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Special Issue on "*Ensuring the Quality of Higher Education*"

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Special Issue Information

The issue of quality of training in higher education establishments has been and remains the cornerstone for the effective functioning of industries, businesses and banks, the development of science, culture, education and society in general. Graduate student should be competitive in the job market. This means that they should not only get a good education, but also be willing and able to further self-improvement. To solve this problem it is important to discuss the comprehensive and diverse scientific basis of ensuring the quality of higher education, to review the results of scientific studies and the experience of higher education in various countries. The unanswered questions are: the definition of the concept of "quality of higher education", criteria and indicators of quality education, diagnostic tools, methods of monitoring the quality of education, ways and means of improving the educational process in Universities, the correlation of the quality education with higher education management and so on. In a special issue of the journal, we plan to deal with both - theoretical studies and practical achievements of scientific and educational community.

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Specifications of the University Course "Methods of Teaching Mathematics in Higher Education Institutions"

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Abstract The article necessitates the introduction of a subject "Methods of teaching mathematics in higher education" to the undergraduate's curriculum of mathematics students. The subject curriculum is presented, its goals and objectives are described, the contents of lectures and workshops are detailed on, the contents of the independent study material are provided, and the level-related requirements to the results of the study of this discipline by the students are offered.

Keywords: master program in mathematics, training future university instructors, methods of teaching university mathematics, a special course

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the teacher of mathematical disciplines in higher education (Table 1).

1. Introduction

Under the educational reform in Ukraine one of the main objectives of higher education is to ensure providing special training for students, cultivate their personal qualities for them to become qualified and highly skilled experts who know how to work creatively [1-10].

Teaching activities are among the masters' future careers. Therefore, it is a must that masters should acquire at least basic knowledge and skills in methods of teaching in higher education along with being well-trained in fundamental subjects [4].

The Masters' curriculum of the Mathematical department of the Bohdan Khmelnytsky National University of Cherkasy (Ukraine) includes the course "Methods of Teaching Mathematics in Higher Education" (MTM in HEI). The course is unique for the Ukrainian Universities. Hence, the key goal of the publication is to expose the reader to the basic principles, content and methodological features of this course [3].

2. The Main Functions of Math Teachers' Professionally Activity at University

2.1. The Content of Functions and Typical Problem

In developing the program of the course "MTM in HEI" we were guided, first of all, by the analysis of the main functions and common methodological problems facing

2.2. The Main Requirements to the Results of Study

The purpose of the course "Methods of teaching mathematics in higher education" is to form and develop students' professional knowledge, skills and abilities that provide reconstructive and varied level, and will lay the basis for the creative approach in performing professional functions in higher education institutions.

The objectives of the course "Methods of teaching mathematics in higher education" are as follows: to reveal the importance of mathematical education, ways of practical application of mathematics in various fields of knowledge, the impact of mathematics on the development of logical and visual thinking, spatial imagination and ideas, scientific outlook of students; show the relationship of methods of teaching mathematics with mathematics as a science and other disciplines; reveal the aims and objectives of teaching mathematics in higher school, peculiarities of the organization of teaching mathematics in higher education, content, methods and means of improving the quality of students' mathematical preparation; acquaint students with the changes in the forms, methods and means of training at this stage; raise a general cultural level of the students and develop their mathematical culture and the scientific worldview; shape students' professional knowledge, skills and abilities that are to provide reconstructive and varied level and form the basis of the creative approach of the future teachers to the performance of their professional functions in teaching mathematics in higher education institutions (see Table 1).

Table 1. Main Functions and Common Methodological Problems

Facing the Teacher of Mathematical Disciplines in Higher Education	
<i>FUNCTION CONTENT</i>	<i>A TYPICAL PROBLEM CONTENT</i>
ANALYTIC-SYNTHETIC ACTIVITIES	LOGICAL-MATHEMATICAL ANALYSIS OF THE CONTENTS OF MANUALS AND COLLECTIONS OF PROBLEMS IN VARIOUS SECTIONS OF HIGHER MATHEMATICS. 2. LOGICAL ANALYSIS OF DIDACTIC TEACHING MATERIAL. 3. METHODOLOGICAL ANALYSIS OF THE MATHEMATICAL, PSYCHOLOGICAL AND PEDAGOGICAL, AND INSTRUCTIONAL MATERIALS. 4. METHODOLOGICAL ANALYSIS OF TEACHING AND TRAINING AIDS AND TOOLS. 5. ANALYSIS OF THE INDIVIDUAL AND GROUP POTENTIAL OF THE STUDENTS IN THE PERSPECTIVE OF DIFFERENT APPROACHES TO TEACHING MATHEMATICS AND THE COURSE MATERIAL SPECIFICATIONS
PLANNING AND DESIGNING	1. Planning within the discipline. 2. Planning within a particular training module. 3. Planning within a particular semantic module. 4. Planning classes of various kinds. 5. Planning students' independent work. 6. Teaching students to plan their own academic work in the study of different courses of Mathematics and methods of teaching mathematics
STUDENTS' ACTIVITIES: ORGANIZATION AND CONTROL	1. Setting students on a conscious treatment of various activities in the study of mathematics courses in higher education institutions: a) listening to the teacher and students; B) READING TEXTBOOKS, LECTURES, SCIENTIFIC AND POPULAR LITERATURE; C) SOLVING VARIOUS MATHEMATICAL PROBLEMS; D) WORKING INDEPENDENTLY WITH DIFFERENT LEARNING MATERIAL IN CLASS AND AT HOME; D) PREPARATION OF REPORTS, PRESENTATIONS AND MORE. 2. INDIRECT CONTROL OF STUDENTS' ACTIVITIES THROUGH A SET OF TRAINING MATERIAL AND TRAINING AIDS. 3. DIRECT CONTROL OF STUDENTS' ACTIVITIES THROUGH THE FORMATION OF CERTAIN EDUCATIONAL-COGNITIVE ACTIONS OF THE STUDENTS' AND THE ACTIONS OF CONTROL AND SELF-CONTROL
EVALUATION OF THE TEACHER'S PERSONAL ACTIVITY AND THE STUDENTS' ACTIVITY	1. ORGANIZATION OF VARIOUS FORMS OF CONTROL AND CORRECTION OF THE STUDENTS' TEACHING AND LEARNING ACTIVITIES IN THE STUDY OF MATHEMATICAL SCIENCES IN UNIVERSITIES. 2. TEACHING STUDENTS TO EVALUATE AND SELF-EVALUATE. 3. MAKING SELF-ASSESSMENT AND DOING SELF-CORRECTION OF ONE'S METHODOLOGICAL ACTIVITY

2.3. Body of Knowledge in the Methods of Teaching Mathematics in Higher Education Institutions

2.3.1. The Data of Knowledge

To be skilled in performing one's professional duties of the University mathematics professor the University graduate (master level) should possess a complex set of knowledge in the methods of teaching mathematics which includes the following:

1. Knowledge of concepts, facts and methods of the University mathematics.
2. Knowledge of the specificity of comprehensive and specializing functions of mathematics.
3. Knowledge of the logical structure of some courses of Mathematics and semantic features of their content lines.
4. Knowledge of the goals of teaching University mathematics and various aspects of setting these goals (the purposes of studying the smallest mathematical content by units, studying themes and sections; aims of studying methods of mathematics; purposes of solving mathematical problems, proving mathematical statements, etc.).
5. Knowledge of the ways of ensuring students' understanding of the purposes of learning the material of mathematical disciplines in universities (making the students motivated in training, making the instruction intelligible, making the objectives of learning personally relevant).

6. Knowledge of the specifications of the mathematical, educational and methodological problems, ways of their wording and statement in teaching University mathematics.
7. Knowledge of mathematical operations and the corresponding actions that are necessary for solving certain classes of mathematical, educational, and teaching tasks of the University mathematics.
8. Knowledge of specific methods of mathematics and mathematics teaching methods applicable in the University mathematics.
9. Knowledge of the techniques of the organization and management of students' activities in teaching University mathematics.
10. Knowledge of the math teaching tools, ways of their creation and application in the learning process in accordance with the purposes and methods of teaching University mathematics.
11. Knowledge of different forms of monitoring, assessment and adjustment of students' performance in teaching mathematics disciplines in University, including how to establish an adequate self-assessment of students.
12. Knowledge of the principles, ways and means of implementing tiered differentiation of mathematical sciences in universities.
13. Knowledge of the types, structure types and classes of University mathematics.
14. Knowledge about the specific features of independent work in mathematics in higher education.

