According to A. Kocharian, there's the need to form a single educational and scientific space, develop common standards and criteria for assessing the quality of educational services. Following the requirements of the Bologna Process, Ukraine had had to complete the modernization of higher education by 2010. This reform was aimed at creating a European Higher Education Environment. The fundamental principles of this environment are mutual recognition of educational degrees and qualifications, transparency and cooperation with European colleagues in ensuring education quality guarantees [124, p. 31]. Thus, he argues that «the criterion should include small units of measurement that allow practical assessment of the reality in comparison with the ideal» [124, p. 128–129].

He considers that the problem of determining the criteria for evaluating the effectiveness of training has many aspects and levels. In pedagogical practice, there are already fairly interrelated criteria, which are designed to assess various psychological and pedagogical aspects of the learning process, among which the following are highlighted:

– criteria for assessing teaching forms and methods effectiveness: quality, comprehensiveness, depth, strength and functionality of the methods used in accordance with the tasks;

– the level of skills and abilities formation;

– criteria for assessing training effectiveness: independence of research and teaching staff, the culture of the learning process (the ability to rationally plan the learning process);

– criteria for assessing learning outcomes effectiveness: depth of knowledge and awareness;

– criteria for assessing theoretical knowledge formation: understanding of concepts, educational policy provisions formulation, corporate standards;

– qualitative criteria for assessing skills and abilities formation: following appropriate sequence of actions, independence in performance;

– criteria for assessing attitude to individual's own cognitive activity: interest or indifference, understanding social significance of the ability to use up-to-date ICTs, emotional comfort or discomfort, fear of possible mistakes [124, p. 66].

Similar approaches to understanding the criteria and indicators essence use other researchers.

Therefore, foreign and Ukrainian scientists define the criterion-diagnostic apparatus for assessing certain phenomena and processes grounding on the studied object, certain professionals' ICC and the subject of their study, the structure of the studied scientific phenomenon and the specificity of its environment. In such a case, they use, as a rule, an etymological understanding of the concept «criterion». Criterion, from Greek, is means of judgment, measure.

Analysis of the research results of these and other scientists shows that there are currently no generally accepted criteria and indicators for diagnosing teachers' ICC development in higher military education institutions.

Thus, the results of scientific sources analysis show that currently there is no unified approach to understanding the criteria and indicators for diagnosing teachers' ICC formation and development levels in the system of military education.

Therefore, one of the methodological requirements to pedagogical experiment organization is to identify and justify the criteria and indicators for diagnosing its results, as well as clarifying the levels of those qualities manifestation that are formed and developed in the course of pedagogical experiment. Hence, according to many scientists, it is recommended to determine it before conducting an indicative experiment.

We believe that the criteria and indicators for diagnosing teachers' ICC development should be directly linked to the content of their information and analytical activities and the realization of information and communication function as subjects of scientific and educational activities in military education system. Following the substantiated components of teachers' ICC, value-motivational, intellectual, praxeological, information-technological and subjective, it is recommended to determine criteria and indicators for diagnosing its development grounding on level approach. It allows taking into account leading ideas and provisions of competence-based, contextual-based, subject-action based and information-based approaches in education. Therefore, to measure it in the system of military education, it is necessary to have clear definition of the concepts «criterion» and «indicator».

We believe that the scientific definition of criteria and indicators of teachers' ICC taking into account the specificity of their educational activities in the system of military education is an important research task for both theoretical and practical aspects. The prerequisite is the interconnectedness and interdependence of these concepts. The criterion largely determines the

correct choice of indicators. But, the indicator quality depends on how fully and objectively it characterizes a particular criterion [277].

It should be mentioned that clear requirements need to be formulated for the criteria. For instance, scientists claim the following: «objectivity, i.e. the reflection of the features inherent in the subject under analysis, regardless of the consciousness and will of the subject; reflection of essential features of the subject of diagnosis; stability and regularity of the studied features; link to the goals, objectives, functions and content of a specific psychological research; the direct connection between the goal and the final result of the studied phenomenon» [283, p. 117].

Revision and analysis of dictionaries and scientific literature, as well as clarifying methodological approaches of scientists to understanding the concept of «criterion» allows us to argue about the ambiguity of its interpretations and definitions in modern science. Thus, according to the New Dictionary of the Ukrainian Language, the notion «criterion is defined as a «feature» on the basis of which assessment, definition or classification is carried out; measure for determining, evaluating an object or phenomenon, the basis for assessing or classifying something» [295, p. 211].

When determining criteria and indicators for a particular pedagogical phenomenon evaluation, S. Honcharenko noted, «one should take into account the quality of knowledge, which involves the relationship of knowledge (laws, theories, applied, methodological and evaluative knowledge) with elements of educational content and levels of the their learning» [98, p. 373].

S. Ivanova emphasizes that «criteria should also reflect the dynamics of the measured quality in space and time and be revealed through indicators; by the intensity of indicators one can draw conclusions about the level of a particular criterion formation» [111, p. 153].

O. Spirin and T. Vakaliuk characterize the notion «criterion» as a sign and property [249, p. 279].

Researchers V. Kremen and V. Bykov define criteria as «a system of objective functions that reflect the target and content-technological requirements» [133, p. 8]. This approach is used as a methodological principle to substantiate the criteria and indicators for diagnosing the teachers' ICC development.

According to O. Rezvan, criterion is «a separate generalized indicator that characterizes the quality of the phenomenon, its parameters, features or characteristics, human attitude to the process of learning this phenomenon» [220, p. 132].

Criterion, in our opinion, is a measure, a rule which enables teachers' ICC diagnosing. It directly allows determining the degree of its formation and development of various components at the key stages of pedagogical experiment.

In course of the study, the criteria make it possible to determine both ICC content and current state at different stages of pedagogical experiment, and to determine the dynamics of its formation/development. We believe that the selected criteria should be objective and include the most significant and key features of the phenomenon under study, reflect the dynamics of its formation/development in space and time.

It should be noted that in modern pedagogical literature, the definition of «criterion» is closely related to the term «indicator». Thus, each criterion consists of a set of indicators that consolidate and clarify the content of each criterion. It should be mentioned that the effectiveness of teachers' ICC formation and development will depend not only on the development of criteria, but also a clear determination of their indicators, as their dynamics allows determining presence or absence of, for instance, certain positive changes in the analyzed pedagogical phenomenon, in our case – teachers' ICC.

It should be emphasized that the number of indicators should be optimal in each criterion in order to ensure an objective diagnosis of teachers' ICC. We consider this one of the most important methodological requirements. Indicators must be clear, specific, sufficient and available for teachers' ICC measurement. In addition, each indicator must be sufficiently wide and reflect an essential component, a characteristic feature of each criterion.

Taking into consideration the essence of the criteria, indicators are specific qualitative (quantitative) characteristics of teachers' ICC formation/development, which allow them to be observed and measured. Thus, **an indicator** is a quantitative or qualitative measure of effectiveness, i.e. the specific manifestation and quality of teachers' ICC, the content, methods and technologies of educational activity which have their own specificity in the system of military education.

Thus, taking into account teachers' position competencies, the specificity of teaching primarily general and special military subjects, information society requirements for goals, content, features and results of pedagogical and educational activities in the system of military education, as well as modern methodological requirements for the professionals' ICC content, we define the

criteria and indicators for diagnosing the teachers' ICC development in the system of military education.

1. **Value-motivational criterion**, which is «a starting and core criterion», as it characterizes the values and motivation of teachers as subjects of educational life in the information society in general and the use of ICTs in teaching, in particular. They are directly reflected in their needs in:

– achieving success in scientific and educational activities;

– feeling social significance of teachers educational activity, its awareness and perception;

– active, conscious participation in resolving scientific and educational tasks;

– self-affirmation as a subject of information society in the system of military education;

– striving for continuous development, self-development as a subject of educational activity;

– striving for active use and systematic implementation of ICTs in teachers educational activities, as an element of providing educational services in the system of military educational institution.

Indicators of this criterion are the values of scientific and educational activities with the use of information and communication technologies, motivation to develop their ICC as subjects of pedagogical life in the system of military education.

2. **Cognitive criterion** is the knowledge base of teachers' ICC, which determines his/her mastery of systemic, theoretical and most importantly, practical and applied information, communication, technology knowledge in the following aspects:

1) theoretical: knowledge of the essence of the notions «information»; «Information and communication activities»; «Information need»; «information search»; «Qualitative and semantic transformation of information»; «Information and analytical data processing»; «Information and analytical activities»; «Information-analytical competence»; «Means of communication in the information society»;

2) technological: knowledge of types of information search; information and bibliographic resources; searching for information on the Internet; methods and means of information search; sources of information; search engines; principles of information selection; information storage technologies;

information processing methods; methods of information analysis; types of information synthesis;

3) practical: knowledge of teachers in the relevant field of military and specific disciplines, as content and methods of its teaching are unique and have their own methodological features and specificity, for instance the discipline *«Simulation and imitation of combat actions by different types of units and services»*.

Indicators of this criterion are knowledge of ICT theory and methods of their application in the process of teaching specific disciplines to future officers; knowledge of theoretical background for analysis and decision-making in military affairs; knowledge of technologies for modeling processes (phenomena), for example, organization and conduct of combat actions by different types of units and services; knowledge of theoretical principles of cyber-security in the process of using ICT in military sphere; knowledge of modern hardware and software; knowledge of software development technologies.

3. **Technological criterion** is the activity and behavioral basis for pedagogical life of a teacher in the information society. It determines the formation/development of general practical abilities of teachers to use ICTs in everyday life and the eventual possibility of using it in their educational activities in the system of military education. It demonstrates their own practical experience of updating ICC in various standard and non-standard situations of teaching and teaching a particular discipline.

Its indicators are the following:

– the ability of a teacher to systematically use ICTs for solving various professional and pedagogical tasks in accordance with the goals and methods of teaching general and special military disciplines;

– ability to develop and use up-to-date hardware and software to realize pedagogical functions and their testing for cyber vulnerability.

4. **Functional criterion** is an integral one, it enables diagnosis, as it characterizes practical activities of the teacher in the system of military education in the information environment, as well as his/her information and computer literacy as a subject of scientific and educational activities. These include:

– ability and readiness to search for and analyze information, synthesize, compare, abstract, generalize and specify it with the help of ICTs, taking into account the specificity of teaching general and special military disciplines;

– flexibility and criticality of practical, both military and professional thinking, the availability of skills, abilities, and ideally the ability to work with hardware and software, use it in scientific and educational activities;

– advanced nature of the practical application of ICTs in the pedagogical environment of military education system.

The indicators are the following:

– ability to develop information software to use it in teaching general and special military disciplines;

– ability to synthesize various software tools to increase the efficiency of scientific and educational activities;

– ability to use ICTs in scientific and educational activities.

5. **Reflective criterion** is an extremely important one, and sometimes crucial, because it allows diagnosing the subjective ability and most importantly, psychological, personal and professional readiness of a teacher to practically apply ICTs in scientific and educational activities. The content of this criterion enables to determine teacher's awareness of oneself as a subject of scientific and educational activities and the subjective attitude to oneself as a scientific and pedagogical employee. Scholars rightly argue that subjectivity, which is based on reflexivity of any specialist, including military teacher, is an integrative quality, as it determines the subjective and professional ability of a specialist to creatively and professionally apply information technology to realize their job responsibilities [1, p. 88]. This criterion allows finding out whether the teacher of military education system is really a subject of information society, to determine his/her professional and educational subject activity in educational environment of a higher military education institution, awareness of the importance of teachers own information and communication actions in the process of performing pedagogical job responsibilities.

For their successful realization with the help of modern ICTs, the subjective qualities of a teacher are important, which are formed and developed gradually under the influence of various factors and processes, including informational and professional. This is the awareness of their own goals and results of educational activities and their professional development, including directly in the information aspect, which involves self-learning, objective self-assessment of their own strengths and capabilities for the use of ICTs in teaching, objective and critical attitude to themselves as subjects of information society and the results of their own activities as subjects of teaching in the system of military education.

Indicators of the reflexive criterion are the following:

– scientific and educational subjectivity;

– ability to objective self-assessment as a subject of information society and educational activity in the system of military education.

The selected criteria and the corresponding indicators are the basis for establishing levels of teachers' ICC development in the system of military education considering the key principles of subject-action based and competence-based approaches to understanding its content. They allow transforming qualitative indicators into quantitative ones and fairly objectively assessing the degree of development of the studied phenomenon for each criterion, followed by generalization of averages to determine the development of a particular ICC component.

It should be noted that in pedagogical research there is no generally accepted classification of levels and the corresponding assessment scale, which creates «freedom» for scientists in establishing these levels and the corresponding assessment scale. We believe that scientists have the right to arbitrarily, i.e. at their discretion, more or less objectively determine the number of «levels» of the studied phenomenon and the appropriate rating scale, based on the selected criteria for diagnosing and supplementing each level with appropriate content and characteristics.

Thus, the analysis of scientific sources and, in particular, dissertations on the ICC shows that researchers distinguish a number of levels of its development, which are determined by the degree of qualities manifestation, which are diagnosed. Researchers generally differentiate levels of ICC development in accordance with the subject of their research. We believe that the «level» can be considered as a rating scale, the degree of quality or ability of the subject, the teacher to apply ICTs in one's scientific and educational activities. They are determined by a set of objective tools, criteria and indicators that allow a comprehensive assessment of the studied pedagogical phenomenon in conditions of uncertainty.

In our study, a **level** is the degree of development of information and communication skills, knowledge, abilities, psychological and professional readiness, and professionally important qualities of a teacher in the system of military education. Under the level of ICC development we will understand the state of results achieved regarding practical application of up-to-date ICTs in the course of teachers scientific and educational activities.

Therefore, by using the methods of system-action based and system-functional based approaches, we determined the content of information-

analytical activity of teachers in the system of military education and the structure of teachers information-communication competence as an important component of professional-pedagogical competence.

With the help of system-action structuring of their ICC we defined the main criteria of ICC diagnosis, and by concretizing its content using methods of system-functional approach we determined the content of each criterion, the corresponding indicators.

In addition, we used interviews and talks with teachers to clarify the content and specificity of their information and analytical activities, as well as to substantiate the criteria and indicators for diagnosing their ICC. Hence, the research involved 40 lecturers from The National Defence University of Ukraine named after Ivan Cherniakhovskyi, including 4 doctors of sciences, 26 candidates of sciences and 10 lecturers without scientific degrees. They represented the Institute of Information Technology, the Center for Military Strategic Studies, the Center for Simulation Modeling and the Distance Learning Research Center. Considering their training, military-professional and scientific-pedagogical experience they can form a representative group for all teachers of the military education system. They have extensive scientific, military-professional, professional and pedagogical experience in the use of ICTs in scientific and educational activities.

Thus, substantiated criteria and indicators will be used to diagnose the state of formation of teachers' ICC and determine its development in the process of formative experiment.

Therefore, we propose to use the following levels of development to assess teachers' ICC in military education system: low; satisfactory; sufficient; high. These levels characterize their ability and readiness to use ICTs in their scientific and educational activities and determine the degree of this integral ability manifestation in teaching general and special military disciplines. So, we summarize the general vision of the criteria and indicators for diagnosing their ICC and the levels of its development.

Value-motivational criterion

Indicators:

1. Values of scientific and educational activity with the use of ICT.

2. Motivation for the ICC development.

Levels:

1. Low – lack of values and motivation for scientific and educational activities using ICTs.

2. Satisfactory – anxiety and insecurity in information and communication

activities; insufficient awareness of the values of the information society and lack of understanding of the essence of information and communication activities in the process of teaching general and special military disciplines.

3. Sufficient – understanding the essence of information and communication activities and awareness of the values of information society; low motivation to improve information and communication competence in teaching general and special military disciplines.

4. High – a high level of cognitive motivation, adequate understanding of the role and essence of information and communication activities on the basis of the latest implemented ICTs grounded on awareness of the values of information society; the need to improve information and communication skills in teaching general and special military disciplines.

Cognitive criterion

Indicators:

1. Knowledge of ICT theory.

2. Knowledge of the theoretical background for analysis and decision-making in the military sphere.

3. Knowledge of technologies for modeling processes (phenomena) in teaching general and special military disciplines.

4. Knowledge of theoretical principles of cyber-security in the process of using ICTs in teaching general and special military disciplines.

5. Knowledge of up-to-date hardware and software.

6. Knowledge of software development technologies in accordance with specific teaching methods.

Levels:

1. Low – poor knowledge in the field of ICTs, lack of understanding of the theoretical background of analysis and decision-making in the military sphere using ICTs; poor knowledge of technologies for modeling processes (phenomena) in teaching general and special military disciplines; poor understanding of all aspects of cyber-security, especially in the military sphere; low awareness of modern hardware and software that can be used in teaching general and special military disciplines; poor understanding of application software development technologies.

2. Satisfactory – limited knowledge in the field of ICTs, fragmentary understanding of theoretical background of analysis and decision-making in military sphere using ICTs; satisfactory knowledge of technologies for modeling processes (phenomena) in teaching general and military special disciplines;

lack of understanding of all aspects of cyber-security, especially in military sphere; weak awareness of modern hardware and software that can be used in teaching general and special military disciplines; fragmentary understanding of application software development technologies.

3. Sufficient – correct, but not complete and clear idea of ICTs and their application in teaching general and special military disciplines; understanding of theoretical background of analysis and decision making using ICTs; knowledge of technologies for modeling processes (phenomena) in military sphere; understanding of all aspects of cyber-security in military sphere; awareness of modern hardware and software that may be used in military field; understanding of software development technologies for teaching general and special military disciplines.

4. High – systematic knowledge in the field of ICTs and the possibilities of their use for teaching general and special military disciplines; understanding of theoretical background of analysis and decision-making with the use of ICTs in military sphere; knowledge of technologies for modeling processes (phenomena) of a military nature; understanding of all aspects of cyber-security in military sphere; awareness of up-to-date hardware and software and the possibility of their use in military sphere; understanding of software development technologies used for teaching general and special military disciplines.

Technological criterion

Indicators:

1. Ability to use ICTs.

2. Ability to develop and use modern hardware and software and test them for cyber vulnerabilities.

Levels:

1. Low – lack of ability to use ICTs and design up-to-date hardware and software including its testing for cyber vulnerability.

2. Satisfactory – uncertain ability to use ICTs and design up-to-date hardware and software including its testing for cyber vulnerability.

3. Sufficient – confident, but low capability to use ICTs and design up-to-date hardware and software including its testing for cyber vulnerability.

4. High – creative and conscious ability as well as willingness to use ICTs and design up-to-date hardware and software including its testing for cyber vulnerability.

Functional criterion

Indicators:

1. Ability to use ICTs in scientific and educational activities.

2. Ability to synthesize various software tools to increase teaching effectiveness of general and special military disciplines.

3. Ability to develop information software for teaching general and special military disciplines.

Levels:

1. Low – limited ability to use ICTs in scientific and educational activities, to synthesize various software tools to improve teaching of general and special military disciplines, to develop information software tools for teaching general and special military disciplines.

2. Satisfactory – uncertain ability to use ICTs in scientific and educational activities, to synthesize various software tools to improve teaching of general and special military disciplines, to develop information software tools for teaching general and special military disciplines.

3. Sufficient – confident, but not high ability to use ICTs in scientific and educational activities, to synthesize various software tools to improve teaching of general and special military disciplines, to develop information software for teaching general and special military disciplines.