15. Knowledge about the specific features of the mathematics students' research.

Level-related the mathematics undergraduates' knowledge of methods of teaching mathematics in higher education and quality characteristics of these levels are given in Table 2.

2.3.1. The Levels of Knowledge

Table 2. Methodological Knowledge Formedness Levels

Level I	<i>Reproductive</i>	The use of knowledge is possible only in standard situations Simple reproduction of knowledge, a partial understanding of the contents. Diffuse state of the knowledge complex. Independent and is mostly based on the models suggested in the instructions
Level II	<i>Reconstructive and variational</i>	Reconstructive and variational reproduction of knowledge close to a full understanding of the contents. Partially-ordered state of the knowledge complex. Independent use of knowledge is possible in standard situations and under minor variations of conditions and is based on general guidelines and general heuristics
Level III	<i>Creative</i>	Reconstructive and variational reproduction of knowledge, a complete understanding of the contents. System and concept state of the knowledge complex. Independent use of knowledge is possible in varied situations, it follows individually-set goals, is based on the creation of personal activity programs, it is unconventional and is realized under the conditions of the creative use of existing programs in the situations with considerable variations of conditions.

2.4. A Set of Skills in the Methods of Teaching Mathematics in Higher Education Institutions

To be affluent in solving typical problems of one's professional activity in the capacity of a teacher of mathematical disciplines in higher education the University graduate (master level) should master a set of skills in the methods of teaching mathematics, which includes the following skills.

2.4.1. Skills that Provide the Occupational Function Realization "Analytic-synthetic Activities"

1. The ability to perform mathematical and logical-semiotic analysis of definitions of mathematical concepts, mathematical facts (axioms, theorems, formulas and other statements), rules, algorithms, heuristic schemes, which is the object of assimilation in the study of mathematical sciences in universities.
2. The ability to perform mathematical and logical-semiotic analysis of mathematical problems as learning objects and learning tools.
3. The ability to define specific purposes of learning the University mathematics instructional material (concept definitions, theorems, rules, etc.).
4. The ability to perform mathematical and logical-semiotic analysis of the content of educational material within the discipline, individual courses, training and semantic module (select core and cover material, the leading idea of the theme, the basic knowledge and skills, internal and interdisciplinary ties, etc.).
5. The ability to perform analysis of sets of the learning module mathematical problems of a University mathematical discipline: the number and quality of the tasks designed to uncover the nature of new learning objects, to form the skills for organizing mathematical activity at a student level; quantity and quality of the problems meant to motivate the students, problems and exercises for updating basic knowledge, problems for the dispersed reviewing, etc.
6. The ability to perform mathematical, semiotic and methodical ranging of the mathematical problems of the University mathematics.
7. The ability to identify key training tasks within the University mathematics courses and corresponding educational and cognitive activities that correspond to them.

8. The ability to set the methodical tasks within some University mathematics discipline.
9. The ability to select basic methods, techniques, forms and means to teach a particular body of educational and contents module within some University mathematics course.
10. The ability to determine the forms of monitoring and assessing the progress and results of the students' academic performance in mastering the mathematical discipline.
11. The ability to summarize and review mathematical, psychological, pedagogical, and methodical articles and guides.
12. The ability to identify individual students' learning opportunities in mathematics and form homogeneous and heterogeneous academic groups.

2.4.2. Skills that Provide the Occupational Function Realization "Planning and Designing"

1. The ability to design a model of the methodical system (objectives, contents, methods and forms of teaching aids) of the study of some semantic unit of a university mathematics course (at the level of a separate learning object and a learning module).
2. The ability to differentiate the requirements to the results of mastering the instructional material of the University mathematics course.
3. The ability to develop a plan of a particular University mathematics discipline study, the ability to plan within a particular learning module.
4. The ability to create a set of questions for reviewing in studying a certain University mathematics discipline.
5. The ability to create a system of exercises for updating students' basic skills in University mathematics in the classroom.
6. The ability to construct counter-examples to the system of concepts (mathematical facts, mathematical performance) studied within a separate learning and semantic modules of the University mathematics discipline.
7. The ability to select the problems meant for: different stages of the formation of mathematical concepts, studying mathematical facts, methods, techniques and rules that are the objects of assimilation within a separate learning and content module of the University mathematics; teaching of how to prove mathematical statements; developing the skills to apply the acquired knowledge in standard and other situations.

8. The ability to compose systems of questions designed to uncover the contents of the new instructional material, to master the acquired skills, to test students' knowledge of orally and in a written form.
9. The ability to compose and compile tests, independent and control assignments of educational and monitoring nature.
10. The ability to select material for lectures, practical classes and to develop a detailed synopsis or outline classes.
11. The ability to select the literature to explore a particular issue (theorems, problems, and educational content modules of the course) and make the appropriate filing.
12. The ability to develop tutorials and manuals.
13. The ability to prepare visual aids, handouts, etc..

6. The ability to work with a tutorial or a manual, tables and other related materials, as well as to teach the students to do it.
7. The ability to place the material on the board, arrange the process of the solution of the problem and the proof of mathematical statements, etc., to teach the students to do it.
8. The ability to use different techniques to respond to students' responses.
9. The ability to use a system of questions, exercises and problems designed to train students to perform analysis, synthesis, generalization, specification, comparison, division, classification and more.

2.4.3. Skills that Provide the Occupational Function Realization "Students' Activities in Learning Mathematics: Organization and Monitoring"

1. The ability to provide motivation for the study of specific teaching material (topics, mathematical problems, theorems, etc.) of the University mathematics.
2. The ability to ensure students' understanding of the purposes of learning the material of mathematical disciplines in universities - revealing the feasibility and importance of personal learning outcomes.
3. The ability to form students' cognitive interest to studying mathematics as a whole and that of its individual components.
4. The ability to apply techniques of asking questions in varied situations.
5. The ability to search for the ways of solving mathematical problems, proving mathematical statements and more.

2.4.4. Skills that Provide the Occupational Function Realization "Evaluation of One'S Personal Activities and Students' Activities in Teaching and Learning Mathematics Disciplines"

1. The ability to analyze students verbal responses, assess them and teach the students to do it.
2. The ability to assess training or monitoring quizzes, analyze their results.
3. The ability to teach students to find and correct errors in written papers..
4. The ability to use different types, forms, methods and means of control and corrections of students' knowledge.
5. The ability to analyze a lesson considering its place in the system of classes, objectives and characteristics of its instructional and educational material.

2.4.5. The Levels of Skills

Level-related the mathematics undergraduates' skills in methods of teaching mathematics in higher education and quality characteristics of these levels are offered in [Table 3](#).

Table 3. Methodological Skills Formedness Levels

Level I	<i>Reproductive</i>	The students become aware of the purpose of the performance of a separate methodical of instructional-cognitive action, they assess its operational composition. The students search for the ways of performing some mathematical operations, mostly based on the sample offered in the instruction
Level II	<i>Reconstructive and variational</i>	The students become aware of the purpose of the performance of a methodical of instructional-cognitive action, they assess its operational composition. The search for the ways of performing mathematical operations is made based on the employment of general recommendations and general heuristics Some formed methodical skills or their complexes are transferred to bigger blocks of instructional material (mathematical method, themes, set of mathematical problems, etc.)
Level III	<i>Creative</i>	Being aware of the purpose of the performance of methodical or instructional-cognitive operation and its operational body assessment, there takes place an independent choice and creative use of different methods and ways of methodical activities and operations respective of varied situations in teaching mathematics. New ways and skills of methodical activities take place

2.5. The Peculiarities of Course "MTM in HEI"

Academic Discipline "Methods of teaching mathematics in higher education institutions" is a compulsory course in preparing students for the qualification of "Master" as "Math 0801". This course is offered to the undergraduates in the 1st year of study. It comprises 54 hours of which 12 hours are allocated for a course of lectures, 20 hours are allocated for seminars, and 22 hours are allocated for the students' self-study.

2.5.1. The Content of Modules

The curriculum is divided into two content modules. Here we offer the topics and subject content of the lectures.

2.5.1.1. Topical Module 1. Methods of Teacher-guided Mathematical Training of University Students

Topic 1.1. Aims and objectives of teaching mathematics in higher education institutions. Standardization of students' mathematical training.

1. Aims and objectives of University mathematics.
2. The structure of University mathematical education.
3. Standardization of students' mathematical training.
4. Psychological and pedagogical fundamentals of University mathematics.

5. Comprehensive, systematic, functional and semiotic approaches to University mathematics.
6. Differentiation and individualization of teaching.
7. Peculiar features of the University mathematics methodological system.

Topic 1.2. Specificity of preparing and conducting University lectures in mathematical sciences.

1. Peculiar features of the lectures on mathematical subjects.
2. Types of lecture presentation.
3. Ways and means of enhancing students’ cognitive activity at the lectures on mathematics.
4. Steps of the teacher’s getting ready for the lecture.
5. Specificity of reading lectures.

Topic 1.3. Methods of forming students’ knowledge, skills, and abilities at practical classes in mathematics.

1. Objects of mastering in the University mathematics.
2. Students’ knowledge, skills and abilities as the product of learning activities.
3. Logical-mathematical analysis of the content of teaching materials and tasks.
4. Peculiarities of the selection of the learning content to be delivered at practical lessons.
5. Updating students’ background knowledge at the lesson.
6. Perfecting students’ knowledge, skills and abilities.
7. System of the preparation of the mathematics teacher for practical classes.

2.5.1.2. Topical Module 2. Students’ Independent Work in Mathematics.

Topic 2.1. Methodical system of students’ independent work in the study of mathematical sciences.

1. The purpose of the students’ independent work.
2. Methods of selecting the material for the independent work.
3. Learning methods that are applied in the independent work.
4. Selection and application of general and specific organizational forms.
5. Methods of the development of learning tools and their use in students’ self-study.

Topic 2.2. Control and correction of the students’ academic performance in mathematics

1. The purpose and objectives of control and correction during the formation of students’ mathematical knowledge, skills and abilities.
2. Functions of control and correction in learning mathematics.
3. Components of the process of preparing and realizing monitoring and correcting the students’ educational achievements.
4. Types of control.
5. Types of control activities as related to the activities of the subject of control.
6. Types of control activities as related to its placement in the learning process.
7. Forms of control.
8. Ways to control.
9. Means of controls.
10. Assessment scale.

2.5.2. The Themes of Practical Training

The course "MTM in HEI" foresees practical training on the following topics:

1. Logical-mathematical analysis of teaching materials and tasks. Logical and didactic analysis.
2. The system of lecture preparing.
3. Development of computer support for lecture presentation.
4. Methods of updating the students’ basic knowledge.
5. Methods of testing the knowledge, skills and abilities of students during practical classes.
6. Organization of practical training using ICT.
7. Construction of differentiated sets of exercises and problems designed for self-study students.
8. Methods for inspection and assessment of students’ academic performance. Testing.
9. Reviewing scientific and methodological publications.
10. Tests.

2.5.3. The Content of the Students’ Self-study

Curriculum allocates as many as 22 hours for the students’ independent work. Thus, it becomes very important to clearly define the contents of the independent work and its time limits. We offer the following sets of tasks for the course “MTM in HEI” (see [Table 4](#)).

Table 4. Tasks for the Independent Work

#	Task Content	Quantity of hours
1	Solving mathematical problems	6
2	Solving methodical problems (topic: “Guidelines for preparing lectures”)	4
3	Solving methodical problems (topic: “Guidelines for preparing practical classes”)	4
4	Solving methodical problems (topic: Organization of the students’ independent studies”)	4
5	Solving methodical problems (topic: Control and corrections of the students’ academic performance”)	4

Alongside with general tasks for the independent work the students are offered to perform two compulsory individual educational and research assignments. One of the problems relates to the issues of the general methods of teaching University mathematics. The second task is to prepare an abstract for general and specific methods of teaching University mathematics.

In conclusion we should admit that the problems of developing a system of tasks and exercises for the course “MTM in HEI” require further research. Their implementation will allow of adding contents to the masters’ learning and promote more effective preparation of the future University teachers.

3. Conclusion

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Education Quality Guarantee Systems in Ukraine and Hungary

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Abstract The article analyses the characteristics of a quality assurance system of higher education in Ukraine and Hungary in the two past decades. The countries have already established the necessary legislative framework, but a quality assurance system has been operating inefficiently for a long time. Higher education is in need of establishing an independent organization to ensure the quality and enhance quality assurance in higher education.

Keywords: *quality of education, Bologna process, Ukraine, Hungary*

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1. Introduction

Higher education in Europe is in a state of reform. Main directions of change are defined by pan-European transformation of higher education known as the Bologna process; the ultimate goal is to create a unified and effective higher education. In this process, the issue of quality assurance is particularly important. The role of quality control of higher education increases in direct proportion as the higher education becomes more and more widespread and gains importance in the economy of the country and the continent. At the same time, constant monitoring and quality assurance of higher education is stimulated by increase in the number of students each year set out to study abroad, the growing number of higher education institutions and increase in their competition [10].

Problems of evaluation of quality in higher education in Europe become the subject of interest in the late 1980s. Earlier in the process of mutual recognition of educational achievements the main role was played by the exact determination and harmonization of content of training. Later attention was focused on the study of the conditions of preparation. This greatly increased the interest in achieving the highest possible level and quality of education, and assessment of the quality of training within the institutions and in external independent agencies and partners. The emergence of a large number of students in universities also required more precise and strict regulation [2]. Creation of quality assurance system requires the development of recommendation, guidance documents, a series of legal acts, creation of appropriate structures and mechanisms and sources of funding. This created a need in comparative research and study of the experience of the countries in which the situation in higher education has developed similarly. Ukraine and Hungary

are countries that give perfect example of this: they are closely linked shared by a past, intense contacts, and the historical, social and economic development.

Features of quality assurance system of Hungarian higher education in the Bologna process were studied by Gy. Bazsa, J. Bálint, A. Derényi, T. Kozma, I. Polónyi, T. Szántó and others. The scientists analysed the legislation on quality assurance, quality improvement programs, summarized the existing experience with the implementation and quality assurance activities in the Hungarian higher education.

Modern trends in higher education of Ukraine in the context of joining the European higher education system were studied by V. Kremeny, V. Lugovii, M. Bilis'ka, N. Protasova, T. Lukina, V. Oharenko, V. Viktorov, V. Stepko, L. Prokopenko, G. Kryvenko, I. Babyn, V. Beschstnii, Zh. Talanova and others. Almost all of their studies conclude about the low efficiency of governmental structures in the management of quality of higher education, the need for higher educational institutions to acquire genuine autonomy, combined with high responsibility, as it is in European countries.

The goal of this study was to identify common features of quality assurance in higher education in Ukraine and Hungary in 1990-2010 years.

2. Methods of Analysis

To reach the goal of the study the author analysed the professional literature, legal and regulatory documents, databases, electronic resources and documentations of universities and governments meant to ensure the quality of higher education in Ukraine and Hungary.

3. Results and Discussion

At the beginning of the new millennium, the quality assurance of higher education gained special importance in the context of pan-European transformation of higher education known as the Bologna process. The Bologna process is a typical reform of the late 20th century controlled from above, which is implemented as a series of centralized changes, and quality control is carried out at higher educational establishments. That is why the quality assurance in the Bologna process is somewhat controversial: quality assurance was a new, more widespread form of state control over higher education institutions, through which the government managed to introduce their representatives (coordinators and quality assurance agencies) into higher education establishments, significantly limiting their autonomy self-government [8].

Unlike Ukraine, in Hungary Bologna reform of higher education was carried out simultaneously with the integration into the European Union. However, despite this significant difference, both governments use quality assurance as an excuse to control higher education. This trend is typical for all countries in the region [8]. In both countries, governments are trying to adapt to Western European higher education systems and quality assurance and apply the principles of quality assurance, formulated at different stages of the Bologna process. Differences, that occur both at levels of the organization and at the structure are not significant.

One of the important elements of quality assurance system in the Bologna process is the credit-modular (European Credit Transfer and Accumulation System) system. The credit-modular system at the beginning of its use in the United States had little relation to quality assurance. It probably contributed more to the strengthening of the reliability of teaching, developing the students own way of life based on academic performance and obtained credits, raising the efficiency of education [403]. At the stage of development and initial stages of Credit Transfer System ECTS in Europe it was seen as purely cumulative system, designed to promote individual learning paths of student and achieve higher efficiency of training in higher educational institutions. The quality of education was not an issue when the ECTS was introduced.