4. High – creative, conscious ability and willingness to use ICTs in scientific and educational activities, to synthesize various software tools to improve teaching of general and special military disciplines, to develop information software for teaching general and special military disciplines.

Reflexive criterion

Indicators:

1. Scientific and pedagogical subjectivity in the information society.

2. Ability to self-assessment as a subject of information-analytical activities within the realization of the functions of a teacher of general and special military disciplines.

Levels:

1. Low – lack of ability to objectively assess the results of their scientific and educational activities on the use of ICTs, lack of independence and autonomy in their application in teaching general and special military disciplines, and development of teachers' ICC.

2. Satisfactory – fragmentary ability to objectively assess the results of one's own scientific and educational activities on the use of ICTs, lack of independence and autonomy in their application in teaching general and

special military disciplines, and development of teachers' ICC.

3. Sufficient – sufficient ability to objectively assess the results of one's own scientific and educational activities on the use of ICTs, sufficient independence and autonomy in their application in teaching general and special military disciplines, and development of teachers' ICC.

4. High – the ability to objectively assess the results of one's own scientific and educational activities on the use of ICTs, creative independence and complete autonomy in their application in teaching general and special military disciplines, and development of teachers' ICC.

Therefore, we determine the final characteristics of the possible levels of teachers' development in the system of military education.

Low level of teachers' ICC development in the system of military education is characterized by lack of awareness of values and, lack of motivation for scientific and educational activities using ICTs; insufficiency of even satisfactory knowledge in the field of ICTs and lack of understanding of theoretical background for analysis and decision-making in military area using ICTs; insufficiency of practical knowledge about technologies for modeling processes (phenomena) in teaching general and special military disciplines; lack of awareness of all aspects of cyber-security, especially in military sphere; poor awareness of up-to-date hardware and software, which can be used for teaching general and special military disciplines; practically no understanding of technologies for developing application software for teaching.

Satisfactory level of teachers' ICC development in the system of military education is characterized by superficial knowledge of means, tools, methods, techniques and technologies for ICTs application in scientific and educational activities; indifference to the use of ICTs in military- educational process of a higher military education institution; lack of value attitude to broadening knowledge of the theory and methods of using ICTs in scientific and educational activity; insufficient knowledge of theoretical background for ICTs application in teaching general and special military disciplines; indifference to self-improvement in the field of ICTs and development of one's own ICC.

Sufficient level of teachers' ICC development in the system of military education is characterized by situational attitude to the use of ICTs in scientific and educational activities; the desire to expand one's own knowledge in the field of ICTs; skills to use different software and hardware means for teaching general and special military disciplines, which have implemented automated methods of scientific educational activity etc.; ability to objectively assess the

level of one's own ICC development; positive attitude to self-improvement in the field of ICTs and development of one's own ICC.

High level of teachers' ICC development in the system of military education is characterized by full awareness and creative attitude to the use of ICTs in solving scientific and pedagogical problems in the course of educational activity; the ability to prove scientific and pedagogical colleagues the need for ICTs use; positive experience of ICTs application in scientific and educational activities, including software tools that can be used in the process of education by other teachers for teaching general and special military disciplines; the ability to select and apply ideal for a particular scientific and pedagogical task ICTs in a certain general and special military discipline; capability to self-assessment of one's own ICC development; constant self-improvement in the field of ICTs and systematic development of one's own ICC.

Thus, to determine the degree of ICC development according to determined criteria, it is necessary to evaluate it. The necessary tools for assessment are questionnaires, paraprofessional and professional theoretical tasks, as well as testing. Each studied phenomenon, i.e. a component of each ICC component, has a corresponding number of points with a percentage (Table 2.4).

It should be noted that for assessing the value-motivational component of teachers' ICC in the system of military education teachers' attitude and desire to use ICTs in scientific and educational activities were taken as the basis. In addition, the study did focus on psychological research, which requires a completely different methodological approach to the analysis of values and motivation of subjects of educational activities. In our opinion, however the use of adapted psychological techniques is not objective, as for its validity it is necessary to conduct various experiments to make sure it is reliable.

Thus, after obtaining evaluation results, they are compared with the scale to determine the appropriate level of ICC development (Table 2.5). To do this, it is necessary to calculate the integral value of the results. At the same time, to determine the level of ICC development we need to calculate the integral value of each component (see subsection 3.1).

It should be emphasized that teachers' ICC in general and its individual components in particular are considered underdeveloped if the appropriate level evaluation level is less than 25%; average – 26-50%; sufficient – 51-75%; high – 76-100%.

Table 2.4

Scale for assessing the levels of teachers' ICC development (score scale)

№ з/п	Criterion	Indicator	Means of evaluation	Points	Percentage %
1	2	3	4	5	6
1	**Value-motivational**	1) Values of scientific and educational activity with the use of ICTs	Questionnaires, testing.	100	100
		2) Motivation for the ICC development		100	
2	**Cognitive**	1) Knowledge of ICT theory;	Testing, Paraprofessional and professional theoretical tasks	100	
		2) Knowledge of the theoretical background for analysis and decision-making in the military;		100	
		3) Knowledge of technologies for modeling processes (phenomena) in teaching general and special military disciplines;		100	
		4) Knowledge of theoretical principles of cyber-security in the process of using ICTs in the teaching general and special military disciplines;		100	
		5) Knowledge of up-to-date hardware and software;		100	
		6) Knowledge of software development technologies in accordance with specific teaching methods .		100	
3	**Technological**	1) Ability to use ICTs;	Paraprofessional and professional theoretical tasks	100	
		2) Ability to develop and use modern hardware and software and test them for cyber vulnerabilities .		100	
4	**Functional**	1) Ability to use ICTs in scientific and educational activities ;	Paraprofessional and professional theoretical tasks	100	
		2) Ability to synthesize various software tools to		100	

		increase teaching effectiveness of general and special military disciplines;			
		3) Ability to develop information software for teaching general and special military disciplines.		100	
5	**Reflexive**	1) Scientific and pedagogical subjectivity in the information society;	Questionnaires, testing	100	
		2) Ability to self-assessment as a subject of information-analytical activities within the realization of the functions of a teacher of general and special military disciplines.		100	

Table 2.5

Scale for assessing the levels of teachers' ICC development

Levels	Points	Percentage
Low	0-25	0-25%
Satisfactory	26-50	26-50%
Sufficient	51-75	51-75%
High	76-100	76-100%

Thus, the substantiation of criteria and indicators for diagnosing teachers' ICC development in the system of military education is an urgent scientific and pedagogical problem, which is being addressed by both Ukrainian and foreign scientists. The analysis of scientific literature enabled us to clarify the content of the basic notions of pedagogical research, «criterion», «indicator» and «level».

We found out that diagnosis criteria and indicators of teachers ICC in the system of military education are interconnected and interdependent. Therefore, diagnosis objectivity can be ensured only in complex analysis.

Taking into consideration teachers' position competencies, the specificity of teaching general and special military disciplines, the requirements of information society to the goals and content, the peculiarities of scientific and

educational activity within the military educational process we determined the following set of criteria for diagnosing teachers' ICC: value-motivational, cognitive, technological, functional, reflexive and their corresponding indicators.

Additionally, we determined and characterized the following four levels of teachers' ICC development in the system of military education: low, satisfactory, sufficient, high, and their quantitative and qualitative characteristics, as well as means for its diagnosis.

Conclusions to the second section

The results of research on pedagogical modeling of teachers' ICC development in the system of military education in the course of distance learning are the following:

1. We substantiated the professionally-oriented model of ICC development for teachers in the system of military education in the course of distance learning. It includes the following key blocks: conceptual (contains the purpose and subordinate main tasks for the teachers' ICC development in military education taking into consideration latest provisions of information-based, competence-based, subject-action based, andragogy-based and contextual-based methodological approaches); content block (contains the content of teachers' ICC; requirements for its development considering up-to-date advances in psychological, pedagogical and methodological areas, information sphere; promotes consistency and continuity of development of teachers information and communication knowledge); subject block (contains the process of interaction of the subjects of the process of teaching: teacher(s) and student(s); methodical block (contains the author's methodology of teachers' ICC development in the system of military education during distance learning); diagnostic-result block (contains criteria and indicators for diagnosing the development of teachers' ICC; levels of its development (low, medium, sufficient, high).

2. We designed a methodology for the teachers' ICC development in the system of military education during distance learning. The main stages of the methodology are: value-motivational, developmental and final. The basis of its implementation was a distance course «Information and communication technologies in teachers' scientific and educational activities» in accordance

with the author's curriculum.

3. We singled out the following criteria and indicators for diagnosing the development of teachers' ICC in the system of military education: value-motivational (values of scientific and educational activities with the use of ICTs; motivation for the ICC development); cognitive (knowledge of ICTs theory; knowledge of theoretical background for analysis and decision-making in the military sphere with the use of ICTs; knowledge of technologies for modeling processes (phenomena) in teaching general and special military disciplines; knowledge of theoretical principles of cyber-security in the use of ICTs in teaching m general and special military disciplines, knowledge of up-to-date hardware and software, knowledge of software development technologies in accordance with specific teaching methods); technological (ability to use ICTs; ability to develop and use up-to-date hardware and software and it's testing for cyber vulnerabilities); functional (ability to use ICTs in scientific and educational activities; ability to synthesize various software tools to increase the effectiveness of teaching general and special military disciplines; ability to develop information software tools for teaching general and special military disciplines); reflexive(scientific and pedagogical subjectivity in the information society; the ability to self-evaluation as a subjects of information and analytical activities when performing the responsibilities of a teacher general and special military disciplines).

The main results of this section are published in the author's scientific papers [142], [146], [147], [277], [278], [279].

SECTION 3
EXPERIMENTAL RESEARCH VERIFICATION OF DEVELOPEDNESS OF THE INFORMATION AND COMMUNICATION COMPETENCE OF TEACHERS IN THE MILITARY EDUCATION SYSTEM IN THE COURSE OF DISTANCE LEARNING

3.1. Methodology of conducting an experiment on the development of the information and communication competence of teachers in the military education system

Pedagogical research is a process and result of scientific activity aimed at obtaining new knowledge about the patterns of teaching and education process, its structure and mechanisms, theory and methodology of organization, content, principles, methods and techniques. It allows verifying initial scientific and statistical hypothesis using an evidence-based test [97].

When designing the methodology of experimental research aimed at analysis of teachers' ICC development in the system of military education we took into consideration key methodological recommendations of S. Honcharenko [97], S. Sysoieva [256] & V. Yahupov [293]. Hence, latest achievements of the theory and methodology of modern pedagogical science were considered.

Therefore, to perform pedagogical experimental research, first of all, it is necessary to determine its purpose.

The purpose of our experimental research was to test the main theoretical provisions of the study, practically evaluate the effectiveness of the model and methods of teachers' ICC development in the system of military education during distance learning on advanced training courses in the system of postgraduate education.

According to the purpose of the experimental research we designed its program and methodology. On the basis of the program, the research took three years to complete (2018 – 2020). Thus, the methodology of the research can be divided into three stages: *analytical-indicative*, *experimental* and *summarizing* (Table 3.1).

Table 3.1

Methodology of experimental research

Stage name	Content of experimental research
1	2
Analytical-indicative (2018)	– formulate unresolved scientific problem in pedagogical theory and practice; – determine the relevance of the research; – determine research inconsistencies; – determine the purpose of the research; – study of the object of the research; – determine the subject of the research; – formulate scientific hypothesis; – determine tasks of the research; – predict expected results; – substantiate notion and categorical apparatus of the research; – select and determine criteria and indicators for teachers' ICC diagnosis in the system of military education; – choose means of diagnosis to evaluate ICC development level considering the substantiated criteria and indicators; – determine general and sample selection; – check the state of teachers' ICC development in the system of military education;
Experimental (2018 – 2019)	– develop and substantiate the professional-oriented model and methodology of teachers' ICC development for the system of military education during distance learning, test the model and methodology; – develop methodological recommendations for teachers' ICC development in the course of distance learning; – conduct formative pedagogical experiment; – determine levels of teachers' ICC development in the system of military education; – statistically substantiate the results of formative stage of the experiment;
Summarizing (2020)	– summarize, systemize and arrange the results obtained; – draw overall conclusions on teachers' ICC development in the system of military education during distance learning; – outline further perspectives of the research.

The key tasks of **analytical-indicative stage** are the following (2018):

– formulate unresolved scientific problem in pedagogical theory and practice, determine the relevance of the research and research inconsistencies;

– determine the purpose of the research, its and subject;

– formulate scientific hypothesis and tasks of the research;

– analyze the problem of teachers' ICC development in the system of military education within pedagogical theory and practice;

– analyze the notion, content and structure of teachers' ICC in the system of military education;

– substantiate the criteria and indicators of teachers' ICC diagnosis in the system of military education;

– check the state of teachers' ICC development in the system of military education.

Considering the results of scientific literature and dissertations analysis dedicated to the problem of teachers' ICC development in the system of military education, we specified the definition of «teachers' ICC in the system of military education» (more details in section 1.2), substantiated its structure, criteria and indicators for diagnosing the ICC development in the process of distance learning (more details in section 2.4).

Using empirical research methods we determined the current state of teachers' ICC formation in the system of military education. As a result we conducted a series of conversations, surveys, questionnaires, observations, used exercise methods, methods of written (test) control of practical skills and abilities to use ICTs in scientific and educational activities in the course of advanced training at the Research Center for Distance Learning at The National Defence University of Ukraine named after Ivan Cherniakhovskyi (more details in section 1.3).

The key tasks of **experimental stage** are the following (2018 – 2019):

– develop and substantiate the professional-oriented model and methodology of teachers' ICC development for the system of military education during distance learning, test the model and methodology (more details in sections 2.2, 2.3);

– develop methodological recommendations for teachers' ICC development in the course of distance learning (more details in section 3.3);

– conduct formative pedagogical experiment to experimentally verify the efficiency of professional-oriented model and methodology for teachers' ICC

development in the system of military education (more details in section 3.2);

– determine levels of teachers' ICC development in the system of military;

– statistically substantiate the results of formative stage of the experiment.

The key tasks of **summarizing stage** are the following (2020):

– summarize, systemize and arrange the results obtained;

– draw overall conclusions on teachers' ICC development in the system of military education during distance learning;

– outline further perspectives of the research.

Thus, the gradual and consistent use of the developed methodology of experimental research allowed carrying out a pedagogical experiment on the development of teachers' ICC in the system of military education in the process of distance learning.

Hence, the pedagogical experiment allowed obtaining new theoretical and practical knowledge and empirical facts about the object of study in specially created and controlled conditions. As a result, we established cause-and-effect links that record changes in the subject of the study by manipulating one or more experimental factors and conditions. Additionally, the main purpose of the pedagogical experiment was to confirm or refute the relevant scientific (statistical) hypothesis.

It should be mentioned that the pedagogical experiment is classified into natural or laboratory according to the conditions in which it is held. According to the purpose it is divided into indicative (diagnostic, control) or formative (transforming) [293, p. 350–364].

Laboratory experiment is held in specially created conditions, while natural one is characterized by real conditions of the process of life, educational in particular. Therefore, mainly natural type of experiment is used to solve problems of scientific and pedagogical research. It should be noted that there are also two ways to prove the hypothesis in an experimental study: parallel and consecutive.

A parallel experiment is based on the principle of identical groups, which involves two or more identical (with adequate distribution) study groups. One group uses experimental conditions, while the other uses traditional ones. After formative experiment is held, the results of two groups are compared.

A consecutive experiment is based on the principle of a single research group. First, the level of formation/development of the studied pedagogical phenomenon is recorded, using traditional system. Then they are compared

with the effectiveness results of pedagogical innovations introduced as an experimental factor in the same group.

In the course of scientific and pedagogical research we held a consecutive pedagogical experiment. The idea of this experiment was to compare the effectiveness of professional-oriented model and methods of development of teachers' ICC in the system of military education during distance learning in the same research group of teachers, before and after the formative stage of pedagogical experiment.

To determine the levels of formation and development of the teachers' ICC in the system of military education, we conducted the indicative and formative stages of the pedagogical experiment in 2018 – 2019. We carried out the analysis of its formation and development considering the value-motivational, intellectual, praxeological, information-technological and subjective components [141].

Using system-action structuring of their ICC we determined the main criteria of its diagnosis. By specifying its content using methods of system-functional approach we determined the content of each criterion and the corresponding indicators [277]. Thus, the integral value of the obtained results in relation to its components allowed us to determine the level of this competence formation and development.

In the course of pedagogical experiment the following research methods were used: conversation, survey, questionnaire, observation, exercise method, method of written (test) of knowledge, practical skills and abilities to use ICTs in scientific and pedagogical activities. To assess the level of teachers' ICC formation and development for the system of military education a research group of 333 teachers was involved in the pedagogical experiment (Table 3.2). The overall number of teachers in the military education system is 1,997 people. Hence, the dependence of the sample group size on the overall number of teachers with a standard deviation of 5% (confidence probability – 0.95) was determined according to the summary table [200, p. 181].

Table 3.2

Composition of those surveyed in the course of indicative experiment

№	Higher military education institution	Number of teachers	Percentage, %
1	The National Defence University of Ukraine named after Ivan Cherniakhovskyi	34	10,21
2	Hetman Petro Sahaidachnyi National Academy	30	9,01

	of Land Forces		
3	Military Academy (Odesa)	34	10,21
4	Military Institute of Tank Forces of National Technical University «Kharkiv Polytechnic Institute»	39	11,71
5	Ivan Kozhedub Kharkiv National University of Air Forces	34	10,21
6	Institute of Naval Forces of National University «Odesa Naval Academy»	32	9,61
7	Military Institute of Taras Shevchenko Kyiv National University	33	9,91
8	Serhii Korolov Zhytomyr military Institute	31	9,31
9	Ukrainian Military Medical Academy	32	9,61
10	Military Institute of Telecommunications and Information Technologies named after Heroes of Kruty	34	10,21
Total		**333**	**100**

In addition, the quantitative and qualitative characteristics of teachers of military education system give grounds to argue that the sample research group can be representative for the overall number of teachers (Tables 3.3 – 3.7).

Table 3.3

Ages of teachers in the system of military education

№	Age of teachers	Number of teachers	Percentage, %
1	under 30 years old	59	17,72
2	30-39 years old	70	21,02
3	40-49 years old	93	27,93
4	50-59 years old	80	24,02
5	60 years old and over	31	9,31
Total		**333**	**100**

For the indicative stage of the pedagogical research we chose the following age ranges: under 30 years – 59 teachers (17.72%), 30-39 years – 70 teachers (21.02%), 40-49 years – 93 teachers (27.93%), 50-59 years – 80 teachers (24.02%), 60 years old and over – 31 teachers (9.31%). Consequently, the data indicate an almost proportional selection of teaching staff, which corresponds to the overall number of those surveyed.

Table 3.4

Scientific and teaching work experience of teachers

№	Work experience	Number of teachers	Percentage, %
1	Less than 5 years	63	18,92
2	6-10 years	71	21,32
3	11-15 years	88	26,43
4	16-20 years	78	23,42
5	21-25 years and more	33	9,91
Total		333	100

The experience of scientific and scientific- educational activity of teachers of the military education system meets the necessary criteria for selecting respondents of the indicative stage of the pedagogical experiment and confirms their almost proportional selection. Thus, the number of teachers with experience less than 5 years was – 63 teachers (18.92%), 6-10 years – 71 teachers (21.32%), 11-15 years – 88 teachers (26.43%), 16-20 years – 78 teachers (23.42%), 21-25 years and more – 33 teachers (9.91%).