The same happened during the implementation of ECTS in Ukraine and Hungary: first, it was seen only as an instrument to organize students training, and then – as means to transfer academic achievements [7]. According to A. Derényi, J. Temesi [4], it happened so that credit-modular system was not meant to guarantee the quality of education, it was meant to guarantee reliability of studies, and optimized system performance. For the first time in Hungary, the credit-modular system was associated with quality assurance of education at the end of 20th century, during the development of criteria of contests quality [2].

The need to identify an unambiguous and understandable system for all institutions that would display all the level and other characteristics of advances acquired in training became particularly significant during the comparison of training in certain areas in different countries. The importance of this question demanded the development of theoretical and methodological principles of requirements towards assessing the quality of training. The combination of credits and quality assurance mechanisms had to bring higher education to a new level.

Monitoring results of credit transfer system conducted in Hungary in the 2005 showed that its tools, processes, regulatory mechanisms, statistical data can be used to improve the quality of higher education. Obviously, the learning activity is so complex, that it cannot be described only through credit-transfer system, without the involvement of a large number of other means. However, A. Derényi and J. Temesi admit that nowadays without research and analysis of the credit system it is impossible to study the system of higher education or guarantee its quality [4].

The standards of training play a special role in the development of common approaches to evaluate the quality of higher education [6]. The management of higher education in Ukraine is centralized. However, despite this, the national standards of training for the large part of the specializations have not been developed until now. The content and clarity of existing standards is still being under discussion. The Hungarian standards of training outstrip the Ukrainian with its short and simple structure. However, as it is described in Materials of Hungarian Rector's Conference [11], Hungarian standards of training are more like a centralised training plan than the characteristic profile of training. This limits the independence of the institution. The training is burdened by large amount of contact hours. A large number of contact hours hinder the academic mobility of students. Hungarian law on higher education was aimed at developing a system of quality assurance of higher education, to assure that the students will obtain a high level of knowledge that can be used in the domestic and foreign labour market [1]. The Bologna Process aims to develop a system of quality assurance in accordance to unified common principles. The quality control is not just a new name of the state control of higher education. The international studies at the beginning of the 21st century emphasized the possibility of international accreditation in the European higher education, but this idea has not become the practice yet. The accreditation process that was formed in Central Europe in the 1990-s, continues to be a national matter, while the concept of quality assurance relatively quickly appeared in international official documents and subsequently became even more actualized. Thus, the quality assurance has become an instrument of association of higher education in Europe. Exactly these practices and policies affect most the formation of the European higher education. In accordance with the Law on Higher Education in Hungary (ed. of year 2000), the country's higher education institutions are required to establish an internal quality assurance system and take care of the conditions of its functioning in all divisions. The system has to work towards the progressive approximation of the objectives and activities of the institution; focus on the needs of direct and indirect partners, especially students, employers, research promoters, the international and national scientific community.

Institutions, faculties or even smaller units have the right to implement systems of quality assurance (such as «ISO»), which can be confirmed by agencies of external quality assurance, accredited by the Hungarian National Accreditation Committee. Such confirmation is not directly related to the accreditation of the educational establishment by the Hungarian Accreditation Committee

of Higher Education (HNAC does not give «ISO» certificates), but the experts definitely have to take into account the availability of the system during accreditation.

All Hungarian universities should have a program of quality improvement, within which the goals of management, planning, monitoring, measurement and evaluation of quality, course of teaching evaluation by students are represented. The management of institution must annually assess the quality and publish the results on its website in acceptable way. The law does not contain an accurate description of program content. However, according to Hungarian professionals, the program had to be an action plan which is prepared for a certain period, based on the analysis of results of the quality assurance system, and it also had to outline the future objectives.

All Hungarian universities were enabled to invite foreign organizations for quality assurance, quality evaluation, and accreditation or for custom consultations. Universities in Szeged and Debrecen were the first that took advantage of this opportunity. Similarly, international or foreign organization may accredit a separate unit or program.

In Ukraine, monitoring and evaluation of the quality of education rely entirely on the state. These tasks are primarily performed by the Accreditation Commission of Ukraine and the State Inspectorate for education which are subordinated to the state. Their activity is regulated by a number of laws and legislations. The competence of the accreditation committee includes licensing and accreditation of the higher educational institutions.

The problem of foundation of criteria for evaluating the quality of teachers as well as students' knowledge cannot be solved once and for all, since it requires constant updating and improvement. The quality assurance and accreditation in higher education in Central European countries are organic satellites, as it is reflected in their motivation and reasoning [12]. According to T. Kozma and A. Juhász terms of accreditation and quality control are used interchangeably [8].

Even a superficial acquaintance with the actual process of accreditation makes it obvious that it is carried out mainly with reference to quality assurance of training. In the region, spread of accreditation was typical for higher education at the end of the last century. At the beginning of the new millennium, under the influence of the Bologna Process, the key issue of higher education was the quality assurance. This fact is explained by some delay of reforms of higher education in Eastern Europe. Countries that have begun the process of accession to the European Higher Education Space with some delay are facing two requirements simultaneously. To ensure the quality of higher education an independent organization for its control is essential, whose role in Hungary is performed by Hungarian National Accreditation Committee (HNAC). Compliance with legal requirements in Hungary is provided by external quality control system.

A similar structure was established in Ukraine in 1998, with the Minister of Education and Science at the head. Tasks related to quality assurance of higher education were divided between the Ministry of Education and Culture (now the Ministry of Human Resource Development), HNAC and educational institutions.

HNAC was formed in 1991. It is a commission organized by the Government of Hungary for the quality

control of higher education. It is responsible for the functioning of the national system of accreditation, evaluation of programs and training in institutions, and providing guidance on how to improve their quality. Members of HNAC are appointed by the prime minister on the basis of submissions of universities, research institutions and others, for three years. The representatives of student government and the PhD students of the country participate in the work of HNAC as non-voting members. HNAC is empowered to make decisions only regarding the doctoral programs. For other levels of training HNAC submits its proposals for approval to the Minister of Education.

Functions of Accreditation Commissions are similar in both countries. Accreditation Commission plays a key role in the Bologna reform of higher education. Without it the licensing and accreditation of training programs and institutions is impossible. Each higher education establishment should monitor and ensure quality within its walls. All training programs and educational institutions must be accredited by an independent expert committee. Accredited higher educational institutions and training programs are periodically re-accredited. An independent expert committee makes conclusions on the results of inspections. Its conclusions are based on the internal introspection of the educational institutions. Obligatory part of accreditation in Hungary is the determination of views of students on the quality of training.

Both Ukrainian and Hungarian State Accreditation Committees formulate high demands towards the quality of the research and teaching staff. The bachelor training is not an exception though it does not exactly match its goals and objectives. In the process of training students to perform practical tasks the professional degree of teacher not always serves as a guarantee of a high level of practical training. Such maximalist demands are justified only during the accreditation of doctoral programs.

In many ways, the role of the Ministry of Education has a leading role in the accreditation as the Minister approves the policy, principles, and the entire industry, control of accreditation; the ministry develops regulations on quality assurance systems in higher education, creates and provides conditions for its activity; hears appeals of higher education institutions on expert opinions of Accreditation Commission; provides annual funding to higher education institutions and accreditation committee, significantly affecting their activities. All sides believe that the quality assurance of higher education is primarily the task of universities; Accreditation Commission plays only a function of external quality control.

Both in Hungary and in Ukraine universities are participating in the work of Accreditation Commission for evaluating the quality level of programs and institutions (licensing examination and accreditation materials of the areas and specialties, preparation of self-examination, admission of expert committees, development and implementation of decisions).

Both Hungary and Ukraine take part in various international organizations to ensure the quality. HNAC recognized and applies the quality assurance system of European standards and principles of quality assurance of domestic education («ESG»).

Thus, despite significant differences in the period of study, the State Accreditation Committee of both

countries - is a relatively independent organization established to assess training, scientific work, artistic activities and analysis of the quality assurance system in higher education. They perform a number of identical tasks related to quality assurance in higher education, the main ones are:

- Expert assessment of the quality of training at its foundation (licensing);
- Expert evaluation of training (accreditation);
- Harmonization of sectorial system of quality standards of the European Higher Education Area;
- Participation in the development of policy of guidelines and guarantees of the quality of higher education and supervision of the implementation;
- Preparation of a list of experts of higher education.