Table 3.5

Direction of scientific and educational activity of teachers

№	Direction of teachers' activity	Number of teachers	Percentage, %
1	Technical group of subjects	111	33,33
2	Social and humanitarian group of subjects	116	34,83
3	Military group of subjects	106	31,84
Total		333	100

It was also taken into account the representation in the selective group of those surveyed, members of the three groups of teaching disciplines. The number of teachers of the technical group of subjects represented 111 teachers (33.33%), social and humanitarian group – 116 teachers (34.83%), military group – 106 teachers (31.84%).

Table 3.6

Teachers' position

№	Teachers' position	Number of teachers	Percentage, %
1	Chief of department	20	6,01
2	Deputy chief of department	20	6,01
3	Chief of scientific department	25	7,51
4	Chief of academic laboratory	9	2,7

5	Professor of department	41	12,30
6	Associate professor of department	52	15,62
7	Senior teacher of department	75	22,52
8	Teacher of department	91	27,33
Total		**333**	**100**

Within the pedagogical experiment it was also taken into consideration a wide range of respondents' positions. In the study took part 91 teachers of departments or 27.33%, 75 senior teachers (22.52%), 52 associate professors (15.62%), 41 professors of departments (12.30%), 9 chiefs of academic laboratories (2.7%), 25 chiefs of scientific departments (7.51%), 20 deputy chiefs of departments (6.01%), 20 heads of departments (6.01%).

Table 3.7

Availability of academic degrees

№	Teacher's academic degree	Number of teachers	Percentage ratio, %
1	Candidate of technical sciences	45	13,51
2	Candidate of pedagogical sciences	40	12,01
3	Candidate of philosophical sciences	16	4,80
4	Candidate of medical sciences	7	2,10
5	Candidate of physical and mathematical sciences	3	0,90
6	Candidate of political sciences	1	0,30
7	Candidate of philological sciences	7	2,10
8	Candidate of psychological sciences	21	6,31
9	Candidate of military sciences	42	12,61
10	Doctor of technical sciences	9	2,70
11	Doctor of pedagogical sciences	1	0,30
12	No academic degree	141	42,34
Total		**333**	**100**

An interesting part of the experiment was the analysis of the availability of a certain academic degree among teachers in military education system. Thus, the number of teachers with a degree in technical sciences was – 45 (PhD) teachers (13.51%), pedagogical sciences – 40 (PhD) teachers (12.01%), philosophical sciences – 16 (PhD) teachers (4.80%), medical sciences – 7 (candidates of sciences) teachers (2.10%), physical and mathematical sciences – 3 (PhD) teachers (0.90%), political science – 1 (PhD) teacher (0.30%), philological sciences – 7 (PhD) teachers (2.10%), psychological sciences – 21 candidate of sciences) teacher (6.31%), military sciences – 42

(candidate of sciences) teachers (12.61%), technical sciences – 9 teachers (doctors of sciences) or 2.70% respectively, pedagogical sciences – 1 teacher (doctor of sciences) or 0.30%, and 141 teachers do not have a degree or 42.34% respectively.

Moreover, teachers had undergone a preliminary survey to find out their subjective opinion about their own level of ICC formation (Table 3.8).

Table 3.8

Teachers' subjective analysis of their level of ICC formation

№	Level of teachers' ICC formation	Number of teachers	Percentage ratio, %
1	low	133	39,94
2	satisfactory	82	24,62
3	sufficient	62	18,62
4	high	56	16,82
Total		**333**	**100**

To diagnose teachers' ICC formation and development in the system of military education according to substantiated criteria and indicators before and after the formative stage of the pedagogical experiment, we developed the following diagnostic tools: questionnaires; tests; paraprofessional (professional) tasks; theoretical (practical) tasks that had been prior agreed with a group of experts.

Assessment of the levels of teachers' ICC formation and development in the system of military education was held considering the appropriate scale (Table 3.9). Therefore, 0-25 points – low level, 26-50 points – satisfactory level, 51-75 – sufficient level, 76-100 – high level (Table 3.10).

Table 3.9

Scale for assessing the levels of teachers' ICC development (score scale)

№ з/п	Criterion	Indicator	Means of evaluation	Points	Percentage %
1	2	3	4	5	6
1	**Value-motivational**	1) Values of scientific and pedagogical activity with the use of ICTs	Questionnaires, testing.	100	100
		2) Motivation for the ICC development		100	
2	**Cognitive**	1) Knowledge of ICT theory;	Testing, Paraprofessional and professional	100	
		2) Knowledge of the theoretical background for		100	

		analysis and decision-making in the military;	theoretical tasks		
		3) Knowledge of technologies for modeling processes (phenomena) in teaching general and special military disciplines;		100	
		4) Knowledge of theoretical principles of cyber-security in the process of using ICTs in the teaching general and special military disciplines ;		100	
		5) Knowledge of up-to-date hardware and software;		100	
		6) Knowledge of software development technologies in accordance with specific teaching methods .		100	
3	**Technological**	1) Ability to use ICTs;	Paraprofessional and professional theoretical tasks	100	
		2) Ability to develop and use modern hardware and software and test them for cyber vulnerabilities .		100	
4	**Functional**	1) Ability to use ICTs in scientific and pedagogical activities ;	Paraprofessional and professional theoretical tasks	100	
		2) Ability to synthesize various software tools to increase teaching effectiveness of general and special military disciplines;		100	
		3) Ability to develop information software for teaching general and special military disciplines.		100	
5	**Reflexive**	1) Scientific and pedagogical subjectivity in the information society;	Questionnaires, testing	100	

		2) Ability to self-assessment as a subject of information-analytical activities within the realization of the functions of a teacher of general and special military disciplines.		100	

Table 3.10

Scale for assessing the levels of teachers' ICC development

Levels	Points	Percentage
Low	0-25	0-25%
Satisfactory	26-50	26-50%
Sufficient	51-75	51-75%
High	76-100	76-100%

To analyze the data obtained empirically in the course of the pedagogical experiment we used specialized software *IBM Statistical Package for the Social Sciences*. This is a statistical package for the social sciences. We calculated formation teachers' ICC (development) in the military education system using the formula (3.1):

$$C = \frac{\sum_{n=1}^{n} e_n}{n}, \tag{3.1}$$

where:

C – Level of teachers' ICC formation/development in the system of military education;

$\sum_{n=1}^{n} e_n = e_1 + e_2 + \ldots + e_n$ – Sum e_n of teachers' ICC structural components quantities;

e_n – n – teachers' ICC structural component;

n – Number of teachers' structural components (e_n).

Thus, the level of structural component formation (development) e_n is calculated according to the formula (3.2):

$$e_n = \frac{\sum_{n=1}^{n} i_n}{n}, \tag{3.2}$$

where:

e_n – n – teachers' ICC structural component;

$\sum_{n=1}^{n} i_n = i_1 + i_2 + \ldots + i_n$ – sum i_n of quantities of structural component indicators (e_n) of teachers' ICC;

i_n – n – teachers' ICC structural component indicator (e_n) of teachers' ICC;

n – Number of indicators (i_n) of structural component (e_n) of teachers' ICC.

To calculate the level of a certain structural component (e_n) indicator i_n formation (development) we used the following formula: (3.3):

$$i_n = \left(\frac{\sum_{n=1}^{n} b_n}{n} \right) * n_{true}, \tag{3.3}$$

where:

i_n – n – teachers' ICC structural component indicator (e_n) of teachers' ICC;

$\sum_{n=1}^{n} b_n = b_1 + b_2 + \ldots + b_n$ – Sum of points (b_n) for n-number of completed tasks, total sum of points for all correct answers mustn't exceed 100 points;

b_n – Points for n-task;

n – Number of tasks i_n for a certain indicator e_n of teachers' ICC structural component;

n_{true} – Number of correct answers i_n for indicator e_n of teachers' ICC structural component.

Statistical analysis of the results of experimental verification of the

effectiveness of professionally-oriented model of teachers' ICC development in the system of military education during distance learning will be discussed in the following part.

3.2. Dynamics of the results of the development of the information and communication competence of teachers in the military education system in the course of distance learning

To confirm the effectiveness of implementation of the professional-oriented model in the process of education and methodology of teachers' ICC development in the system of military education during distance learning we held the formative stage of the pedagogical experiment considering the consistent way of proving the scientific (statistical) hypothesis.

Hence, we compared the obtained empirical data from a sample group of teachers in the system of military education. They were considered as CG and EG according to the developed criteria and indicators for diagnosing their ICC (see part 2.4) before and after the formative stage of the pedagogical experiment.

Entry and final diagnosis were held using developed diagnostic tools, for instance: questionnaires; tests; paraprofessional (professional) tasks; theoretical (practical) tasks that had been prior agreed with a group of experts. The obtained results were grouped into four levels (low, satisfactory, sufficient, high), which corresponded to certain levels of teachers' ICC development in the system of military education.

Therefore, we are going to analyze the dynamics of teachers' ICC development in the system of military education for an EG with all its components before and after the formative stage of the pedagogical experiment.

As a result, the development of teachers' ICC in the system of military education for a value-motivational component is shown in table. 3.11 and Fig. 3.1. We can see that the EG showed a significant increase in the number of teachers with sufficient (156 teachers – 46.70%) and high levels (141 teachers – 42.49%) of value-motivational component development. Additionally, there is a positive trend in reducing the number of teachers with low (16 teachers – 4.80%) and satisfactory (20 teachers – 6.01%) levels.

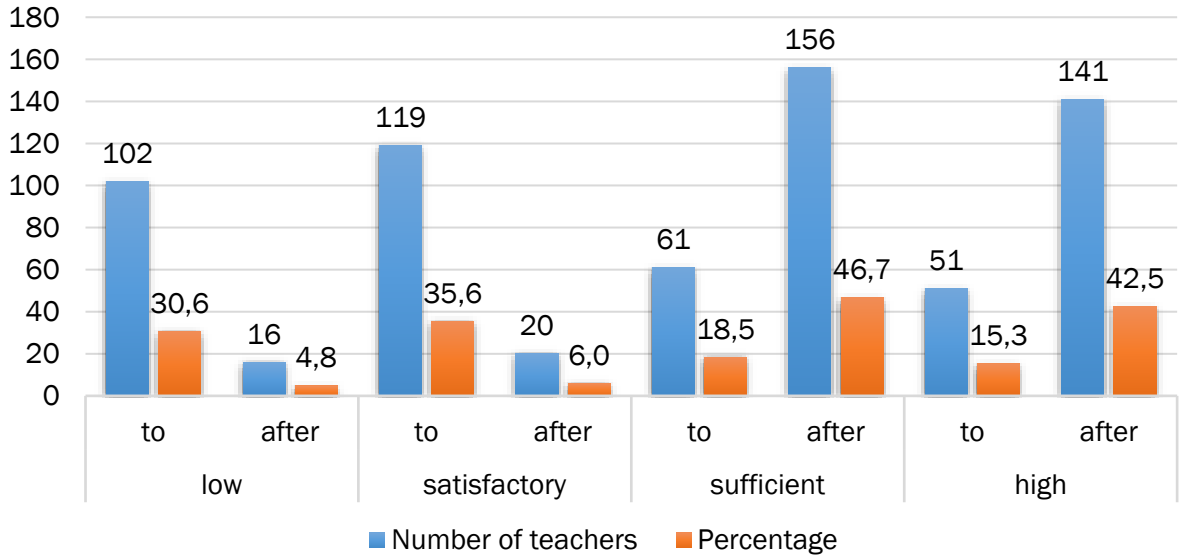


Fig. 3.1 **Levels of teachers' ICC value-motivational component development before and after the formative stage of the pedagogical experiment**

Table 3.11

Dynamics of teachers' ICC value-motivational component development before and after the formative stage of the pedagogical experiment

Content	Levels	Experiment				Difference
		indicative		formative		
		before		after		
		Number of people	%	Number of people	%	
1	2	3	4	5	6	7
1. Values of scientific and educational activity with the use of ICTs	low	53	15,92	17	5,11	36 (10,81%)
	satisfactory	161	48,35	19	5,71	142 (42,64%)
	sufficient	78	23,42	157	47,15	-79 (-23,73%)
	high	41	12,31	140	42,03	-99 (-29,72%)
2. Motivation for the ICC development	low	151	45,35	15	4,50	136 (40,85%)
	satisfactory	76	22,82	21	6,31	55 (16,51%)
	sufficient	45	13,51	154	46,25	-109 (-32,74%)
	high	61	18,32	143	42,94	-82 (-24,62%)

Value-motivational component	low	102	30,63	16	4,80	86 (25,83%)
	satisfactory	119	35,59	20	6,01	99 (29,58%)
	sufficient	61	18,47	156	46,70	-95 (-28,23%)
	high	51	15,32	141	42,49	-90 (-27,17%)
Number of teachers = 333						

The development of teachers' ICC intellectual component in the system of military education is shown in table 3.12 and Fig. 3.2. We can see that in the EG there was a significant increase in the number teachers with sufficient (158 teachers – 47.50%) and high (141 teachers – 42.14%) levels of the intellectual component development. Moreover, there is a positive trend in reducing the number of teachers with low (16 teachers – 4.85%) and satisfactory (18 teachers – 5.51%) levels, respectively.

Table 3.12

Dynamics of teachers' ICC intellectual component development before and after the formative stage of the pedagogical experiment

Content	Levels	Experiment				Difference
		indicative		formative		
		before		after		
		Number of people	%	Number of people	%	
1	2	3	4	5	6	7
1. Knowledge of ICT theory	low	162	48,65	16	4,80	146 (43,85%)
	satisfactory	80	24,02	22	6,61	58 (17,41%)
	sufficient	53	15,92	163	48,95	-110 (-33,03%)
	high	38	11,41	132	39,64	-94 (-28,23%)
2. Knowledge of the theoretical background for analysis and decision-making in the military field	low	130	39,04	17	5,11	113 (33,93%)
	satisfactory	94	28,23	14	4,20	80 (24,03%)
	sufficient	60	18,02	151	45,35	-91 (-27,33%)
	high	49	14,71	151	45,35	-102 (-30,64%)
3. Knowledge of technologies for	low	163	48,95	19	5,71	144 (43,24%)

modeling processes (phenomena) in teaching general and special military disciplines	satisfactory	74	22,22	17	5,11	57 (17,11%)
	sufficient	57	17,12	156	46,85	-99 (-29,73%)
	high	39	11,71	141	42,34	-102 (-30,63%)
4. Knowledge of theoretical principles of cyber-security in the process of using ICTs in the teaching general and special military disciplines	low	180	54,05	20	6,01	160 (48,04%)
	satisfactory	47	14,11	19	5,71	28 (8,4%)
	sufficient	70	21,02	160	48,05	-90 (-27,03%)
	high	36	10,81	134	40,24	-98 (-29,43%)
5. Knowledge of up-to-date hardware and software	low	197	59,16	13	3,90	184 (55,26%)
	satisfactory	37	11,11	20	6,01	17 (5,1%)
	sufficient	47	14,11	161	48,35	-114 (-34,24%)
	high	52	15,62	139	41,74	-87 (-26,12%)
6. Knowledge of software development technologies in accordance with specific teaching methods	low	179	53,75	12	3,60	167 (50,15%)
	satisfactory	76	22,82	18	5,41	58 (17,41%)
	sufficient	46	13,81	158	47,45	-112 (-33,64%)
	high	32	9,61	145	43,54	-113 (-33,93%)
Intellectual component	low	169	50,60	16	4,85	153 (45,75%)
	satisfactory	68	20,42	18	5,51	50 (14,91%)
	low	55	16,67	158	47,50	-103 (-30,83%)
	satisfactory	41	12,31	141	42,14	-100 (-29,83%)
Number of teachers = 333						

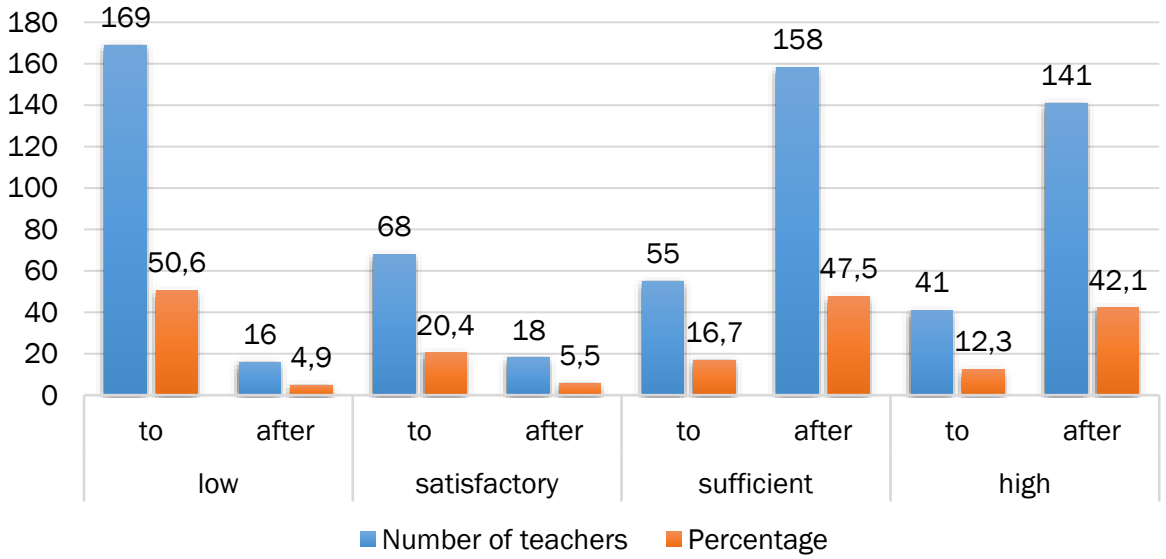


Fig. 3.2 **Levels of teachers' ICC intellectual component development before and after the formative stage of the pedagogical experiment**

The development of teachers' ICC information-technological component in the system of military education is shown in table 3.13 and Fig. 3.3. We can see that in the EG there was a significant increase in the number of teachers with sufficient (153 teachers – 45.95%) and high (143 teachers – 42.79%) levels of information-technological component. In addition, there is a positive trend in reducing the number of teachers with low (16 teachers – 4.80%) and satisfactory (21 teachers – 6.46%) levels respectively.