Based on the examination Accreditation Committee prepares proposals to the Minister on the activities of the institution. In both countries, accreditation committees represent the quality assurance of entire higher education, not individual institutions. Their members and experts advocate the interests not of individual institutions, but common accreditation values, so conflicts of interest often emerge among accreditation commissions and individual universities. According to Gy. Bazsa, T. Szántó, in the struggle of institutions for existence questions the content and quality are increasingly losing their priority [3].

The most important factors that equally affect the maintenance of quality in higher education both in Ukraine and Hungary in the period of study were:

- Environment of domestic and European higher education;
- Regulatory and legal requirements;
- Management of institutions;
- The capacity for objective self-analysis and evaluation of the current state of higher education;
- High demands towards teaching and research staff;
- The availability of necessary resources.

According to I. Polónyi [9], a legislative framework for the introduction of quality assurance in higher education in Hungary began over 20 years ago, but imprecise wording in the regulations, the confusion in terminology, lack of guidance and quality evaluation methods etc. created a long-term obstacles to effective work. This conclusion is quite fair for higher education in Ukraine too.

3. Conclusions

At the beginning of the new millennium, the government policy became dominant element of the quality assurance system in Ukraine and Hungary. Even then the quality assurance of higher education in both countries already needed an independent commission on accreditation of quality assurance, enhancing quality assurance in higher educational institutions and creating necessary conditions for this regulatory framework. However, an Accreditation Committee controlled by the Minister of Education can be considered independent only conditionally. It is quite obvious that the system relying solely on state control and evaluation of the quality of education in modern conditions is outdated and ineffective.

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The Development of Adult Education System in Ukraine: Basic Stages and Modern Structure

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Abstract The article focuses on the main stages of development of adult education system in Ukraine. The focus is made on the analysis of the influence the traditions of the past have left in the modern system of adult education. The author underlines the importance of studying the historical processes taking place in its development. Having been the part of Russian empire and later the USSR, the country went through the common process of formation, faced the common challenges, and formed similar with the neighbors' system of adult education. To adapt the lifelong learning system to the new, changed conditions, it is necessary to understand its basic stages and carefully implement world's best experience into existing realities.

Keywords: *Adult education, lifelong learning, formal education, informal education, non-formal education*

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1. Introduction

Adult learning has long been the focus of attention among educators all over the world. Now that progress in science and technology is in pace, issues concerning adult education have come to the force in the Ukrainian system of education, too, both in practice and in theoretical research.

But adult education has not become a complex structure in the system of Ukrainian lifelong education yet. The creation of such a system is a goal for the Ukrainian Ministry of Education. It is a pleasure to say that theoretical foundations for adult education have been successfully developed by the specialized ministry department. Speaking about functional existence, though, present adult education exists in the shape of separate schools, both formal and non-formal, not covered by any general conception of adult learning.

2. Subject

The Chinese proverb wisely recommends, 'When planning the program for a year, sow rye. When planning the program for a decade, plant a tree. When planning for the whole life, bring up and educate people' [1].

The rapid development of technology, increased competition and consumer demand lead to the need for lifelong learning, "...from early childhood to old age - and in different contexts: formal (at educational institutions), informally at work place informally in social life" [2].

Accents in education have largely shifted over the recent years. The system crisis arising from new challenges of our society encourages us to review and rethink both – goals of acquiring knowledge and educational time measurement.

Quick and unstoppable development of new technologies requires constant mobilization of forces and opportunities for learning and acquiring more and more skills. Knowledge is currently the center of activity and development of individuals and society in general. It is personal capital, special means to achieve success in life. Constant, continuous education promotes a deeper understanding of events and processes that prevent unemployment, humiliation and discrimination.

Acquiring new knowledge is necessary for both professional work and leisure, since requirements to qualification are increasing, and therefore the value of knowledge in the process of personal self-realization increases, too. Due to the rapid aging of knowledge, people get into the situation when education received before is insufficient to fully participate in the social, industrial and individual processes. The issue of finding a solution in the situation becomes urgent.

Adult education as a part of lifelong learning system has long been under study of many foreign and domestic scientists. We used to search for the ways of its developing anywhere. We used to think that the answers to all our questions in this sphere could be found in European countries, American continent, somewhere in highly-developed societies.

To our mind, it is high time to draw the attention to the Ukrainian experience in teaching adults. The country has rich traditions in the sphere, so we should study them

thoroughly to decide on which of them to count in reforming the lifelong learning system.

3. Materials and Methods

At this stage, requirements for adult education sharply increase to meet the spiritual and educational needs of people engaged in independent professional activity. The value of adult education today is also increased by economic restructuring and the consequent necessity of re-training a significant number of people of working age, and the active involvement of citizens in social and political life in a democratic society.

Taking into consideration the interests and age characteristics of adults in each country its own system of adult education is being developed, the system of specialized agencies of general and vocational education, cultural, educational, entertainment facilities, etc. At present it is the organic component of the education system of the country, which purpose is to promote the comprehensive development of the individual during adult life. In this sense, adult education is a social institution that generates process of transformation of existing society, socio-cultural experience of all its members and consequently, it provides enriching of individual potential.

Ukrainian pedagogical science pays significant attention to the development of adult education. Yet it should be noted that this issue is still at the stage of formation. In the late XX – early XXI APS of Ukraine made an important step for further development of the system of adult education. The 'Main Directions of Educational and Psychological Research in Ukraine', approved by APS of Ukraine, has designated units and the approximate directions of the subjects and research problems of andragogics. In 2007, Institute of Pedagogy and Psychology of Professional Education was transformed into the Institute of Teacher Education and Adult Education of APS of Ukraine. In its structure the department of andragogics was formed.

Search for Ukraine's own model of the national policy on adult education, development and implementation of the Concept of adult education, effective activities of various institutions in the field require understanding of existing problems in the context of pan-European paradigm. Currently, is a necessity for analysis of international legal documents; creating and strengthening of our own regulations implementing the strategic objectives of an effective national system of adult education; systematic and detailed analysis of the theoretical principles and practices of adult education in the developed countries of the world; identification of trends of modern methodology in adult education and development of criteria for adaptation of world practice of adult education into the national experience.

But we shouldn't forget about the peculiarities of our existing traditions in adult educations for they are to be the basis of the further development in the branch.

4. Results

Taking into consideration that Ukraine has long been under pressure of Russia, its ruling traces are also noticeable in Ukrainian system of education, too.

It should be mentioned that the adult population was quite actively educated in the former USSR; say, in 1989 about 70 million people (42.7% of the 164 million of active population) took part in various forms of adult education [3].

But historical background of this educational phenomenon is far more serious. It started at the middle of the 19th century. The first Sunday schools for adults were founded in Ukraine, being the part of Russian empire, in 1859. The demand was great, so that such schools met with wide public acceptance and their number grew rapidly. There were 200 of them on the territory of Russian Empire in 1860, 300 in 1862 and 1,656 in 1905, with 89,000 students [4,5].

Other kinds of educational institutions emerged, concerned mainly with providing education for adults: reading rooms, reading circles, evening schools and people's universities. Their objective was to spread literacy, culture and advanced social ideas among the population.

Schools for adults delivered education at various levels. The majority limited their activity to creating literacy, but some extended their offer to partial or complete programs of secondary education, sometimes even up to the level of higher education. All schools for adults were characterized by the some democracy and the flexibility of curricula.

It should be stated that a foundation for the theory of adult education in the country was laid in the nineteenth century. An article 'The Sunday Schools' by K. D. Ushinsky (1824-1871), a famous Soviet pedagogue of Ukrainian origin, was published in 1861. The author set out a basic curriculum for Sunday schools which should contain the following fields of study:

- religious history;
- state history;
- physical phenomena;
- the main animal species;
- mental arithmetics, related to measurement, weight, time, etc.;
- drawing;
- crafts;
- major technical inventions.

Konstantin Ushinsky formulated a number of fundamental principles in the education of adults. Most of them are still important today. Among them are:

- the connection of adult learning with the student's work;
- practical objectives in learning;
- the use of adults' life experience;
- the importance of visual aids;
- the importance of recognising individual learner's needs;
- the developing lifelong character of adult education.