Table 3.13

Dynamics of teachers' ICC information-technological component development before and after the formative stage of the pedagogical experiment

Content	Levels	Experiment				Difference
		indicative		formative		
		before		after		
		Number of people	%	Number of people	%	
1	2	3	4	5	6	7
1. Ability to use ICTs	low	138	41,44	19	5,71	119 (35,73%)
	satisfactory	72	21,62	20	6,01	52 (15,61%)
	low	65	19,52	134	40,24	-69 (-20,72%)
	satisfactory	58	17,42	160	48,05	-102 (-30,63%)

2. Ability to develop and use modern hardware and software and test them for cyber vulnerabilities	low	157	47,15	13	3,90	144 (43,25%)
	satisfactory	80	24,02	23	6,91	57 (17,11%)
	low	50	15,02	172	51,65	-122 (-36,63%)
	satisfactory	46	13,81	125	37,54	-79 (-23,73%)
Information-technological component	low	148	44,29	16	4,80	132 (39,49%)
	satisfactory	76	22,82	21	6,46	55 (16,36%)
	low	57	17,27	153	45,95	-96 (-28,68%)
	satisfactory	52	15,62	143	42,79	-91 (-27,17%)
Number of teachers = 333						

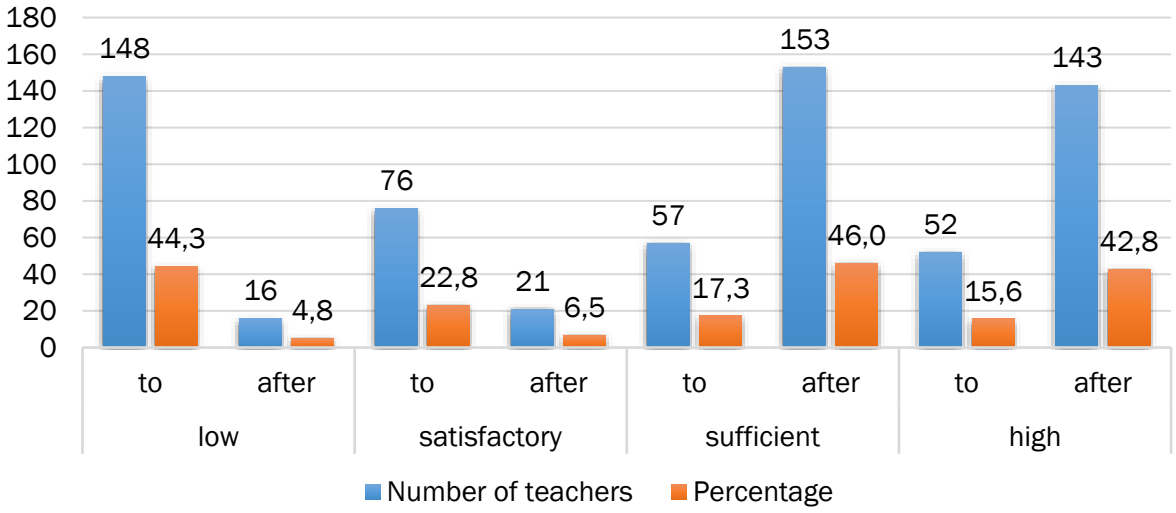


Fig. 3.3 **Levels of teachers' ICC information-technological component development before and after the formative stage of the pedagogical experiment**

The development of teachers' ICC praxeological component in the system of military education is shown in table 3.14 and in Fig. 3.4. We can see that in the EG there was a significant increase in the number of teachers with sufficient (181 teachers – 54.35%) and high (121 teachers – 36.44%) levels of praxeological component development. Moreover, there is an optimistic trend in the number of teachers with low (12 teachers – 3.60%) and satisfactory (19 teachers – 5.61%) levels respectively.

Table 3.14

Dynamics of teachers' ICC praxeological component development before and after the formative stage of the pedagogical experiment

Content	Levels	Experiment				Difference
		indicative		formative		
		before		after		
		Number of people	%	Number of people	%	
1	2	3	4	5	6	7
1. Ability to use ICTs in scientific and educational activities	low	141	42,34	12	3,60	129 (38,74%)
	satisfactory	100	30,03	16	4,80	84 (25,23%)
	sufficient	43	12,91	182	54,65	-139 (-41,74%)
	high	49	14,71	123	36,94	-74 (-22,23%)
2. Ability to synthesize various software tools to increase teaching effectiveness of general and special military disciplines	low	160	48,05	10	3,00	150 (45,05%)
	satisfactory	68	20,42	15	4,50	53 (15,92%)
	sufficient	63	18,92	177	53,15	-114 (-34,23%)
	high	42	12,61	131	39,34	-89 (-26,73%)
3. Ability to develop information software for teaching general and special military disciplines	low	160	48,05	14	4,20	146 (43,85%)
	satisfactory	84	25,23	25	7,51	59 (17,72%)
	sufficient	60	18,02	184	55,26	-124 (-37,24%)
	high	29	8,71	110	33,03	-81 (-24,32%)
Praxeological component	low	154	46,15	12	3,60	142 (42,55%)
	satisfactory	84	25,23	19	5,61	65 (19,62%)
	sufficient	55	16,62	181	54,35	-126 (-37,73%)
	high	40	12,01	121	36,44	-81 (-24,43%)
Number of teachers = 333						

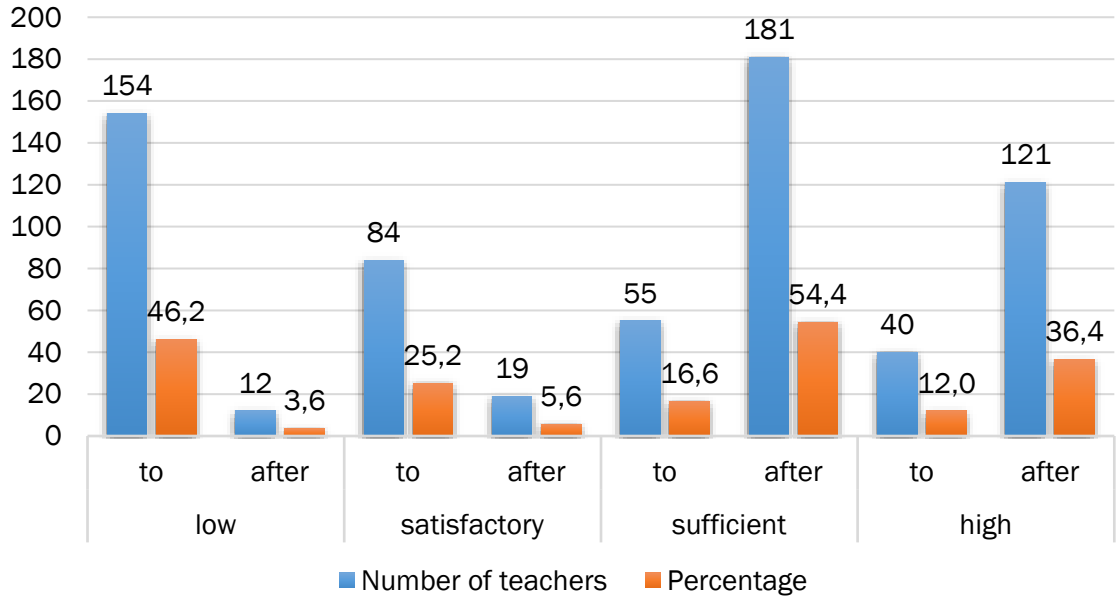


Fig. 3.4 **Levels of teachers' ICC praxeological component development before and after the formative stage of the pedagogical experiment**

The development of teachers' ICC subjective component in the system of military education is shown in table 3.15 and in Fig. 3.5. We can see that in the EG there was a significant increase in the number of teachers with sufficient (154 teachers – 46.25%) and high (147 teachers – 44.14%) levels of subjective component development. In addition, there is a certain trend in the number of teachers with low (16 teachers – 4.80%) and satisfactory (16 teachers – 4.80%) levels respectively.

Table 3.15

Dynamics of teachers' ICC subjective component development before and after the formative stage of the pedagogical experiment

Content	Levels	Experiment				Difference
		indicative		formative		
		before		after		
		Number of people	%	Number of people	%	
1. Scientific and pedagogical subjectivity in the information society	low	222	66,67	17	5,11	205 (61,56%)
	satisfactory	46	13,81	14	4,20	32 (9,61%)
	sufficient	32	9,61	151	45,35	-119 (-35,74%)
	high	33	9,91	151	45,35	-118 (-35,44%)

2. Ability to self-assessment as a subject of information-analytical activities within the realization of the functions of a teacher of general and special military disciplines	low	201	60,36	15	4,50	186 (55,86%)
	satisfactory	58	17,42	18	5,41	40 (12,01%)
	sufficient	29	8,71	157	47,15	-128 (-38,44%)
	high	45	13,51	143	42,94	-98 (-29,43%)
Subjective component	low	212	63,51	16	4,80	196 (58,71%)
	satisfactory	52	15,62	16	4,80	36 (10,82%)
	sufficient	30	9,16	154	46,25	-124 (-37,09%)
	high	39	11,71	147	44,14	-108 (-32,43%)
Number of teachers = 333						

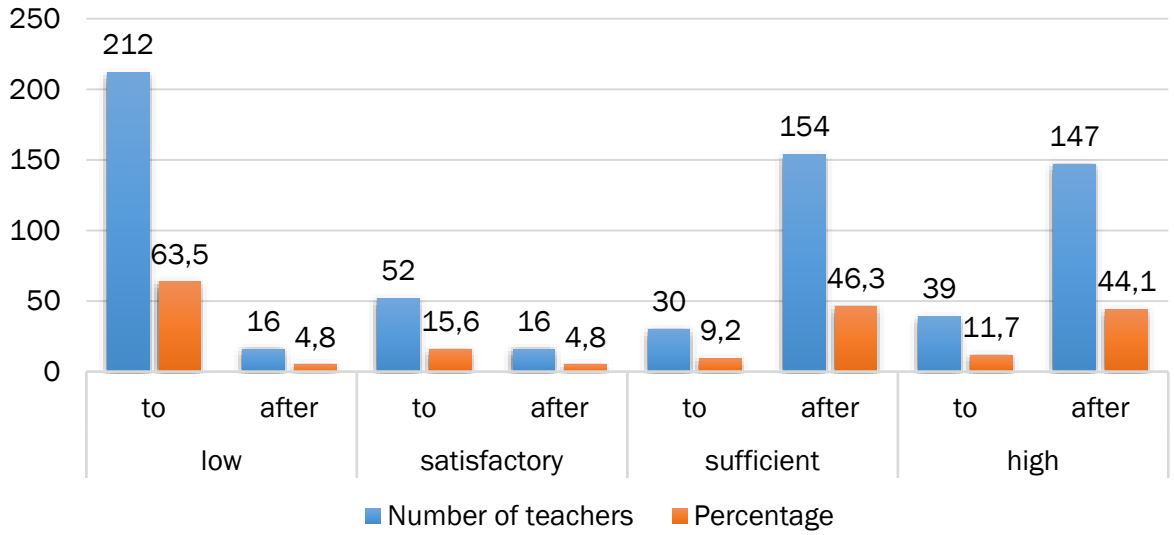


Fig. 3.5 **Levels of teachers' ICC subjective component development before and after the formative stage of the pedagogical experiment**

Thus, having calculated the statistical data on the teachers' ICC components development, we got the following summary results (Table 3.16 and Fig. 3.6): 4.57% (15 teachers) have low level, 5.68% (19 teachers) – satisfactory, 48.15% (160 teachers) – sufficient and 41.60% (139 teachers) received high level.

Table 3.16

Dynamics of teachers' ICC development before and after the formative stage of the pedagogical experiment

Components	Levels	Experiment				Difference
		indicative		formative		
		before		after		
		Number of people	%	Number of people	%	
1	2	3	4	5	6	7
1. Value-motivational	low	102	30,63	16	4,80	86 (25,83%)
	satisfactory	119	35,59	20	6,01	99 (29,58%)
	sufficient	61	18,47	156	46,70	-95 (-28,23%)
	high	51	15,32	141	42,49	-90 (-27,17%)
2. Intellectual	low	169	50,60	16	4,85	153 (45,75%)
	satisfactory	68	20,42	18	5,51	50 (14,91%)
	sufficient	55	16,67	158	47,50	-103 (-30,83%)
	high	41	12,31	141	42,14	-100 (-29,83%)
3. Information-technological	low	148	44,29	16	4,80	132 (39,49%)
	satisfactory	76	22,82	21	6,46	55 (16,36%)
	sufficient	57	17,27	153	45,95	-96 (-28,68%)
	high	52	15,62	143	42,79	-91 (-27,17%)
4. Praxeological	low	154	46,15	12	3,60	142 (42,55%)
	satisfactory	84	25,23	19	5,61	65 (19,62%)
	sufficient	55	16,62	181	54,35	-126 (-37,73%)
	high	40	12,01	121	36,44	-81 (-24,43%)

5. Subjective	low	212	63,51	16	4,80	196 (58,71%)
	satisfactory	52	15,62	16	4,80	36 (10,82%)
	sufficient	30	9,16	154	46,25	-124 (-37,09%)
	high	39	11,71	147	44,14	-108 (-32,43%)
ICC development	low	157	47,04	15	4,57	142 (42,47%)
	satisfactory	80	23,93	19	5,68	61 (18,25%)
	sufficient	52	15,64	160	48,15	-108 (-32,51%)
	high	44	13,39	139	41,60	-95 (-28,21%)
Number of teachers = 333						

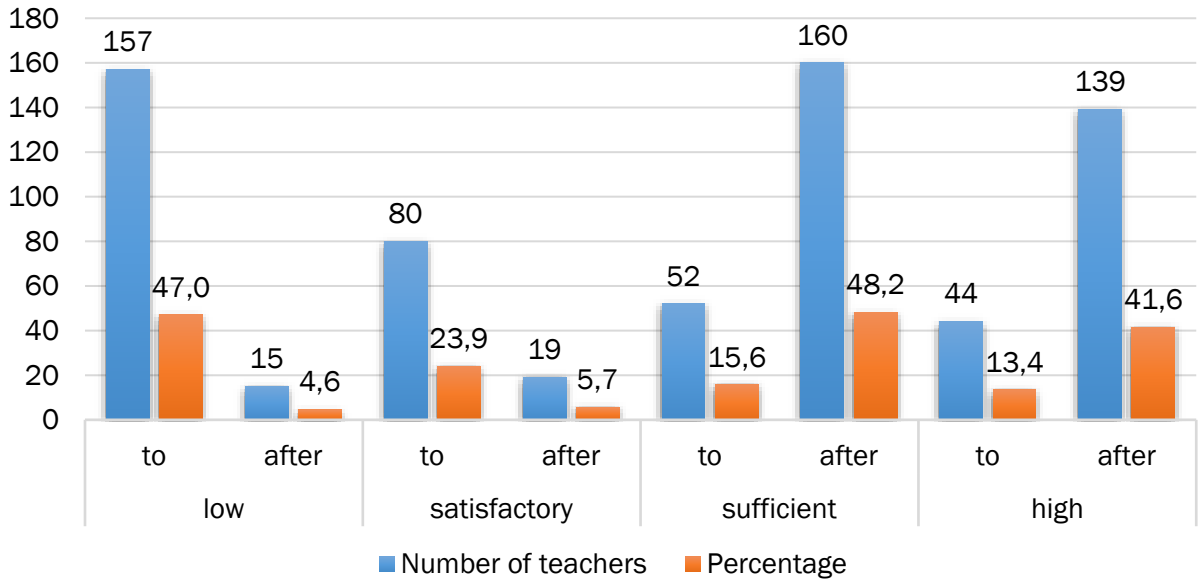


Fig. 3.6 **Levels of teachers' ICC development before and after the formative stage of the pedagogical experiment**

According to the results of the formative stage of the experiment (Fig. 3.6) there is a positive dynamics of teachers' ICC development in the system of military education during distance learning. The percentage of teachers with sufficient and high levels of ICC development has increased.

After the introduction and approbation of the professional development-

oriented models and methodology of ICC development in the educational process, the number of teachers with a sufficient level of ICC development has increased by 32.51% (108 teachers) while with a high level by 28.21% (95 teachers). At the same time, the number of teachers with a low level of ICC development has decreased by 42.47% (142 teachers) and with satisfactory by 18.25% (61 teachers).

Thus, the effectiveness of the professional-oriented model and methodology of ICC development has been confirmed. Most teachers of the system of military education have increased their levels of ICC in the course of distance learning.

However, we need to confirm or refute the statistical (scientific) hypothesis, to determine the reliability of the obtained empirical data, to confirm that it was not just a coincidence. For this reason, we first need to formulate our hypotheses regarding teachers' ICC development for military education system in the process of distance learning.

Statistical hypothesis:

1. *Overall statistical hypothesis-making* –differences between the selected sample before and after the formative stage of the pedagogical experiment are the following:

2. H_0 – differences in the studied sample before and after the formative stage of the pedagogical experiment were not detected.

3. H_1 – differences in the studied sample before and after the formative stage of the pedagogical experiment were detected.

Scientific hypothesis:

1. *Overall scientific hypothesis-making* – the development of teachers' ICC in the system of military education in the process of distance learning will be effective in case the professionally-oriented model and methodology of ICC development is introduced, namely the statistical hypothesis H_1 of the experimental research is confirmed.

2. H_0 – the development of teachers' ICC in the military education system in the process of distance learning is not effective provided that the statistical hypothesis H_0 is confirmed.

3. H_1 – the development of teachers' ICC in the military education system in the process of distance learning is effective provided that the statistical hypothesis H_1 is confirmed.

Thus, the confirmation or refutation of the statistical hypotheses of the experimental research (statistical solution) had the following stages:

1. Formulation of statistical hypothesis H_0 and H_1.

2. Determining the size of the sample group for the experimental research.

3. Choice of a corresponding significance or H_0 refutation probability levels of the statistical hypothesis. It can be less than or equal to 0.05 (5% significance level). Depending on the importance of the study, one can choose a significance level of 0.1 or even 0.001.

4. Choice of a testing method for statistical hypothesis, depending on how the scientific and pedagogical problem is solved within the experimental research.

5. Calculation of the required empirical value based on the experimental data considering the chosen method of statistical testing of the hypothesis.

6. Determination of critical values according to the chosen method of statistical testing of the hypothesis taking into account the significance level for $p = 0.05$ and for $p = 0.01$.

7. Building the axis of significance according to the critical and empirical values of the selected statistical testing method of G_{emp} hypothesis.

8. Conclusions on the taken statistical decision (choice of the corresponding statistical hypothesis H_0 or H_1).

To calculate the empirical data of the pedagogical experiment we used the *G*-signs statistical criterion [214], [294].

The *G*-sign test is used to compare the state of some properties (features) of two dependent samples members grounding on their diagnosis. The relevant criterion refers to the non-parametric criteria of data statistical analysis and is used only for related samples. The *G*-sign test allows one to determine how the values of the corresponding properties (features) change in the course of re-diagnosing a related sample.

When calculating the statistical data, the term «shift» is used. Shift is the difference value between the values of certain properties (features) of one and the same participant before and after the formative stage of the pedagogical experiment.

The *G*-sign test is intended to spot changes in the values of properties (features) when re-diagnosing a related sample in the direction of its increase or decrease.

Based on the above mentioned, we need to introduce two necessary symbols.

1. The sum of shifts, which is the highest, is called typical shift and is

denoted by the letter *n*. A typical shift is used when working with the appropriate table for this criterion, which presents the critical values (G_{cr}) of 5% and 1% of the test significance levels.

2. The sum of the shifts, which is the lowest, i.e. has a non-typical shift, is denoted by G_{emp}. G_{emp} value is placed on the axis of significance.

An example of the statistical data calculation result is shown in Fig. 3.7, where as a result, G_{emp} did not fall into the zone of significance.

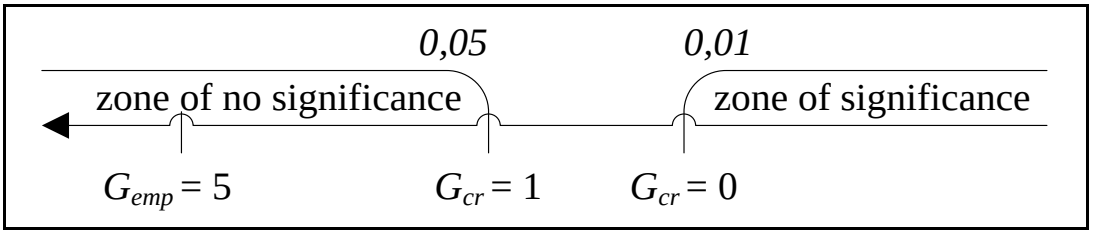


Fig. 3.7 Significance axis for *G*-sign test

It should be mentioned that the example presents the axis of significance upside-down. The zero mark is on the right, and the number line increases in the opposite direction. This peculiarity is justified by the fact that the presence of non-typical shifts is decreased by the probability of the statistical reliability total shift. This type of placing the axis of significance is valid for Wilcoxon *T*-test, McNamara test and Mann-Whitney *U* test.

Based on the mentioned above, we will analyze the example of calculating statistical data of the formative stage of the pedagogical experiment for the implementation in the process of education in the advanced courses of professionally-oriented model and methodology of teachers' ICC development in the system of military education in the course of distance learning.

Thus, Annex D contains the values (grades) of teachers before and after distance advanced training courses and their shifts (typical, non-typical, ties).

In 2020, after studying on remote advanced training courses for teachers of military education system we calculated the following number of shifts: ties – 0; positive – 333, negative – 0.

Hence, we obtained only positive shifts, i.e. typical ones, $n = 333$. Non-typical shifts (negative) – 0. Thus, $G_{emp} = 0$.

Following the recommendations in [75] the critical values, according to the range of the typical shift, in our case its $n = 333$.

$G_{cr}\begin{cases}135 \ for \ p \le 0,05\\129 \ for \ p \le 0,01\end{cases}$, i.e. at a significance level of 5%, the sum of non-

typical shifts does not exceed 135, and at a significance level of 1% – 129.

In this case $G_{emp} = 0$, i.e. $G_{emp} \leq G_{cr}$. Thus, the statistical hypothesis H_0 is refuted and H_1 is confirmed ($p \leq 0.01$).

In addition, we used specialized software *IBM Statistical Package for the Social Sciences* for statistical data calculation.

Calculation results are shown on Fig. 3.8 – 3.12:

Hypothesis Test Summary				
	Null Hypothesis	Test	Sig.	Decision
1	The median of differences between ***to_the_experiment*** and ***after_the_experiment*** equals 0.	Related-Samples Sign Test	,000	Reject the null hypothesis.
Asymptotic significances are displayed. The significance level is ,050.				

Fig. 3.8. **Statistical hypothesis test summary**

Fig. 3.8 shows the result of calculating the empirical data of the indicative and formative stages of the pedagogical experiment using specialized software *IBM Statistical Package for the Social Sciences*. Thus, the median of differences between «before» and «after» the pedagogical experiment in CG and EG is not ties, i.e. the statistical hypothesis H_0 is not confirmed.

Related-Samples Sign Test Summary	
Total N	333
Test Statistic	333,000
Standard Error	9,124
Standardized Test Statistic	18,193
Asymptotic Sig. (2-sided test)	0,000

Fig. 3.9. **Test summary of *G*-sign related samples**

Fig. 3.9 indicates that asymptotic significance (2-sided test) tends to zero, i.e. the *G*-signs test summary confirms the importance of the obtained empirical data of the pedagogical experiment after the introduction of professionally-oriented model and methodology of teachers' ICC development in the system of military education in the process of distance learning (the results and conclusions can be applied on the overall population of those surveyed, teachers of the military education system).

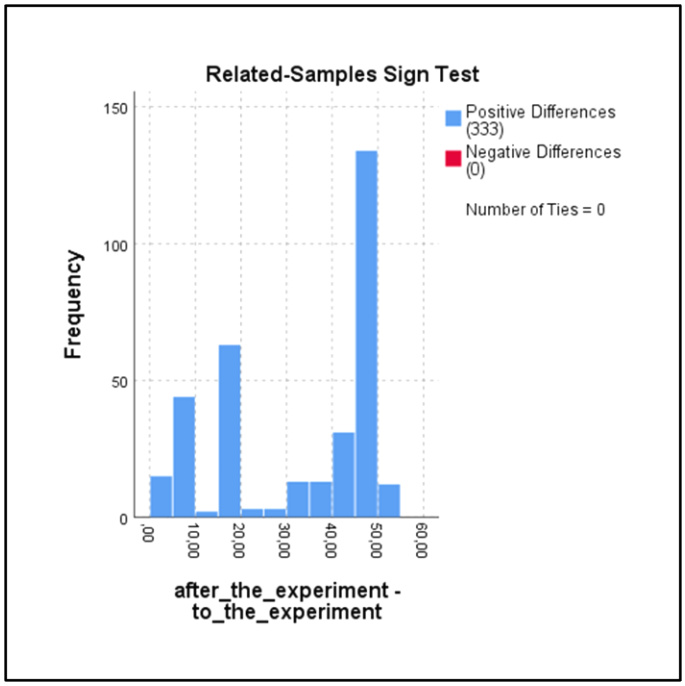


Fig. 3.10. **Sum of shifts (typical, non-typical, ties)**

Fig. 3.10 shows the sum of shifts in the results of pedagogical experiment in CG and EG, in particular positive (typical) shifts – 333, non-typical shifts (negative) – 0 and ties – 0.

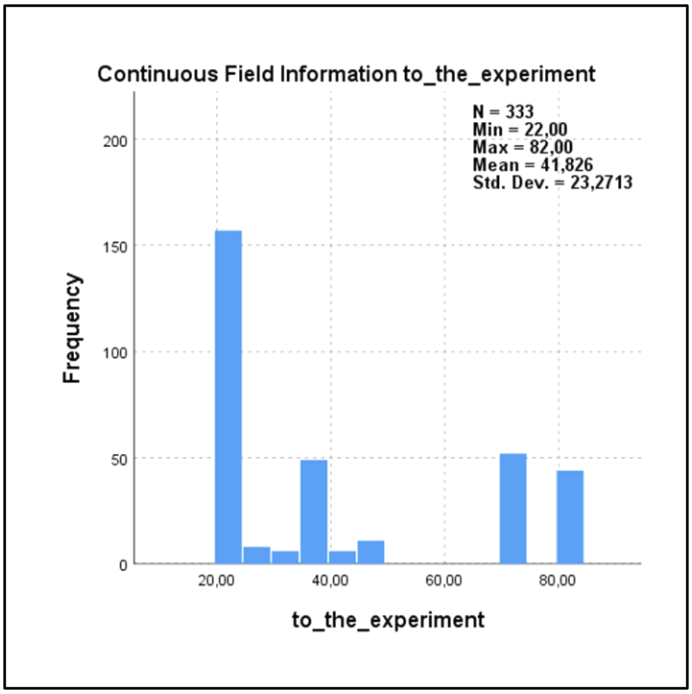


Fig. 3.11. **Continuous Field Information before the formative stage of the pedagogical experiment**

Fig. 3.11 displays information on the number of respondents (333 teachers of the military education system) who took part in the indicative stage of the pedagogical experiment and relevant statistical information, namely: the minimum value obtained for the experiment – 22; maximum value – 82; the average value is 41.82 and the standard deviation is 23.27.

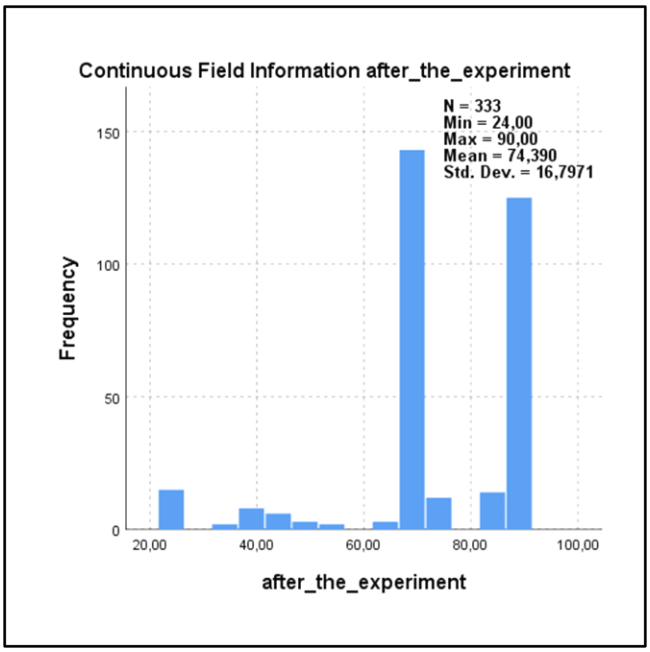


Fig. 3.12. **Continuous field information after the formative stage of the pedagogical experiment**

Fig. 3.12 displays information on the number of respondents (333 teachers of the military education system) who took part in the formative stage of the pedagogical experiment and relevant statistical information, namely: the minimum value obtained for the experiment – 24; maximum value – 90; the average value is 74.39 and the standard deviation is 16.79.

Thus, the analysis of the formative stage statistical results confirmed the qualitative changes in the numerical values of the relevant indicators and levels of teachers' ICC development in the system of military education. The compared results of empirical data prove the effectiveness a professionally-oriented model and methodology of teachers' ICC development in the system of military education in the course of remote advanced training. Therefore, the scientific hypothesis H_1 is confirmed and H_0 is refuted.

Thus, qualitative changes in the relevant components and levels of teachers' ICC development in the system of military education are not a coincidence, as proved by the corresponding calculations above.

3.3. Organizational and pedagogical conditions for the development of the information and communication competence of teachers in the military education system in the course of distance learning

Analyzing the unresolved scientific problem in pedagogical theory and practice of teachers' ICC development in the system of military education during distance learning and the results of experimental research, we can conclude that the introduction of the professional-oriented model and methodology of teachers' ICC development in the process of advanced training is effective.

The generalized data on the experience in the use of diagnostic means, implementation of professional-oriented model and methodology of teachers' ICC development in the system of military education in distance learning enabled us to formulate recommendations for improving the process of teachers' advanced training in the system of military education during distance learning, in particular, their ICC.

First of all, the basis for methodological recommendations should be the use of professionally-oriented model of teachers' ICC development in the system of military education during distance learning.

Therefore, to implement the model it is necessary to follow an appropriate structure of its building, and distance learning system operation. As an example we consider the structure of distance learning technologies use of The National Defence University of Ukraine named after Ivan Cherniakhovskyi, Fig 3.13.

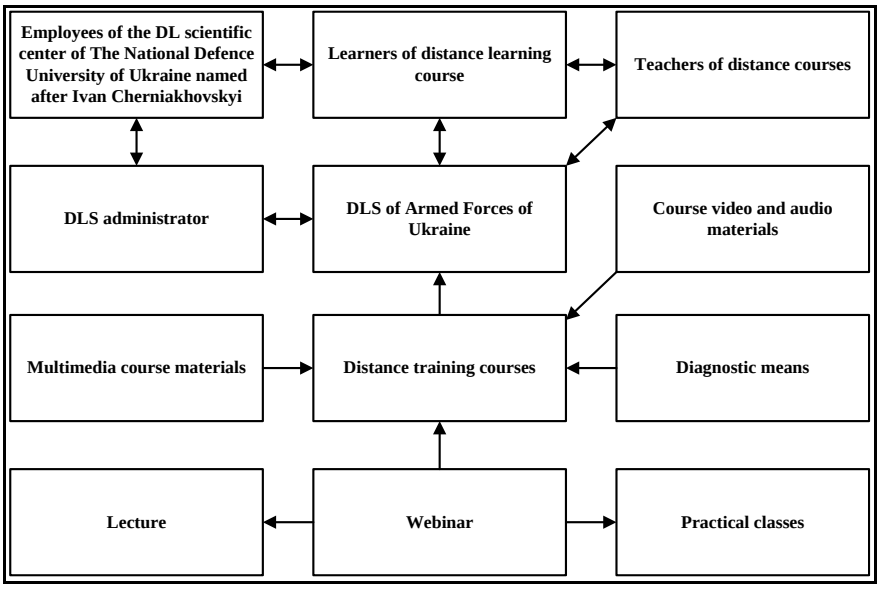


Fig. 3.13. Structure of distance learning system operation

The structure shown on Fig. 3.13 allows ensuring interoperation between all subjects of distance learning process. This is possible due to operation and interaction of system elements. It particular, it ensures development of teachers' ICC in the system of military education in the course of remote advanced training.

It should be noted that distance learning technologies allow creating appropriate distance courses, which may include:

– curriculum of the relevant distance learning course (topics, schedule);

– methodical recommendations on the features and order of training materials (types of control, criteria for successful training completion);

– relevant educational material (lectures, practical classes, group and seminar classes using video or audio format);

– glossary of categorical apparatus (terminological dictionaries);

– additional multimedia materials;

– multimedia lecture materials created with the help of specialized software (*Adobe Captivate, iSpring, Adobe Illustrator*);

– practical and test tasks for control;

– e-libraries or links to them.

Secondly, in order to ensure the development of the teachers' ICC in the system of military education during distance learning, it is necessary that the distance course meets the following requirements:

– interactive and high-quality content;

– availability of educational and methodical materials;

– the sequence of learning educational material and control of students educational activities;

– a precise timetable for teachers to implement the curriculum;

– criteria for performance and diagnostic means;

– a well-organized system of teacher interaction, taking into account the synchronous and asynchronous modes of their learning.

Additionally, regardless of the way distance course is presented, there is a generally accepted rule that ensures the basis for its construction. It is important to clearly define the course subject, which other educational materials are based and developed on (lectures, group and practical classes, seminars, tests) and which contribute to the educational activities of students. Therefore, it allows achieving the goal of the distance course, in particular, the student achieves the appropriate level of competence in a certain composition of generally accepted knowledge, skills and abilities. In the process of

developing a distance course, the teacher should take into account a list of specific topics that are fundamental.

To motivate students, the teacher should consider the gray areas of certain topics, those areas that are new to students and should be of interest. This will activate students and create appropriate communicative environment for the discussion of problematic issues. Initial interaction can mainly consist of students questions to the teacher. It should be mentioned that gray area topics can be effectively used to promote students to educational interaction.

It is worth mentioning that the distance course usually consists of more than one published lecture or several PowerPoint schemes. Experience shows that the distance learning course is studied continuously, when its content is placed in pre-defined modules (blocks – sections), each contains relevant training materials presented in different formats. For example, a weekly course can be organized in seven training modules. Each module can contain theoretical materials and practical tasks. It is also necessary to pay attention to the placement of test tasks at the end of each module, which will allow students to demonstrate how well they mastered educational topics.

Distance course, as a rule, should be filled with high-quality and meaningful course materials, which fully cover the subject. In addition, the text should be technically accurate, legible, concise, and preferably, if necessary, contain graphics. Thus, when developing a distance course, the teacher should walk in students' shoes, i.e. design and complete the course so that the student has the opportunity to learn it independently and master the relevant knowledge.

The content of the distance course should not have duplicated materials from the textbook or manual, but on the contrary, it should have difference, be more conceptual. Therefore, the textbook will be a supporting material, which will give relevant examples and detailed information on the relevant issue of the course topic. The teacher should prepare materials that demonstrate (oppose) wrong views as correct, as provided in the textbook. This additional information will help boost students' motivation and commitment. It should be mentioned that this way structured course content gives a variety of discussion opportunities between a student and a teacher, a student and another student. This allows increasing the efficiency of the distance learning process and interaction with each other. The most important thing is that the process of this interaction forces the student to use acquired knowledge when fighting with the answers that fall into the gray areas, usually not covered in the textbook.

Experience shows that students prefer to read from a textbook rather than from a computer screen. One reason is that educational activities are personal and the book meets the needs of education, including distance learning. Therefore, the choice of appropriate good textbooks enhances and complements the process of independent learning activities in the course of distance learning.

Additionally, we should always remember about the order of course materials presentation according to the modules of the course taking into account the time for students to study and master them. Thus, after students learn these requirements, they are in the situation of forced participation, meaning that in case they do not follow it, they may not successfully pass the examination.

It should be mentioned that it is important to determine the kind of activities and materials that can complement, support and enhance the process of distance learning when the student-instructor interface is not personal and verbal. One needs to consider the way and format of training materials submission taking into account available means of communication.

Analyzing the experience, group classes can be held in virtual rooms (online environment). One can form small groups and set tasks to work on. Remote courses, where group interaction was used, an active students' interaction was recorded in performing the tasks set. This group work plays a key role in the students' learning experience. Hence, group interaction in the created learning environment gives students the opportunity to develop and improve the culture of teamwork necessary for achieving success in their daily activities.

Test tasks enable teachers to control the quality learning information in the process of distance learning, in accordance with the main course topics. When developing test tasks it is necessary to take into account the completeness and complexity of the learned training material. It means that the result of the assessment should show not fragments of the classes completed, but a set of all course topics or a single topic or course issue.

Thirdly, even taking into account the first and second points of the recommendations, it is impossible to guarantee the effectiveness of teachers advanced training in the system military education without implementing and following basic requirements for distance learning in places where they connect to the system of distance learning in the Armed Forces of Ukraine, namely:

– introduction and development of information and communication networks, i.e. the actual integration of networks into a single information space and the use of up-to-date technologies for audiovisual information transmission in higher military education institutions;

– the use of distributed storage and data processing systems, upgrading the client-server architecture, the use of up-to-date hardware and software, including integration of cross-platform software that will allow working on any computer with a different architecture and operating system *Windows, Unix, Mac OS*.

It should be mentioned that the implementation of each requirement needs close attention from both administrators responsible for the integrity, confidentiality and accessibility of these means, resources and technologies, and teachers who use these means. However, it can already be argued that improvement of the learning process by using new ICT tools leads to an increase in the level of ICC of both teachers who teach on the distance learning courses and students, in particular, teachers of military education system.

Fourthly, analysis of the experience of professional development of scientific and teaching staff in the system of military education allows stating the following aspects:

– the task of training highly-skilled scientific and pedagogical employees who have the appropriate level of ICC is necessary at all levels of military education system;

– the necessary conditions for the ICC development are the availability of basic training in the field of ICTs. Without it the learning process, which involves the use of these tools, is complicated, especially remote learning;

– the development of teachers' ICC in the system of military education can be ensured provided that the structure and content of teachers training follow the latest trends in ICTs for education and society in general, i.e. it is important to take into account the specificity of their scientific and pedagogical activities;

– main factors that influence the quality and effectiveness of teachers' educational activities in the system of military education regarding mastering up-to-date ICTs are their values, motivation and subjectivity to professional training in the process of distance learning, i.e. without this effective training is impossible;

– the number of trained scientific and pedagogical employees exceeds

the number of those who are really competent, i.e. those who are able to apply ICTs in their scientific and educational activities, especially it is necessary to clearly define the minimum requirements for the goals and learning outcomes regarding the development of their ICC.

Thus, the issue of creating a continuous system of professional development for scientific and teaching staff in the field of ICTs and the introduction of non-declarative but effective educational and methodological support in the course of remote teachers' training in the system of military education is still relevant.

The solution of this problem consists in the reasonable use and presentation of basic teaching and methodological materials, designed for distance learning, for independent work to teachers. It should be posted in relevant repositories (e-libraries or the Internet.

Therefore, methodological support for professional development of scientific and teaching staff can be defined as a set of organizational and support measures that are developed in the course of joint activities by all subjects of professional development. These measures solve the following tasks:

– formation of a conceptual idea of the set goal and partial tasks regarding implementation of the curriculum of advanced training in the field of ICTs necessary for the development of teachers' ICC;

– focus on providing advisory and practical assistance to teachers in overcoming existing or preventing future problems connected with mastering up-to-date ICTs and applying them in practice in the process of distance learning;

– focus on the systematic diagnosis of the state of teachers' ICC development in military education system;

– use of ICTs potential, in particular distance learning technologies;

– focus on the development of teachers professional and pedagogical competence, which is part of the ICC.