In his book, K. Ushinsky wrote, 'The main task of Sunday schools is to awaken the intellectual abilities of learners to act independently.' Another, related task of adult education was to develop 'the desire and the ability of students to obtain new knowledge independently of the teacher ... to be able to learn throughout their life' [6].

At the beginning of the 20th century, adult education was actively developed in Ukraine. Distinguished scientists created and selected training programs for adults being completely different from those for children. Special teaching aids were developed and adopted.

The book 'What the Nation Should Read' by Kh. D. Alchevska was awarded a golden medal at the Paris World Exhibition in 1889. In its three volumes, the women teachers of the Kharkiv Sunday school of Ukraine headed by Kh. D. Alchevska discussed the problems of creating reading books for the out-of-school (extra-mural) education of adults [7].

Thus, by the 1900s, the basic principles of adult education had been developed. They were discussed largely at the first Congress of the People's Universities' Personnel (1908) and the first Congress on Popular Education (1914). At that time adult education was known as extra-mural education. In Basic Problems of Organization of Extra-mural Education in Russia (1909), V.I. Charnolussky described the extra-mural education of the time. It included:

- schools for adults, establishments offering reading facilities (libraries, publishing houses, booksellers');
- the organizations spreading knowledge among the population through courses, public lectures, etc.;
- public recreational and sports organizations, museums and art galleries and the so-called people's houses.

But despite the huge efforts of state intellectuals to spread knowledge among the people, only 28.4% of the population aged between the ages of 9 and 49 registering in 1897 were literate (40.3% male and 16.6% female) [8].

After the revolution of 1917, the elimination of illiteracy became one of the main challenges for the Soviet state. In particular, extra-mural education was developed. Only four days after the revolution, on October, 29, the People's Commissar of Education wrote that 'schools for adults should be given an important place in the system of popular education' [9] (Gornostayev, 1974). In December 1919, a decree on Eliminating Illiteracy among the Population of the Russian Federation was adopted by the Soviet government. Adult education was discussed at congresses of the Bolshevik party, at the congress on education in 1918 and at the congress on extra-mural education in 1919. V.I. Ulyanov-Lenin, Chairman of the Council of People's Commissars, made a speech to that congress, in which he emphasized the importance of this kind of education for the economic, social and political development of Soviet society.

In November 1917, the Department of Extra-mural Education was created at the People's Ministry of Education. N.K. Krupskaya, a famous Communist leader, was its head. A year later, the Institute of Extra-mural Education was established at Petrograd, with the aim of carrying out scientific research on non-school education. In 1919, the magazine Extra-mural Education was launched.

Soon a network of general education courses for adults, adult schools, higher peasants' schools, workers' schools and people's universities started to emerge. The workers' faculties appeared, for workers to receive accelerated preparatory courses before entering high school.

Huge efforts in state and public organizations led to the fact that more than 40 million people became literate

during the twenties and thirties. By 1939, the proportion of literate population in the USSR had reached 87.4% (93.5 of the male population and 81.6% of the female [9]. After World War II, adult education continued to develop, and by 1970, 99.7% of the population aged between 9 and 49 was literate [8].

In the post-war period, the Soviet government adopted a series of laws on adult education (1958 and 1973). The Ministries of Enlightenment and Higher Education and the USSR State Committee on Education monitored the processes of adult education.

At that time, before proclaiming the Ukrainian independence, the following forms of adult education became established in Ukraine. Some of these forms are kept till now.

Formal education

- general secondary education in evening secondary schools
- vocational education in evening and day-time vocational schools and vocational courses
- secondary specialized education by correspondence in special correspondence secondary schools and evening and correspondence departments of regular secondary specialized schools
- higher education in special correspondence institutes and evening and correspondence departments of regular (day-time) institutes
- post-graduate training for those with higher or secondary specialized degrees in institutes and in departments of higher and further education.

Non-formal education

- professionally oriented and general courses in people's universities and in centers of lifelong education, adult education centers and by means of public lectures and through television or the Internet.

The main feature of adult education in Ukraine was the evening school and the correspondence form, so that people could learn without leaving their jobs. Formal postgraduate education and the specialized courses were mainly full-time and held during the day. Paid leave was offered to those taking examinations, and those who chose to study in the evening had their working time shortened by two hours. All formal education diplomas, whether taken in the evening, through correspondence courses or in day-time provision, had equal validity.

Recently there has been a boom in the development of non-formal adult education, with new kinds of institutions emerging and numbers of students growing. The most widespread form of non-formal education is at the people's universities. This form appeared as early as the nineteenth century, following the example of Western Europe. Since then, such universities have developed considerably, from schools which concentrated on popular literacy to multi-functional enterprises able to provide training in great variety, up to graduate level. This modern stage began in the 1950s.

The Znaniye (Knowledge) Society was created in 1947. This is an example of the organization for non-formal education which aimed to spread knowledge of different kinds among the population through lectures series. Under its guidance people's universities started developing greatly, first the universities of culture and then those of pedagogy, science and technology, agriculture and others. In 1973, a law was adopted which included people's

universities in the state educational system. By 1987 there were 47,657 people's universities in the Soviet Union, with 18,687,000 students [3].

Along with the people's universities, other kinds of educational enterprises for adults have appeared known as centers of lifelong education and adult education centers. They are aimed at the rapid expansion of training in specific courses for specific purposes, either to enter a new profession or to improve one's qualifications, or to increase one's general level of culture. Courses in foreign languages, business and management, economics, pedagogy, family relations, law, psychology, etc., delivered in the variety of forms already outlined and also by co-operative and state bodies have also become very popular.

In the modern society, the main target of adult education changed completely. Now it is no longer the elimination of illiteracy, but some more serious challenge.

In Ukraine, the concept of adult education is interpreted as a continuous process of education throughout life based on the need to acquire new knowledge and skills. Since learning is a social process, a person is trained for three main reasons:

- For self-improvement;
- For the sake of competitiveness in the labor market (employment, better salaries, career opportunities, employer requirements, acquiring new skills);
- For the more successful social life (compassion, tolerance, decision making, protection of nature – those issues require collective solutions and people want to be involved, to express their own opinion).

Continuous education provides lifelong learning, improves skills in accordance with the requirements of the labor market and people's own needs. It combines formal and informal educations, develops both new and innate abilities.

The following benefits of lifelong education are distinguished:

- flexibility;
- diversity;
- availability in time and place of study.

It provides a continuous process of improving both the individual and society, ensures the requests of economic development of the state and civil society development.

In March 2009 a group of researchers of the Institute of Teacher Education and Adult Learning in APS (Team Leader L. Lukyanova) presented a draft of conceptual positions of adult education in Ukraine. In the concept, the basic categories of adult education are specified, the meaning of 'adult education,' 'adult student,' 'adult learning activities,' 'adult learning technologies' are defined.

The concept was developed in accordance with the decisions of the Fifth International Conference of Adult Education (Hamburg, Germany, 14-18 July, 1997), the International Council for Adult Education (Damascus, Syria, 22-26 September, 2000), Intergovernmental program of the Concept of common educational space of the Commonwealth of Independent States (November 29, 2001), Sofia Conference of Adult Education (Bulgaria, November 9, 2002), the concept of adults in the countries of the Commonwealth of Independent States (Moscow, Russia, May 25, 2006) and subject to the provisions of the Model law 'On Adult Education' (December 7, 2002) [10].

Analysis of future specialists training in Ukraine and requirements of the modern labor market shows that currently there are some differences between the result of training and the requirements of employers. The last require professionals, competent not only in their professional activities, but also capable of self-education, personal development, social interaction in multinational information society. The main qualities of modern professional are the ability to solve complex social and industrial problems, professional versatility. So the institutions must stop to train for economic problems that have lost or are losing their value.

The modern economy demands regular supplement of knowledge and skills from specialists in the professional development. The researchers note that in order to achieve social success, modern person has to change the scope of professional activities at least four times. For those working in the same industry for a long time, it is necessary to update and improve their skills at least once every three years.

5. Conclusion

According to Alvin Tofler, the famous American futurist, illiterate man of the XXI century is not the one who can not read and write, but the one who does not know how to learn and how to be retrained [1].

The need to optimize the adult education system is due to the importance of improving the policy, regulatory support, funding for this sector as well as the contents, methods and forms of organization of postgraduate education, training, identifying the theoretical and methodological foundations of psychological and pedagogical patterns of effective teaching, developing psychological teacher recommendations, etc.

Implementation of the tasks mentioned above is difficult to imagine without realizing of the country traditions in the related sphere, though. We should be aware of who we are and what our history is about. Only doing so, we can properly develop the system of our Ukrainian adult education in accordance with the best world traditions.

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Corporate Relationship in the Structure of University Faculty Corporate Culture

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Abstract Corporate relations among university faculty are an important part of their corporate culture. The faculty should know how to build business and interpersonal relationships with colleagues, administration, and students. The findings of a survey conducted at different universities characterize corporate relationships with the following key indicators: the instructor's part in realizing the university policy, interpersonal relationship, rendering assistance to colleagues, and the nature of interaction among university faculty.

Keywords: *university corporate culture, university instructor, faculty's corporate culture, corporate relationships, the nature of relationship*

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1. Introduction

Today, the Ukrainian universities are facing some challenges caused by the necessity to revise and develop university strategic policy to ensure its development in new conditions of the university autonomy. Thus, one of the factors that directly affect the university operation is its corporate culture. The carriers of this culture are the representatives of the university community. We should note that the connection between the university corporate culture and its faculty is obvious as the researchers interpret the corporate culture of an educational institution being a set of shared values, norms, traditions that regulate employees' behavior and interaction.

Faculty's corporate culture should contain components describing instructors' awareness of the values and their acceptance; ability to build corporate relationships at different levels of the organizational structure at the educational institution (relationships among employees, between employees and administration); ability to model the behavior in accordance with corporate standards and behaviors; personal awareness of an individual importance for success of the team and organization, the degree of involvement in community and communications systems.

Being one of the components that make up faculty corporate culture, corporate relationships attract our research interest. The study of their characteristics makes it possible to adjust the master training programs for future teachers.

2. Subject

The relationship is an essential element of life and human activity being formed in communication and work. Our research interest is in the relationship among corporate university professors, which we consider to be part of their corporate culture.

The problem of relationship in the team, its influence on human activities attracted the attention of researchers in pedagogy, sociology, psychology, and educational management. There are numerous works by Ukrainian and foreign researchers who studied various aspects of corporate relationships: the relationship of instructors' corporate culture and socio-psychological climate at the department; the ways of establishing a favorable socio-psychological climate in the team based on business and interpersonal relationships.

However, the issue concerning the nature of corporate relationships in the context of faculty corporate culture requires further research and clarification.

2.1. Faculty Business and Interpersonal Relationships

In social psychology relationships are classified into business and personal relations. The business relation [1,2] is based primarily on the business interaction that requires personal responsibility for the work; obligations that people undertake when cooperate in projects. Interpersonal relationships are a complementary business structure enriching the business relationship.

Usually, the pairs of opposite relationships are under the consideration: personal and business, emotional and rational, formal and informal, coordinated and subordinated. The nature of the business relationship is formed by business, educational, social activities and people's social roles; it is governed by legal and moral

norms. Personal relationships based on sympathy /antipathy arising during the interaction, are regulated purely by moral norms. Emotional relationships are built on emotions that a person experiences, whereas rational relations are based on analysis of interactions, situations, calculations, usefulness and practicality. Formal relations reflect the interaction between the social status and job rank. Informal relations are those that are not covered by regulations. People with different social status build subordinated relationships. If organizational members are of equal status, the coordination between them forms relationships that allow coordinate and cooperate in activities.

When at work faculty both form the corporate relationship and are affected by the great variety of formal relations. Formal relations develop various patterns including: faculty - faculty of the same unit, faculty - faculty from the different unit, faculty - librarians, faculty - staff, faculty – administration/researchers.

Formal relations require the use of certain models of corporate behavior with prescribed interactions between social roles and social rank, equal and different social status. Formal relations among employees of equal rank are based on mutual respect, tolerance and recognition of colleagues of equal opportunities. Being equal colleagues consider orders, guidance, and directions unacceptable. They replace them for request, advice, and help. The results of a faculty survey suggest that sometimes even "soft" forms of interaction can cause resistance in colleagues, because: they can feel some arrogance and disrespect in the nature of advice; request intonation is taken as an order; assistance is provided in exchange for a concession; assistance is offered unexpectedly when it is not needed or wanted.

Formal relations among faculty member do not tend to intervene in the professional competence of another instructor, because it usually leads to business conflicts. Formal relations among university faculty are much more complex than among teachers in a public school, where they are more sincere and open. This is explained by a more complex structure of the formal university hierarchy (position, academic degrees), dependence of workload and salary on faculty social rank. Seniority and age have an impact on formal relations. Rules for building formal relations among employees of the same rank at the university have been known for a long time. As they proved to be of great importance we would like to explain them to future teachers.

Subordinated relationships are formed on the basis of order / subordination and can be found in the following interaction systems: faculty - head of a particular department, faculty – an administrator, faculty - student. The relation nature and ways they are reflected always emphasize the difference in social status. Orders and instructions are appropriate in subordinated relationship. The leader is always active in the subordinated relationship. How active is an employee is determined by their status in the organization, the nature of their authority, and the nature of the relationship with the leader. Subordinated relationships are emphasized by the rules of business communication (an office as a private secluded environment, a ritual of entering the leader's office, ritual of greetings, waiting in the line, time of an appointment, time constraints of communication, etc.). We observe

fewer open conflicts in subordinated relationship among employees of the same social rank. However, one should not think that there is no confrontation in this type of relationship. Sometimes an employee's hidden resistance is present, but it is not shown explicitly, and only an experienced manager can detect signs of resistance in the form of responses, intonation, or behavior.

Theoretical principles of corporate relations can be found in human relations school by E. Mayo and M. Follett, in G. Becker's idea of human capital as an organization resource and A. Maslow's motivation theory. The fundamental works of these scientists emphasized the importance of human resources in the organizations as opposed to material resources.

The impact that corporate relations between administration and employees, and among employees in the organization have on the labor productivity can be expressed by the pattern: administration care for subordinates – the degree of employee's satisfaction with working conditions – growth in productivity.

According to E. Mayo's [3] research findings the rigid hierarchy and formalization of the management are incompatible with human nature and that business and informal relationships at work satisfy person's social needs.

A. Maslow [4] identified a set of human needs including fundamental levels of needs at the bottom and top hierarchy needs. The most fundamental and basic needs include physiological needs (breathing, food, water, sex etc); need for safety (security of body, of employment, confidence, freedom from fear and failure); need for belonging and love (friendship, love); need for self-esteem (confidence, self-esteem, approval, achievement, respect of others and by others); educational needs (to know, to be able, to explore); aesthetic needs (harmony, order, beauty). The top level of the hierarchy needs include the need for self-actualization (the realization of their goals, abilities, and self development). However, researchers often use the simplified five-level hierarchy of categories including physiological needs (hunger, thirst, sex); safety needs (comfort, sustainable living conditions); social needs (social relationships, communication, commitment, concern for others and respect for oneself, joint activities); needs of esteem (self-respect, respect from others, recognition, success and high scores, professional growth); self-actualization (morality, creativity, self-expression, self-identification).

In examining faculty – student interactions we found that they can have negative impacts that can develop with carrying out professional responsibilities. These may include:

- faculty's liberal attitude to students' academic performance, which results in lowering student academic achievements. Students fail to meet achievement standards established at the university, thus lowering the quality of knowledge. Instructor's liberal attitude can be expressed in shifting exams to a date later than determined by the syllabus, giving a permission to re-write "a failed" work after the exam; lowering evaluation criteria for students' learning outcomes; grading student works or reports after the deadline, passing works that do not meet established requirements or submitted with considerable delay; showing conscious disregard for plagiarism in essays, term papers and diploma works;

- lowering the assessment and evaluation standards (an instructor being irresponsible missing consultation, avoiding office hours, passing low quality student independent work reports, showing a formal approach to the test development to measure students' academic performance, decreasing learning outcomes assessment criteria).

We refer to violations of faculty – administration corporate relations as all violations of corporate discipline, missing the requirements for professional activities. When faculty abdicates their responsibilities as teachers they:

- fail to fulfill the teaching load in assigned courses or their equivalents over the academic year;
- fail to observe academic regulations concerning the holding of classes, examinations, grades;
- are little involved in scholarly research, use old publications, plagiarize, which gradually reduces the quality of their professional activities and makes supervision of student research less effective;
- do not prepare for classes thus losing professionalism;
- ignore university rules for dress code and looks;
- do not align with the priorities of the university being reluctant to carry out tasks assigned by the university administration / department (delay in terms of performance, looking for excuses that could explain the delay, blaming colleagues for not supporting etc.);
- when department administration does not supervise faculty.