Fifthly, the organization of teachers' ICC development in military education system on remote advanced training courses provides the following benefits:

– combining a set of methodological approaches (information-based, competence-based, subject-action based, contextual-based and andragogy-based) taking into consideration the specificity of distance learning, which ensures the effectiveness of the teachers' ICC development in the system of

military education;

– direct practical application of ICTs from the first minutes of advanced training, which has a positive effect on teachers ability and willingness to use up-to-date ICTs in their scientific and educational activities;

– synchronous (asynchronous) mode of students educational activities, which allows building their own plan for a distance course, i.e. without reference to time and plan;

– continuity of teachers' ICC development in military education system due to the constant use of ICTs when implementing relevant educational tasks in the process of distance learning.

It should be mentioned that the development of teachers' ICC in military education system is a continuous process that requires constant updating of methods, structure and content of professional development in the process of distance learning. This is due to the fact that what is relevant and new today, no one will need tomorrow. Thus, the development of teachers' ICC should be proactive and cover the latest advances in ICTs.

The content and structure of distance learning for teachers' ICC development in military education system should be designed taking into account the latest problems, trends, prospects for the use of ICTs in education, in particular from the point of military education system.

Thus, the main methodological recommendations for the teachers' ICC development in military education system in the process of distance learning can be the following:

– taking into account the values, interests, needs and motives of teachers to use ICTs in their scientific and pedagogical activities, as well as the results of the entry level of its development;

– following general-didactic and specific principles of teaching;

– work on the development of teachers subjectivity;

– ensuring the gradual development of teachers' ICC structural components (value-motivational, intellectual, information-technological, praxeological and subjective);

– intensification of teachers independent work.

In our opinion, the use of the developed methodological recommendations on the teachers' ICC development in military education system in the process of distance learning will help to increase the level of their ICC development, namely the effectiveness of their scientific and educational activities.

Conclusions to the third section

The pedagogical research on the development of teachers' ICC in the system of military education in the process of distance learning was conducted in two stages - indicative and formative. On the basis of the results of these two stages we concluded the following:

1. We calculated the results of the indicative stage of pedagogical experiment, which showed that 70.97% (237 teachers) need to develop theoretical background (knowledge) and practical ability (skills) in using ICTs in scientific and educational activities, which will ensure successful performance of their responsibilities as subjects of scientific and educational activity in the information society.

2. We introduced and tested a professionally-oriented model and methodology of teachers' ICC development in military education system in the course of distance training at the formative stage of the pedagogical experiment.

3. We substantiated the results of qualitative changes in the numerical values of relevant components and levels of teachers' ICC development in the system of military education using the statistical *G*-signs test (taking into account the consistent method of proving the statistical hypothesis). Thus, the number of teachers with a sufficient level of ICC development increased by 32.51% (108 teachers) and with high – by 28.21% (95 teachers). At the same time, the number of teachers with a low level of ICC development decreased by 42.47% (142 teachers) and with satisfactory – by 18.25% (61 teachers).

4. We confirmed the H_1 scientific hypothesis and refuted H_0. Thus, qualitative changes in the relevant components of teachers ICC and its levels of development are not a coincidence, as proved by the relevant statistical calculations.

5. Based on the results of the research, we prepared methodical recommendations on the development of teachers ICC in the system of military education in the course of distance training.

Main provisions of this section are reflected in the following author's publications: [143], [150].

CONCLUSIONS

The monograph explores and solves the scientific problem of teachers' ICC development in pedagogical theory and practice for the system of military education in the course of distance training, considering international approaches and guidelines on ICC. It allowed concluding the following:

1. We analyzed how much is known about professionals' ICC development in scientific and pedagogical practice grounding on information-based, competence-based, subject-action based, andragogy-based and contextual-based methodological approaches. We substantiated the essence and structure of the basic concept «teachers ICC in the system of military education», which is a dynamic professional ability of teachers in the system of military education to the systemic and contextual use of ICTs in scientific and educational activities, that is manifested in the integral unity of value-motivational, intellectual, information-technological, praxeological and subjective components.

2. We justified the essential characteristics of teachers' ICC components in the system of military education, which include the following: value-motivational (ability to positively identify values, motives, needs, interests, aspirations for the use of ICTs in scientific and educational activities); intellectual (ability to perceive, analyze, synthesize, process, critically evaluate and create information messages of military-professional nature in the course of educational activities in the field of digital technologies); information-technological (ability to use digital resources and digital technologies); praxeological (ability to effectively use ICTs in scientific and educational activities, in particular in distance learning); subjective (ability to carry out subject-subject interaction in scientific and educational activities).

3. We substantiated and experimentally verified the professionally-oriented model of teachers ICC development in the system of military education in the process of distance training. Its main blocks are conceptual (contains the purpose and subordinate main tasks for teachers' ICC development in military education system in accordance with the leading provisions of information-based, competence-based, subject-action based, andragogy-based and contextual-based methodological approaches); content block (contains the content of teachers ICC; requirements for its development considering latest advances in psychological, pedagogical and methodological areas, information sphere; promotes consistency, continuity of teachers' information and communication knowledge development); subjective (contains the process of interaction between the subject of teaching – the teacher (s) and the subject of educational activities – the student (s)); methodical block (contains the author's method of teachers ICC development in

the system of military education during distance training); diagnostic-result block (contains criteria and indicators for diagnosing the teachers ICC development; levels of its development (low, satisfactory, sufficient, high).

4. We developed the methodology and provided guidelines for teachers ICC development in the system of military education in the course of distance learning. The main stages of the methodology are: value-motivational, developmental, summarizing. The basis of its implementation was a distance course «Information and communication technologies in teachers' scientific and educational activities» in accordance with the author's curriculum.

5. We developed criteria and indicators for diagnosing the level of teachers' ICC development in the system of military education: value-motivational (values of scientific and educational activities using ICTs; motivation for the development of ICC); cognitive (knowledge of the theory of ICTs; knowledge of theoretical background of analysis and decision-making in the military sphere using ICTs; knowledge of technologies for modeling processes (phenomena) in teaching general and special military disciplines; knowledge of theoretical principles of cyber-security in the use of ICTs for teaching general and special military disciplines, knowledge of up-to-date hardware and software, knowledge of software development technologies in accordance with specific teaching methods); technological (ability to use ICTs; ability to develop and use up-to-date hardware and software and test it for cyber vulnerabilities); functional (ability to use ICTs in scientific and educational activities; ability to synthesize various software tools to increase the effectiveness of teaching general and special military disciplines; ability to develop information software tools for teaching general and special military disciplines); reflexive (scientific and pedagogical subjectivity in the information society; the ability to self-assessment as a subject of information and analytical activities when performing the functions of a teacher of general and special military disciplines).

6. Empirical data of the pedagogical experiment allow us to conclude that the proposed model and methods of development teachers ICC are effective and can be recommended for implementation in scientific and pedagogical activities of teachers of the system of military education.

The conducted scientific research does not cover all aspects of the research problem of teachers ICC development in the system of military education during distance training. The perspectives for further research consist in improving teachers' ICC, taking into account promising areas of ICTs development, in particular determining the peculiarities of use and implementation of specialized software *Experience API* and artificial intelligence in the process of distance learning.

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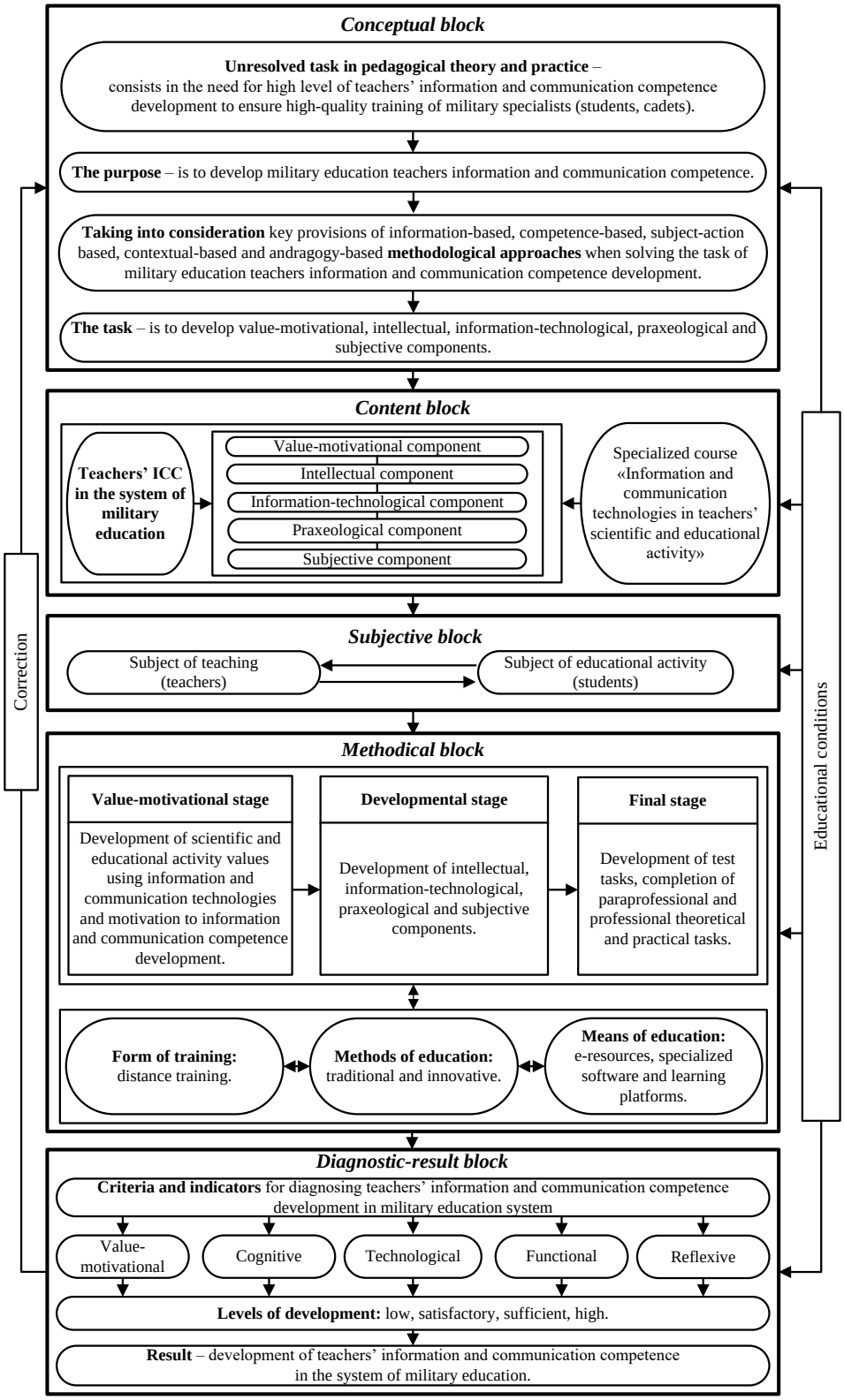
ANNEXES

ANNEX A

Model of teachers' ICC development in the system of military education in the course of remote training



ANNEX B

Value-motivational component

Instruction: express your position regarding the following statements:

1. The use of ICTs in scientific and educational activity is important for me:
   a) Yes;
   b) No.
2. How can we increase the effectiveness of training students in higher military educational institutions:
   a) Give more time for self-study;
   b) use ICTs in the course of training;
   c) enhance the curriculum;
   d) improve the teachers' professional level.
3. What do you use to improve student's mastery of the learning material in the classroom:
   a) tried and tested materials which provide well-presented for understanding course materials;
   b) ICTSs in delivering course materials;
   c) videos in accordance with topic of the lesson;
   d) discussion of the topic of the lesson.
4. Do ICTs complicate the process of students training:
   a) Yes;
   b) No.
5. The use of ICTs in scientific and pedagogical activity is the demand of time:
   a) Yes;
   b) No.
6. Would you like to take part in distance course design:
   a) Yes;
   b) No.
7. Would you like to develop software in scientific and educational activity:
   a) Yes;
   b) No.
8. Would you like to learn specialized software for scientific and educational activity:
   a) Yes;
   b) No.
9. Would you like to improve your level of ICTs knowledge:
   a) Yes;
   b) No.

10. Are you ready for the challenges on your way to mastering up-to-date ICTs:
    a) Yes;
    b) No.

Intellectual

Instruction: answer the following questions:

1. What feature is not an information feature as an object:
    a) elegancy;
    b) reliability;
    c) adequacy;
    d) availability;
    e) relevancy.
2. What is involved in the process of text translation from one language into the other:
    a) information storage;
    b) information transfer;
    c) information search;
    d) information processing.
3. 1 Mbyte equals:
    a) 1 000 000 bits;
    b) 1 000 000 bytes;
    c) 1024 Kbytes;
    d) 1024 bytes.
4. Define the key characteristic of a microprocessor:
    a) speed;
    b) frequency;
    c) portability;
    d) resolution;
    e) capacity.
5. What does AIS stand for:
    a) automated information system;
    b) automatic information system;
    c) automated information network;
    d) automated Internet network.
6. A unified data system, which is organized according to certain rules, presupposes general principles of description, storage and processing of data is:

a) data base;
b) knowledge base;
c) a set of rules;
d) a collection of laws.

7. What is the equivalent of 8-bit binary:
a) byte;
b) bit;
c) word;
d) megabyte.

8. What is the name of the software that provides graphical interface for interactive search, discovery, viewing and processing of data on the network:
a) browser;
b) protocol;
c) page;
d) firewall.

9. What is the name of the method of discrete information representation on nodes connected by links. Data can be presented in the form of text, graphics, sound recordings, videos, pictures, photographs or executable documentation:
a) hypermedia;
b) hyperlink;
c) hypertext system;
d) hypertext.

10. What is the name of the document element for linking different components of information within the document itself, in other documents, including those hosted on different computers:
a) hypermedia;
b) hyperlink;
c) hypertext system;
d) hypertext.

11. What is distance learning using textbooks, personal computers and computer networks called:
a) distance learning;
b) remote training;
c) Internet school;
d) University at a distance.

12. What is the name of the system of scientific and engineering knowledge, as well as methods and tools used to create, collect, transmit, store and process information in subject area:

a) Information technology;
b) Information system;
c) informatics;
d) cybernetics.

13. What is the name of the network that connects the computers in the room or neighboring rooms:
a) global network;
b) local network;
c) regional network.

14. What is the name of a computer systems with integrated audio and video support:
a) multimedia;
b) media;
c) audio-visualization;
d) interaction.

15. What is the name of the main control program (set of programs) on a computer:
a) operating system;
b) applied program;
c) graphic editor;
d) text processor.

16. What is the name of the software that automatically collects and classifies information about sites on the Internet and publishes it at the request of users. Examples: AltaVista, Google, Excite, Northern Light etc. In Russia - Rambler, Yandex, Apart:
a) search engine;
b) knowledge base;
c) data base;
d) forum.

17. What is the name of the method which allows hypertext documents transfer from the server to individual users:
a) FTP protocol;
b) HTTP protocol;
c) TCP / IP;
d) ADSL.

18. What is the name of the network that connects computers within a region:
a) Global network;
b) Local network;

c) Regional network.

19. What is the name of the network node that contains data and provides services to other computers; a computer connected to a network and used to store information:

a) website;
b) server;
c) protocol;
d) browser.

20. What is the name of a system of interacting elements interconnected on dedicated or switched lines to provide local or remote communication (voice, visual, data exchange, etc.) and to exchange data between users who have common interests:

a) network;
b) chat;
c) forum;
d) browser.

21. What is the name of a set of software and language tools designed to manage data in the database, maintain this database, provide multiple user access:

a) DBMS;
b) ISM;
c) AIS;
d) DBIS.

22. What is the name of a communication line with high bandwidth:

a) Fiber optic lines;
b) Radio relay lines;
c) Telephone lines;
d) Cable lines.

23. What is the name of the hypertext page viewer WWW:

a) browser;
b) protocol;
c) server;
d) HTML.

24. What is transaction:

a) Data transfer;
b) Data processing;
c) A set of operations.

d) Data change.

25. Which of the following programs is a graphic editor:
    a) Excel;
    b) Word;
    c) Access;
    d) Paint.
26. Where are all the created files saved in the operating system:
    a) Hard drive;
    b) modulator;
    c) floppy-disk;
    d) generator.
27. What operating system is the basis for Android OS:
    a) Linux;
    b) Mac;
    c) Unix;
    d) Windows CE;
    e) Windows XP.
28. What operations do intellectual systems perform:
    a) Produce information on the basis of which an individual makes decision;
    b) input, systematize, store, issue information without data conversion;
    c) use engineer calculation, create graphics;
    d) produce information, which an individual takes into consideration without it immediate transformation into a series of actions.
29. What operations do information-search systems perform:
    a) Produce information on the basis of which an individual makes decision;
    b) use engineer calculation, create graphics;
    c) input, systematize, store, issue information without data conversion;
    d) produce information, which an individual takes into consideration without it immediate transformation into a series of actions.
30. What is the management decision-making process is based on:
    a) considering management functions;
    b) personal qualities;
    c) use of economic and mathematical methods;
    d) intuition, balance, rationality.
31. What can be applied to individual management decisions:
    a) decrees, orders and instructions;

b) decrees and orders;
c) orders and instructions;
d) orders, directives, instructions and resolutions of managers.

32. Long-term solutions are aimed at:
a) strategic tasks solution;
b) strategic and tactical tasks;
c) mainly log-term tasks;
d) mainly tactical tasks.

33. Short-term solutions are aimed at:
a) tactical operational objectives;
b) operational objectives;
c) tactical objectives;
d) achievement of planned economic indicators.

34. What is creativity:
a) ability to make strategic decisions;
b) combination of abstract thinking, liberality, originality, independence, curiosity, will and attention;
c) ability to solve complicated theoretical and practical issues and tasks, that require special training;
d) ability to respond quickly to problems.

35. Identify the nature of the problem:
a) deviations in operational plans realization;
b) inconsistency between the desired (regulatory) and actual levels of goals achievement;
c) lack of an automated system of decision-making;
d) occurrence of certain circumstances which lead to a particular situation.

36. What stages does preparation to making management decision consist of:
a) obtaining information, determining goals, development of evaluation system, analysis, diagnosis, predicting the development of the situation;
b) generating alternatives, selection of main solution options, scenarios of situation development, expert evaluation of the solutions;
c) decision-making, development of plan of actions, analysis and evaluation of the results of management decisions.

37. What stages does development of management decision consist of:
a) obtaining information, determining goals, development of evaluation

system, analysis, diagnosis, predicting the development of the situation;

b) decision-making, development of plan of actions, analysis and evaluation of the results of management decisions;

c) generating alternatives, selection of main solution options, scenarios of situation development, expert evaluation of the solutions.

38. What stages does realization of management decision consist of :

a) making decision, development of plan of actions, management of its realization, analysis and evaluation of management decision results;

b) obtaining information, determining goals, development of evaluation system, analysis, diagnosis, predicting the development of the situation;

c) generating alternatives, selection of main solution options, scenarios of situation development, expert evaluation of the solutions.

39. What does the head need for a reasonable decision-making:

a) systemic and reliable information;

b) detailed and systemic information;

c) detailed, reliable and systemic information;

d) detailed and reliable information.

40. Give definition to the term “decision”:

a) process and result of choice;

b) information processing;

c) data scanning process;

d) data distribution process.

41. What is necessary for implementing a decision:

a) availability of a goal and alternatives;

b) availability of proposals;

c) availability of beliefs;

d) availability of tasks.

42. Choose general methods of predicting:

a) questionnaires, extrapolation, modeling;

b) data transfer and processing;

c) reconnaissance;

d) predicting situations.

43. Choose the output flow of information in solving predicting problems:

a) information on current state and possibilities;

b) synthesis of the obtained data;

c) data deduction;
d) data flow.

44. Identify the components of predicting:
a) output information collection and analysis;
b) sending of output information;
c) receiving output information;
d) information processing.

45. Choose the methods of received data authentication:
a) comparison of data;
b) data filtering;
c) situation recognition;
d) all answers are correct.

46. What is the data comparison method based on:
a) comparing data from various sources considering their reliability;
b) comparing data from one reliable source considering its credibility.

47. What are filtering methods:
a) reference values for a set of key parameters which form the basis for determining facts credibility and levels of significant coefficients of these parameters for qualitative evaluation;
b) ranking the received data for operational analysis and making decisions.

48. What is the name for information collection and analysis, as well as bringing decisions (commands, instructions) to the objects of management:
a) information processes, key requirements to which are detailed, timely and reliable transfer and receiving of information;
b) set of data about the enemy;
c) background information about the object of the study.

49. How is data retrieved and acquired:
a) with the help of various technical means and systems of data collection about the situation;
b) by calling the information desk;
c) by scanning the document.

50. Who is taking part in the process of making decisions to benchmark data preparation:
a) commander and staff officers-in-command who perform necessary calculations and modeling, report about their results and proposals;
b) commander and the deputy;
c) staff commander.

51. Give definition to the system-wide mathematical software:
    a) a set of descriptions and algorithms dedicated to organization and effective functioning of technical means while modeling combat operations and solving problems connected with information processing; interoperation of operational component of commanding bodies with the help of software;
    b) a set of descriptions and algorithms aimed at organizing and ensuring data processing.
52. What is included in Data Mining:
    a) statistics, data bases, artificial intelligence;
    b) informatics, data bases, statistics;
    c) artificial intelligence, data bases, knowledge bases;
    d) informatics, data bases, data storages.
53. How is Data Mining used on the Internet:
    a) for creating websites;
    b) for search engines organization;
    c) for web-pages presentation.
54. What are tasks of DSS:
    a) data input, data conversion, data output;
    b) data input, data modification, data transfer;
    c) data input, data storage, data analysis.
55. Which class of analysis tasks is responsible for executing queries:
    a) information-retrieval;
    b) operational-analytical;
    c) intellectual.
56. Which class of analysis tasks is responsible for data generalization:
    a) information-retrieval;
    b) operational-analytical;
    c) intellectual.
57. Which class of analysis tasks is responsible for building models:
    a) information-retrieval;
    b) operational-analytical;
    c) intellectual.
58. Which class of analysis tasks is responsible for the search of patterns in the data:
    a) information-retrieval;
    b) operational-analytical;
    c) intellectual.

59. What DSS subsystem is responsible for data input:
    a) OLTP;
    b) Data warehouse;
    c) SQL;
    d) OLAP;
    e) Data Mining.
60. What DSS subsystem is responsible for data storage:
    a) OLTP;
    b) Data warehouse;
    c) SQL;
    d) OLAP;
    e) Data Mining.
61. What DSS subsystem is responsible for information-retrieval of data:
    a) OLTP;
    b) Data warehouse;
    c) SQL;
    d) OLAP;
    e) Data Mining.
62. What DSS subsystem is responsible for operational analysis of data:
    a) OLTP;
    b) Data warehouse;
    c) SQL;
    d) OLAP;
    e) Data Mining.
63. What DSS subsystem is responsible for intellectual analysis of data:
    a) OLTP;
    b) Data warehouse;
    c) SQL;
    d) OLAP;
    e) Data Mining.
64. How is data input subsystem realized:
    a) With the help of Data Mining;
    b) With the help of data bases;
    c) With the help of DBMS;
    d) With the help of data warehouse;
    e) With the help of data showcases.
65. What data can be stored in the system of analysis:
    a) detailed;

b) summarized;
c) detailed and summarized.

66. Can data be stored in the analysis system in different formats:
a) Yes;
b) No;
c) Only data in text form.

67. What data can be stored in the analysis system:
a) normalized;
b) excessive (de-normalized);
c) partially normalized.

68. What are structures of data dedicated to input, modification and search called:
a) operational sources of data;
b) data warehouses;
c) data bases;
d) data files.

69. What are structures of data dedicated to analysis called:
a) operational sources of data;
b) data warehouses;
c) data bases;
d) data showcases.

70. How do we call subject-oriented, integrated, unchangeable, supporting the chronology set of data organized for decision-making support:
a) operational sources of data;
b) data warehouses;
c) data bases;
d) data files.

71. What is disadvantage of virtual data warehouse:
a) long request processing time;
b) significant computer resources;
c) different formats and data encryption in different operational sources of data;
d) practical impossibility of data retrieval for a long period of time.

72. How do we call data transferred from operational sources:
a) metadata;
b) aggregated data;
c) detailed data.

73. What data reflect the nature of the situation:

a) measurements;
b) metadata;
c) facts.

74. Define the type of questions metadata answer:
a) what, who, where, how, when, why;
b) what, who, what reason, how, when, why;
c) what, who, where, how, what is the reason for, why;
d) what, who, where, how, when, how much/many.

75. What is repository:
a) dictionary;
b) metadata warehouse;
c) file catalogue.

76. What is multidimensional analysis:
a) simultaneous analysis of several dimensions;
b) simultaneous analysis of several parameters;
c) simultaneous analysis of several data.

77. How do we call a technology of operational analytical data processing which uses the methods and means of multidimensional data collection, storage and analysis with the purpose of decision-making support:
a) OLTP;
b) OLAP;
c) Data Mining.

78. How do we call a machine analysis and detection of hidden knowledge in raw data (using algorithms, AI software), which were previously unknown, useless, trivial and available for human interpretation:
a) OLTP;
b) Data warehouse;
c) OLAP;
d) Data Mining.

79. What operations are included in ETL-process:
a) input, modification, summary;
b) read, change, write;
c) retrieval, conversion, download;
d) receive, store, analyze.

80. What is the purpose of creation and use of data warehouses:
a) data analysis for management decision-making;
b) reliable storage of accumulated data;
c) data backup.

81. What is OLAP:
    a) technology of fast online analytical processing of complex queries to the database;
    b) technology of online processing of small but with high flow transactions that require quick response.
82. What is machine learning:
    a) specialized program solution (or a set of solutions) which includes all instruments for patterns retrieval from raw data;
    b) grouping of objects (observations, events) that describe objects properties;
    c) a set of data, where each record is a training example that contains input parameter, which corresponds to the correct output;
    d) a unit of artificial intelligence that studies methods of building algorithms capable of learning from data.
83. What type of modeling is based on using models of real technical constructions :
    a) imitation;
    b) material;
    c) abstract.
84. What models reflect processes which don't have random effect:
    a) determined;
    b) discrete-continuous;
    c) abstract.
85. What are the objectives of modeling:
    a) selection of factors combinations and values;
    b) prediction of object's behavior under new modes;
    c) check of different hypotheses;
    d) all the above are correct.
86. What is modeling:
    a) replacement of one object with another object in order to get information about key properties of the original object;
    b) material object of a certain nature in relation to the original;
    c) creation of a new model for testing any kind of object.
87. What type of modeling is aimed at creation and analysis of mathematical models:
    a) mathematical;
    b) analytical;
    c) imitation.

88. What type of modeling presupposes model representation as an algorithm, computer program:
    a) analytical;
    b) blended;
    c) imitation.
89. How do we call a transitional object between the original and modeling process:
    a) material object;
    b) object-original;
    c) model.
90. What is the aim of imitation modeling:
    a) identify efficiency indicators;
    b) identify a continuous uniformly distributed random variable;
    c) realize random process.
91. What programming language is NOT a modeling language:
    a) Simpas;
    b) C ++;
    c) GPSS.
92. What software is used for combat operations modeling:
    a) JCATS;
    b) Paraler;
    c) Siders;
    d) Cretch.
93. What are the difficulties of cyber-security:
    a) Malicious intent of information systems developers;
    b) Technological problems;
    c) Information conflict;
    d) Objective problems of modern software technologies.
94. What are the universal security services:
    a) encryption;
    b) encapsulation;
    c) polymorphism;
    d) means of building private virtual networks.
95. What are the threats of data interception:
    a) accessibility;
    b) relevancy;
    c) confidentiality;
    d) integrity.

96. What is NOT a key aspect of cyber-security:
    a) accessibility;
    b) integrity;
    c) protection from copying;
    d) confidentiality.
97. How do we call a certain cyber influence on our own cyber resources:
    a) technical maintenance;
    b) identification of vulnerabilities.
98. What is the key aspect of cyber-security:
    a) accountability – full registered information about subject's actions;
    b) privacy – hiding information about the user;
    c) confidentiality – protection from unauthorized access.
99. What is a risk function:
    a) probability of threat;
    b) cost of protection means;
    c) number of vulnerabilities in the system.
100. Why is it difficult to provide cyber-security:
    a) lack of attention from the side of the public to the problem;
    b) greater dependence of the society on cyber-systems;
    c) quick progress of information technologies which leads to constant changes of systems and requirements to them.
101. In what cases encryption is used:
    a) to protect passwords from interception;
    b) to ensure traffic confidentiality;
    c) to protect traffic from reproduction.
102. What is the definition of cyber-security:
    a) health protection of Internet users;
    b) protection from cyber-influences and damage;
    c) ensuring information independence of Ukraine.
103. Why is cryptography needed:
    a) for encryption;
    b) for access delimitation;
    c) for access transparency;
    d) for conflicts.
104. Do complex passwords guarantee 100% protection:
    a) No;
    b) Yes, if cookies are deleted and the password is not saved on the

computer;

c) Yes, if the password is not saved on the computer.

105. What types of viruses are activated when the OS is loading?

a) sniffers;

b) downloading;

c) Trojans;

d) Worms.

106. What is the attack of entering arbitrary queries to the database related to:

a) SQL Injection vulnerability;

b) Denial of Service failture;

c) Denial of Service error;

d) PHP Include problem.

107. What is the aim of content filtering:

a) To protect from malware hidden download;

b) To help quickly find necessary content on the Web;

c) To block ads;

d) To filter search spam.

108. What level of traffic protection does WPA2 provide:

a) high;

b) low;

c) enough for home network;

d) average.

109. How many symbols does a secure password have to contain, including capitals:

a) 15;

b) 8;

c) 10;

d) 6.

110. What can lead to infecting computer:

a) Receiving an email;

b) Download of pirated software;

c) Creating a new file;

d) Sending an email.

111. What is Brute Force:

a) An attack of infecting the system via a malicious file;

b) The method that makes the user himself/herself disclose confidential

information;
c) Retrieval of confidential information via email;
d) an attack by selecting passwords.

112. Is it secure to save passwords in browser:
a) Yes, if the password to the system is known only to me;
b) No;
c) Yes, if I'm the only user of a computer.

113. What is the best way of saving passwords in the information system:
a) hashing;
b) archiving.

114. What is botnet:
a) a malware that hides itself, other files and data which makes it impossible to find them on a computer;
b) group of computers which use malware and are remotely controlled by hackers;
c) new type of cyber-virus which spread from China causing global chaos.

115. What type of an attack is intended to impede normal operation of a website or other resources on the Internet:
a) DDoS attack;
b) POS-attack;
c) fishing.

116. How do we call a process of the number of elementary operations performed by a microprocessor per unit of time:
a) speed;
b) speed of information processing;
c) speed of data transfer;
d) clock speed;
e) frequency.

117. Where is the microprocessor placed outside the system unit:
a) as an independent device inside the system blocky;
b) inside video display;
c) on the motherboard.

118. What is NVRAM:
a) a CD;
b) storage device;
c) floppy disk;
d) ROM;

e) External storage device.

119. How do we call an electronic circuit for external devices control:
a) plotter;
b) encryption device;
c) driver;
d) controller;
e) scanner.

120. What is the “brain” of a computer:
a) micro-processor unit;
b) RAM;
c) keyboard;
d) operating system;
e) hard drive.

121. Why do we need a RAM:
a) to store information for a long time;
b) to store unchangeable information;
c) to store information for a short time;
d) to store unchangeable information for a long time.

122. What are the functions of a processing unit:
a) input data processing;
b) connecting a PC to an electrical;
c) output data for printing;
d) data input;
e) viewing pictures.

123. What happens with the information a PC shuts down:
a) it disappears from RAM;
b) it disappears from ROM;
c) it is deleted from a hard drive;
d) it is deleted on a CD.

124. What is used to code information:
a) only ones and zeroes;
b) ordinary digits;
c) symbols;
d) digits and symbols.

125. What are the components of a PC:
a) processing unit, monitor, keyboard, mouse;
b) processing unit, RAM, monitor, keyboard;

c) hard drive, monitor, mouse;
d) system unit, monitor, keyboard, mouse.

126. What is used for permanent information storage:
a) RAM;
b) Processing unit;
c) Floppy and magnetic disk drives;
d) Disk drive.

127. What device is characterized by the speed and bit rate:
a) RAM;
b) Processing unit;
c) ROM;
d) Video card.

128. What is the difference between storing information on external devices and in ROM:
a) On external devices the information can be stored after the power is off;
b) The size of the stored information;
c) The possibility of information protection;
d) Ways to access the stored information.

129. Where the information is deleted in case the power is off:
a) from RAM;
b) from ROM;
c) from a magnetic disk;
d) from a CD.

130. A PC cannot operate in case .... is off:
a) disk drive;
b) ROM;
c) mouse;
d) printer.

131. What device is used to input information:
a) processing unit;
b) ROM;
c) keyboard;
d) printer.

132. What device is used to print drawings:
a) printer;
b) plotter;
c) scanner;

d) modem;
e) monitor.

133. What type of device is the scanner:
a) output;
b) input;
c) storage;
d) processing.

134. A mouse is:
a) input device;
b) modulation and demodulation device;
c) read information device;
d) device for connecting a printer to a PC.

135. Define the term “operating system”:
a) a set of main computer devices a;
b) system of low-level language programming;
c) software environment that defines user interface;
d) a set of programs that ensure interoperation of software and hardware computer parts;
e) program for deleting computer viruses.

136. How do we call programs that control computer devices:
a) downloader;
b) driver;
c) translator;
d) interpretator.

137. How do we call a shell which a user uses for interacting with a computer:
a) core;
b) drivers;
c) interface;
d) command processor.

138. What can we find on a taskbar:
a) buttons of minimized programs;
b) only shortcuts;
c) start button;
d) start button, buttons of minimized programs, indicators, clock.

139. What is NOT a Windows interface element:
a) desktop;
b) taskbar;

c) icons;
d) processor;
e) shortcuts.

140. What CANNOT be done with an object of Windows operating system:
a) create;
b) open;
c) move;
d) copy;
e) tear.

141. What allows servicing disks (check, compress, defragment):
a) service programs (tools);
b) command processor;
c) info system.

142. In operating systems what is aimed at receiving information about OS operation:
a) service programs (tools);
b) command processor;
c) info system.

143. Choose programs which are used for archiving:
a) WinZip, WinRar;
b) WordArt;
c) Word, PowerPoint;
d) Excel, Internet Explorer.

144. What are the programs WinRar i WinZip used:
a) To work with folders;
b) To work with files;
c) To check for viruses;
d) To compress files.

145. What programs are anti-viruses:
a) Doctor WEB, AVP;
b) WinZip, WinRar;
c) Word, PowerPoint;
d) Excel, Internet Explorer.

146. What program is the simplest graphic editor in Windows:
a) Photoshop;
b) Winamp;
c) Excel;

d) Pascal;
e) Paint.

147. What program can be used to work on the Internet:
a) Google chrome;
b) Dareks;
c) Hrime;
d) Prime.

148. Choose the platform for distance training:
a) Dacnet;
b) Prius;
c) Floor;
d) Moodle.

149. Choose the program for photo editing:
a) Adobe Photoshop;
b) Picaso;
c) Malbert;
d) Camtasia.

150. Choose the program for video editing:
a) Camtasia;
b) tuner;
c) Wimax;
d) Usbdec.

151. Choose the program for work with documents:
a) Microsoft Word;
b) Paint;
c) Camtasia;
d) Openchart.

152. Do you know the technology for creating distance courses for your scientific and educational activity:
a) Yes;
b) No.

153. Do you know the technology for creating e-textbooks for your scientific and educational activity:
a) Yes;
b) No.

154. Do you know how to create software applications which can diagnose students' achievements:

a) Yes;
b) No.

Information-technological

1. Find in the Internet and download the book *Vakhalia Yu. UNIX from the inside – 2003*).
2. Remove copy protection from *Task.pdf*.
3. Create a 1-slide presentation (there should be only your DMS login information on the slide) and transform it in a video file.
4. Create an archive of the 3 tasks and upload it to the platform of distance learning.
5. Create an application which will enable you to conduct testing of students and determining their level (up to 10 questions for a subject you're teaching) An application should be developed with *Ispring* software.
6. Check the first task on the vulnerabilities and create a *word* or *txt* file with the description of check process.
7. Upload the completed tasks to the distance learning platform.

Praxeological

1. In the DMS develop a project (structure) of your future distance training course for the subject discipline you're teaching..
2. Make the following settings for your distance learning course:
   a) Give the full name of the course and the short form;
   b) in the course folder "Groups", section "Group work mode", select "Individual groups";
   c) register students on the course. Choose from (BBH3_pz_2/4), use the option "Synchronizing" assign the role "Student", in the section "Add to the group" select "Create new group";
   d) register students on the course. Choose from (BBH3_pz_2/4), use the option "Enroll users";
   e) create course groups according to the names of educational institutions and register users on the appropriate courses;
   f) assign the role "Teacher" to 1 or 2 registered users;
   g) select the mode of enrolment "Self-registration" for the course;
   h) Set the start date and finish date.
3. Add materials and make the necessary settings for the course:
   a) resource "Page" (create and add materials: brief description of the

course, information about authors, course structure, references with hyperlinks to resources from e-library or the Internet);

b) create activity “Glossary” containing from 5 to 10 terms;
c) select the icon for the course and set it as course annotation;
d) resource “Inscription” (create information message at the beginning of the course);
e) add materials to the units of the course, using:
   – resource “Book” (Add lesson materials to “Book” using: hyperlinks in the text to pages on the Internet, videos on YouTube, materials in the e-library, pictures; create in “Book” from 3 to 5 pages; create subsections in “Book”);
   – resource “Folder” (add to the folder 1 or 2 small files; add the folder as a supplementary material);
   – resource “File” (add a separate file as a supplementary material; upload the presentation in HTML5 format. To convert the presentation into HTML5 format use *iSringFree*);
   – resource “Web-links” (create a Web-link for the resources on the Internet as a supplementary material).
f) Add the following blocks to your course (to do this turn on the edit mode): calendar, latest news, coming soon;
g) Hide from students sections 1 and 2 (units, topics) in the course;
h) Back up your course and put the file copy in the task ПЗ 2/6 (same as you did for essay);
i) Recover your file “File recovery ПЗ 2_6” (only this file) from the back-up coy of the course, which is placed in ПЗ 2/6 (as a supplementary material “back-up_copy.mbz”);
j) Recover your file “Import file ПЗ 2_6” (only this file) to your course using import function – from the course “Import ЦППК_2_2019”.

4. Create an element Lesson and set:

a) The highest mark – 5 points;
b) Passing mark – 3 points;
c) Create from 3 to 5 pages with course materials (obligatory elements are text, pictures, video from YouTube, hyperlinks;
d) Add navigation between pages: on the first page the ability to move on to the second and so on;
e) Add a question after page 3, if the question is answered correct, then the student can proceed to the next page; in case the question is

incorrect, go back to start page.

5. Create an element “Task”:
   a) In the settings add the possibility of sending the answer in a file;
   b) Add a task;
   c) Add an illustration of how to send the answer (file .doc or .pdf);
   d) Assign to yourself the role “Student” and “Teacher” in your course;
   e) Fine the element “Task” and send answer for check;
   f) In the role of teacher download the completed task, write comments and evaluate it.
6. Create two mid-term tests in the Course:
   a) Add 5 questions of different types in each task;
   b) Set time limit for the task;
   c) Set the passing mark.
7. Create final test for the Course:
   a) Overall number of questions in the task – 6;
   b) Each task should contain 3 random questions from the question bank from the first mid-term test and 3 questions from the second one.
8. Create activity “Selection”:
   a) Create several options for selection (arbitrary topics, for instance, title for an essay).
9. Create activity “Forum”:
   a) Type of forum – standard forum;
   b) Set the possibility for answers evaluation;
   c) Add topics for duscussion;
   d) Add random answer in the discussion.
10. Create activity “Feedback”:
   a) Add 2 questions “Multiple choice”. Give instruction of how to answer the questions. Add “Other” in the second question;
   b) Create one question “Multiple choice (evaluation)”;
   c) Create question “Text answer” (arbitrary answer);
   d) Set the survey the following way:
      – On the first page – 2 questions “Multiple choice”;
      – When selecting “Other” – move to a separate page where the student can leave a comment (“Text answer”);
      – On the third page – question type “Multiple choice (evaluation)”.
   e) Create another activity “Feedback” and import the questions from the file (“Questions for import”), attached to the task ПЗ 2/14.
11. Create activity “BigBlueButton” and do the following:

a) Assign yourself the role of a Webinar Moderator;
b) Join the webinar;
c) Connect the microphone and check sound;
d) Record the webinar;
e) upload one slide to the webinar;
f) comment the slide and add random graphic elements;
g) share your screen;
h) turn off recording the webinar and end it;
i) click "End session" (if it is still on screen close the "Join session" button).

12. Create book of records:
a) add two categories: unit 1 and unit 2;
b) select main criteria and unit criteria (edit – parameter "Consolidation") type of final mark "Average point";
c) move to the category Unit 1 the element Task and mid-term test 1;
d) move to the category Unit 2 the element mid-term test 2 and the final test;
e) set Value:
– Unit 1 – 0.3;
– Unit 2 – 0.7;
– Element Task – 0;
– Mid-term test 1 – 1.

Subjective

1. I use information and communication technologies in scientific and pedagogical activities independently (without outside help):
a) Yes;
b) No.

2. I master new ICTs without any problems and use them in scientific and pedagogical activities:
a) Yes;
b) No.

3. I show an example of a high level of ICT proficiency to my students:
a) Yes;
b) No.

4. The use of ICTs in scientific and pedagogical activity in the system of military education allows me to increase effectiveness of teaching servicemen:
a) Yes;

b) No.

5. ICT tools enable me to automate routine tasks in the process of scientific and pedagogical activities:

a) Yes;

b) No.

6. ICTs allow me to process large amounts of data during student assessment:

a) Yes;

b) No.

ANNEX C

Course title «Information and communication technologies in teachers' scientific and pedagogical activity»

(Explanatory statement)

Currently, ICTs considerably influence the system of education. They allow providing citizens a wide range of educational services. They significantly modernize the current system of education at all levels, including higher education. Modern ICTs and network educational data centers directly foster this process. Particularly important in this aspect is the ability of teachers to use ICTs in accordance with the needs that arise in the process of teaching. It is important to mention that their information and communication training should be dynamic and continuous, as information technologies are systematically and rapidly updated and improved. Therefore, teachers need to constantly improve their skills in accordance with the changes taking place in the information society.

It should be pointed out that dynamic changes in modern world correspond to the stages of transition to information society, which «dictate» the need to find new methodological approaches to theory and practice of forming and developing professionals' competence in the field of ICTs for all spheres of human life, including pedagogical activities.

Based on the above mentioned, one of the main pedagogical problems is the ability of teachers to use ICTs in accordance with the latest requirements. Thus, their use in institutions of higher military-professional education is a prerequisite for reviewing the conceptual approaches, theoretical and methodological background of military professionals training. ICTs should be implemented directly by teachers who have the appropriate level of ICC formation and development.

Analysis of empirical data on the teachers ICC formation level in the system of military education shows that they have low and satisfactory levels.

Therefore, we developed a special course «Information and communication technologies in teachers' scientific and pedagogical activities». It is aimed at developing teachers' ICC in the system of military education in course of distance training, in particular theoretical training (knowledge) and practical abilities (skills, experience) to systematic, consistent and contextual use of ICTs in scientific and pedagogical activities.

The main objectives of the distance course are the following:

– development of the value-motivational component (values of pedagogical activity using ICTs; motivation for the development of ICC);

– development of the intellectual component (these include the following knowledge: ICT theories; theoretical background of analysis and decision-making in military sphere; technologies of modeling processes (phenomena) in teaching general and special military disciplines; theoretical provisions of cyber-security in the use of ICTs in teaching; up-to-date hardware and software tools, technologies for software development in accordance with the methods of teaching a particular subject);

– development of information-technological component (this includes the following abilities: to effectively use ICTs in pedagogical activities; to systematically develop and use up-to-date hardware and software in teaching general and special military disciplines and find out their cyber vulnerability);

– development of praxeological component (this involves the following abilities: systematic and contextual use of ICTs in pedagogical activities; synthesis of various software tools to increase the effectiveness of teaching specific subjects; develop information software tools for teaching);

– development of the subjective component (pedagogical subjectivity of the teacher in the information society; ability of a teacher of general and special military subjects to objective self-assessment in the process of professional activity).

The distance learning course program is designed for sixty-two hours of study, distributed the following way: 42 hours are classroom activities and 20 hours are for self-study.

According to the aim and objectives of the course, the content covers ten units that should help teachers of military education develop appropriate theoretical knowledge, practical skills and psychological readiness for systematic, consistent and contextual use of ICTs in scientific and pedagogical activity.

The presented curriculum of the distance course «Information and communication technologies in teachers' scientific and pedagogical activities» is developed on the basis of the results of author's own research and the implementation results of author's methodology for developing teachers' ICC in the system of military education during remote training.

Curriculum of the distance course «Information and communication technologies in teachers' scientific and pedagogical activities»

Distribution of hours for topics and types of classes

№	Title and content of units	Total amount of hours	Hours		Types of classes	
			Classroom hours	Self-study	Lecture	Practical class
1	2	3	4	5	6	7
	Unit 1. Information and communication technologies and learning tools: formation, current state, perspectives and application in education	**4**	**2**	**2**	**2**	
1	The notion and definition of information and communication technologies					
2	Historical stages of information and communication technologies development					
2.1	The content of pre-paper information and communication technologies development stage					
2.2	The meaning of ICT development					
2.3	Key ICT means and stages of their evolution					
2.4	Stages of hardware development					
3	The use of ICTs in education					
4	The use of ICTs in the system of military education					
	Unit 2. Theoretical background of information and communication technologies	**4**	**2**	**2**	**2**	
1	Informatics and information					
2	Information system and its structure					
	Unit 3. Computer networks. The Internet	**6**	**4**	**2**		**4**
1	Classification of computer networks					
2	The Internet, a global network					
3	Social services on the Internet and their pedagogical potential					
4	Email in the pedagogical activity of a teacher of higher military educational institution					

	Unit 4. Information search on the Internet	6	4	2		4
1	Web-browsers, their purpose, functional possibilities and pedagogical potential					
2	Search engines. The review of popular search servers and their application in teaching					
3	The use of web-browsers for resources search					
	Unit 5. Communication on the Internet	6	4	2		4
1	Development of virtual communication and its pedagogical potential					
2	Interactive means of communication on the Internet and their pedagogical potential					
	Unit 6. Data and processes analysis	6	4	2		4
1	Systems of decision-making support and their pedagogical potential					
2	Data warehouses					
3	OLAP-systems					
4	Intellectual data analysis					
	Unit 7. Systems and processes modeling	6	4	2		4
1	Principles of imitation modeling					
2	Feature of scheme modeling algorithm and the principles of its construction, principles of its machine realization					
3	The use of experiments planning theory in imitation modeling					
4	JCATS imitation modeling system					
	Unit 8. Basic provisions of cyber-security	6	4	2		4
1	The meaning of information system and information society cyber-security					
2	Cyber threats					
3	Actions in cyber-space					
4	System of cybernetic actions					
	Unit 9. Technological aspects of cyber-security of information and	6	4	2		4

	telecommunication systems and information resources					
1	General characteristic of key tasks of cyber-security management					
2	Characteristic of latest cyber-attacks on information and telecommunication systems and information resources in time of cyber-wars					
3	Technological aspects of information protection in information and telecommunication systems					
	Unit 10. Educational information and communication technologies in the system of military education	6	4	2		4
1	Internet services and education					
2	Methodological background for distance training in the system of military education					
3	Technologies of distance training in the system of military education					
Differentiated exam		6	6			
Total amount of hours		62	42	20	4	32

ANNEX D

Results of the pedagogical experiment before and after implementing the professionally-oriented model and methodology of teachers' ICC development in educational process of remote training for teachers in the system of military education

Experimental group (EG)			
№	2018-2020		
	Before (2018)	After (2019-2020)	Shift
1	82	90	+8
2	82	90	+8
3	82	90	+8
4	82	90	+8
5	82	90	+8
6	82	90	+8
7	82	90	+8
8	82	90	+8
9	82	90	+8
10	82	90	+8
11	82	90	+8
12	82	90	+8
13	82	90	+8
14	82	90	+8
15	82	90	+8
16	82	90	+8
17	82	90	+8
18	82	90	+8
19	82	90	+8
20	82	90	+8
21	82	90	+8
22	82	90	+8
23	82	90	+8
24	82	90	+8
25	82	90	+8
26	82	90	+8
27	82	90	+8
28	82	90	+8
29	82	90	+8
30	82	90	+8
31	82	90	+8
32	82	90	+8
33	82	90	+8

Continuation of table

Experimental group (EG)			
№	2018-2020		
	Before (2018)	After (2019-2020)	Shift
34	82	90	+8
35	82	90	+8
36	82	90	+8
37	82	90	+8
38	82	90	+8
39	82	90	+8
40	82	90	+8
41	82	90	+8
42	82	90	+8
43	82	90	+8
44	82	90	+8
45	72	90	+18
46	72	90	+18
47	72	90	+18
48	72	90	+18
49	72	90	+18
50	72	90	+18
51	72	90	+18
52	72	90	+18
53	72	90	+18
54	72	90	+18
55	72	90	+18
56	72	90	+18
57	72	90	+18
58	72	90	+18
59	72	90	+18
60	72	90	+18
61	72	90	+18
62	72	90	+18
63	72	90	+18
64	72	90	+18
65	72	90	+18
66	72	90	+18
67	72	90	+18
68	72	90	+18
69	72	90	+18
70	72	90	+18
71	72	90	+18

Continuation of table

Experimental group (EG)			
№	2018-2020		
	Before (2018)	After (2019-2020)	Shift
72	72	90	+18
73	72	90	+18
74	72	90	+18
75	72	90	+18
76	72	90	+18
77	72	90	+18
78	72	90	+18
79	72	90	+18
80	72	90	+18
81	72	90	+18
82	72	90	+18
83	72	90	+18
84	72	90	+18
85	72	90	+18
86	72	90	+18
87	72	90	+18
88	72	90	+18
89	72	90	+18
90	72	90	+18
91	72	90	+18
92	72	90	+18
93	72	90	+18
94	72	90	+18
95	72	90	+18
96	72	90	+18
97	49	90	+41
98	49	90	+41
99	49	90	+41
100	49	90	+41
101	49	90	+41
102	49	90	+41
103	49	90	+41
104	49	90	+41
105	47	90	+43
106	46	90	+44
107	46	90	+44
108	44	90	+46
109	43	90	+47

Continuation of table

Experimental group (EG)			
№	2018-2020		
	Before (2018)	After (2019-2020)	Shift
110	43	90	+47
111	43	89	+46
112	43	89	+46
113	43	89	+46
114	39	89	+50
115	37	89	+52
116	37	89	+52
117	37	89	+52
118	37	89	+52
119	39	89	+49
120	39	89	+49
121	39	89	+49
122	39	89	+49
123	37	89	+52
124	37	87	+50
125	37	87	+50
126	38	86	+48
127	38	86	+48
128	38	86	+48
129	38	86	+48
130	38	86	+48
131	38	86	+48
132	38	85	+47
133	38	83	+46
134	38	83	+46
135	38	82	+44
136	38	82	+44
137	38	82	+44
138	38	82	+44
139	35	82	+47
140	35	75	+40
141	35	75	+40
142	35	75	+40
143	35	75	+40
144	35	75	+40
145	35	75	+40
146	35	74	+39
147	35	74	+39

Continuation of table

Experimental group (EG)			
№	2018-2020		
	Before (2018)	After (2019-2020)	Shift
148	35	74	+39
149	35	74	+39
150	35	74	+39
151	35	74	+39
152	37	71	+35
153	37	71	+35
154	37	71	+35
155	37	71	+35
156	37	71	+35
157	37	71	+35
158	37	71	+35
159	37	71	+35
160	37	71	+35
161	37	70	+33
162	37	70	+33
163	30	70	+40
164	31	70	+39
165	34	70	+36
166	31	70	+39
167	33	70	+37
168	32	70	+38
169	27	70	+43
170	28	70	+42
171	27	70	+43
172	27	70	+43
173	27	70	+43
174	27	70	+43
175	27	70	+43
176	27	70	+43
177	24	70	+46
178	23	70	+47
179	23	70	+47
180	23	70	+47
181	23	70	+47
182	23	70	+47
183	23	70	+47
184	23	70	+47
185	23	70	+47

Continuation of table

Experimental group (EG)			
№	2018-2020		
	Before (2018)	After (2019-2020)	Shift
186	23	70	+47
187	23	70	+47
188	23	70	+47
189	23	70	+47
190	23	70	+47
191	23	70	+47
192	23	70	+47
193	23	70	+47
194	23	70	+47
195	23	70	+47
196	23	70	+47
197	23	70	+47
198	23	70	+47
199	24	70	+46
200	23	70	+47
201	22	70	+48
202	22	70	+48
203	22	70	+48
204	22	70	+48
205	22	70	+48
206	22	70	+48
207	22	70	+48
208	22	70	+48
209	22	70	+48
210	22	70	+48
211	22	70	+48
212	22	70	+48
213	22	70	+48
214	22	70	+48
215	22	70	+48
216	22	70	+48
217	22	70	+48
218	22	70	+48
219	22	70	+48
220	22	70	+48
221	22	70	+48
222	22	70	+48
223	22	70	+48

Continuation of table

Experimental group (EG)			
№	2018-2020		
	Before (2018)	After (2019-2020)	Shift
224	22	70	+48
225	22	70	+48
226	22	70	+48
227	22	70	+48
228	22	70	+48
229	22	70	+48
230	22	70	+48
231	22	70	+48
232	22	70	+48
233	22	70	+48
234	22	70	+48
235	22	70	+48
236	22	70	+48
237	22	70	+48
238	22	70	+48
239	22	70	+48
240	22	70	+48
241	22	70	+48
242	22	70	+48
243	22	70	+48
244	22	70	+48
245	24	70	+46
246	24	70	+46
247	24	70	+46
248	24	70	+46
249	24	70	+46
250	24	70	+46
251	24	70	+46
252	24	70	+46
253	24	70	+46
254	24	70	+46
255	24	70	+46
256	24	70	+46
257	24	70	+46
258	24	70	+46
259	24	70	+46
260	24	70	+46
261	24	70	+46

Continuation of table

Experimental group (EG)			
№	2018-2020		
	Before (2018)	After (2019-2020)	Shift
262	24	70	+46
263	24	70	+46
264	24	70	+46
265	24	70	+46
266	24	70	+46
267	24	70	+46
268	24	70	+46
269	23	70	+47
270	23	70	+47
271	23	70	+47
272	23	70	+47
273	23	70	+47
274	23	70	+47
275	23	70	+47
276	23	70	+47
277	23	70	+47
278	23	70	+47
279	23	70	+47
280	23	70	+47
281	23	70	+47
282	23	70	+47
283	23	70	+47
284	23	70	+47
285	23	70	+47
286	23	70	+47
287	23	70	+47
288	23	70	+47
289	23	70	+47
290	23	70	+47
291	23	70	+47
292	23	70	+47
293	23	70	+47
294	23	70	+47
295	23	64	+41
296	23	62	+39
297	23	62	+39
298	23	54	+31
299	23	54	+31

Continuation of table

Experimental group (EG)			
№	2018-2020		
	Before (2018)	After (2019-2020)	Shift
300	23	50	+27
301	23	50	+27
302	23	50	+27
303	23	46	+23
304	23	44	+21
305	23	44	+21
306	23	42	+19
307	23	42	+19
308	23	42	+19
309	22	40	+18
310	22	40	+18
311	22	40	+18
312	22	40	+18
313	22	40	+18
314	22	39	+17
315	22	37	+15
316	22	37	+15
317	22	34	+12
318	22	33	+11
319	22	25	+3
320	22	25	+3
321	22	25	+3
322	22	25	+3
323	22	25	+3
324	22	24	+2
325	22	24	+2
326	22	24	+2
327	22	24	+2
328	22	24	+2
329	22	24	+2
330	22	24	+2
331	22	24	+2
332	22	24	+2
333	22	24	+2

NOTES

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Кива В. Ю.

К 38 Інформаційно-комунікаційна компетентність викладачів системи військової освіти: теорія і практика розвитку в дистанційній формі навчання: монографія / В. Ю. Кива. — Вінниця: ГО «Європейська наукова платформа», 2022. — 222 с.

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У монографії досліджено та розв'язано наукове завдання у педагогічній теорії та практиці щодо розвитку інформаційно-комунікаційної компетентності викладачів системи військової освіти у процесі дистанційного навчання. Проаналізовано український та зарубіжний досвід розвитку інформаційно-комунікаційної компетентності викладачів системи військової освіти. Обґрунтовано сутність та структуру базового поняття «інформаційно-комунікаційна компетентність викладачів системи військової освіти», а також обґрунтовано та експериментально перевірено професійно-орієнтовану модель та методику розвитку інформаційно-комунікаційної компетентності викладачів системи військової освіти у процесі дистанційного навчання. Виокремлено критерії та показники оцінювання розвиненості інформаційно-комунікаційної компетентності викладачів системи військової освіти, а також наданні методичні рекомендації щодо її розвитку.

Монографія розрахована на викладачів, які працюють у системі військової освіти, а також тих науковців і читачів, які цікавляться питаннями формування та розвитку інформаційно-комунікаційної компетентності.

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