We found that the corporate relations system "faculty – faculty" is characterized by:

- conflicts including conflicts of ambition, conflicts of contempt, conflicts of neglect, recognition and other conflicts;
- pressure on the faculty member who is in the opposition to the university administration;
- corporate concessions when the faculty agree to change the grade when requested by administration or another faculty member.

3. Materials and Methods

During the experimental work we examined the faculty corporate culture and the corporate relations which play an important role in the wider area of organizational culture.

For practical reasons to avoid confusion and misunderstanding in further discussion of the experiment findings we need to define concepts referring to formation the corporate (organizational) culture in the university and its social and psychological climate. According to M. Armstrong [5], "measurement" of the climate is referred to as an attempt to evaluate the organization indicators that convey or describe faculty perceptions of corporate relations. The difference between existing national and international methods of diagnosing corporate relationship

is found in terms or categories in which they are measured. Thus, the George H. Litwin, Robert A. Stringer Jr. [6] questionnaire contains the following categories: structure (awareness of restrictions and freedoms of action and the degree of formality and informality in the environment it operates), responsibility, risk, warmth, support, standards (awareness of the importance of internal and external goals and standards for efficient operation), conflicts, and identification.

Ukrainian and Russian scholars are exploring corporate relations with the following parameters: the desire to preserve the integrity of the team unity, contact, openness, organization, awareness, and responsibility. When examining the corporate culture of the organization the general indicators that give a general idea of its condition are used, for example, work, communication, management, motivation, ethics, and the role of a leader. Foreign methods of studying corporate (organizational) culture are focused on determining the type of the organization culture using the typology (Denison D. [7], Cameron Kim. S., Quinn Robert E. [8]; Handy Ch. [9] et al.).

The study of corporate relations is an important step in the study of faculty corporate culture, because it allows developing a system of training for future teachers by including necessary elements in their master program.

We examined faculty corporate relations with the questionnaire designed by the author. It contained statements that describe the features of the faculty interaction when cooperating in joint activities. The questionnaire has statements with four extensions to complete each statement. The respondents could choose only one of the four options offered.

The areas in the survey were: the role of the faculty achievements in the university efficiency, relationship, availability of the support from colleagues, and communication.

The research was conducted at the three universities in Ukraine and covered 376 respondents that are instructors with different teaching experience and experience working at the university. For the entire sample of respondents the average period of work at the university is 17 years. Instructors participated in the survey entirely voluntarily.

The survey results showed the correlation between the relationship among colleagues and rendering support. The paper will discuss the areas of corporate relations.

4. Results

First we wanted to understand how the respondents assessed the role of their academic achievements in the success of the team. The respondents completed the questionnaire statement: "I believe that the success of the university where I work...". The survey results are given in Table 1.

Table 1. The Role of the Faculty in the Efficiency of the University Policy

Questionnaire Statements	Responses in %
is due to my personal achievements	-
is due to the efforts of most of my colleagues and mer	27,7
is due to the administration management	3,2
is due to the coordination between the team and the leader	69,1
Total	100,0

As it is seen, 69.1% of the faculty reported that they regard the success of the university policy to be the result of coordination between the team and team leader, while 27.7% believe that the success of the university policy is due to their personal academic achievements without taking into account the leader’s role. And only 3.2% of the faculty members consider that the university efficient policy is due to the leader’s good management. There are no replies that reveal overestimation of a personal role. This means that faculty members understand the importance of coordinated work and do not overestimate their contribution to the university success.

To continue with the indicators, we need to note that the researchers use collectivism / individualism among the indicators that describe the type of corporate culture. The study results by Ukrainian scientists prove that there is a correlation between an organization and individual, corporate culture and individual’s culture. A group of researchers [10], explaining the positive and negative impacts that a group / team has on the individual refer to the theory of groups (social psychology). They point out that people inevitably tend to get into small groups. The researchers point out that the team is a highly organized group characterized by psychological similarities, good business and interpersonal relationships, two-way communication, recognized leaders, efficiency, personal morale and is based on the mutual trust, respect, openness, and honesty. Such groups must meet certain requirements, for example, be responsible when performing their tasks,

share values, establish good humane relations, create for each member the opportunity for personal advancement, and motivate each other to be productive. The effectiveness of such a group is higher than the sum of the performances of each of its members. Such group is characterized by high corporate culture.

When studying how the university corporate culture is formed, researchers consider that the term “team” referred to as “an ideal” group should not prioritize collective over individual, should not make individual subordinate to the collective. While forming a team one should encourage the employees to take personal responsibility for the organization’s success.

The authors [11] clearly illustrate the "principle of scales" - balanced team characteristics describing teamwork and personal attitude. Affiliation which means connection, communication, emotional relationship with other people, characterized by mutual acceptance, commitment, the need for communication, desire for relationship and referenceness (from the Latin term referens) meaning the quality of the team to influence an individual shaping their opinions, judgments, and behavior are on one scale. The individual freedom is on the other.

It is important for our study to analyze the relationship among faculty as an important factor that influences the parameters of the university corporate culture [12], (Table 2).

Table 2. Relationship Among Faculty

Questionnaire Statement	Responses in%
Most colleagues are happy about academic and professional success of each other	60,6
Half of the faculty are happy about academic and professional success of each other	17,0
Few faculty are happy about academic and professional success of each other	20,2
Almost no one is happy about academic and professional success of each other	2,1
Total	100,0

60.6% of the respondents stated that they are happy about academic achievements and outcomes of each other. It characterizes relatively friendly atmosphere and good communication among colleagues in terms of teaching, research, and corporate interaction at the university. While 17% and 20.2% indicate the existence of significant

problems in the relationship among faculty. 2.1% suggest that the relationship among faculty is not established.

Another important indicator of faculty corporate relations at the university community is the support and assistance that colleagues offer each other. Responses to the statement "I can say with confidence that my team ..." are given in Table 3.

Table 3. Faculty Responses about Assistance from Colleagues

Questionnaire Statement	Responses in%
Most colleagues help each other in solving professional problems and in other cases	59,6
Almost half of the colleagues help each other in solving professional problems and in other cases	17,0
Only a few teachers help each other	23,4
It is unacceptable for teachers to help each other in solving professional and other tasks	-
Total	100,0

A significant number of 59.6% respondents can confidently say that most colleagues in their team help each other in solving professional problems and other matters. This suggests that faculty established friendly relationship (data are taken from various university departments). Many employees rely on help from their colleagues. Although most faculty said that they needn’t help in their professional activities, they identified some areas, where they agreed to receive some assistance, for example, when working on projects, rendering community service, working with student groups, and developing documents.

The results of the corporate relationships study among colleagues that prove our statements are shown in Figure 1.

We found that the relationship among colleagues determines how much assistance they render each other when they work together. ($r = 0,68$, $p < 0,001$). The better the relationship in the team, the more you can rely on the assistance.

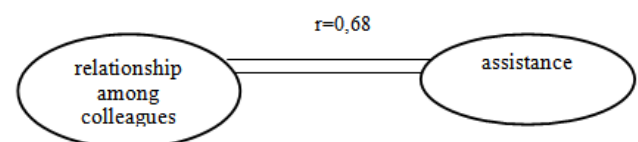


Figure 1. Correlation Galaxy of Interdependencies in Faculty Corporate Relations

According to O. Ivanova [13] interaction among employees in their professional activities is determined by the nature of their social relationships at different levels. The author examines cases where organization parameters match individual ones.

In our opinion, this limits the range of options for interaction, indicating that there are certain contradictions between the organization and the individual. We propose our ways of describing the interaction options:

- 1) coordination / mismatch of social organization goals, social system and individual;
- 2) similarity / difference in social requirements and individual expectations;
- 3) match / mismatch of the organization requirements and the individual's behavior;
- 4) coordination / divergence of regulatory requirements, social group standards and individual norms;
- 5) commonality / difference of values of the organization and the individual.

Studying the nature of interaction among faculty revealed (Figure 2) that 18.1% of respondents have only business relationships with colleagues.

Thus 13.8% of faculty reported that their interaction with colleagues is purely formal, and it is the norm in the organization. This is the evidence that the importance of corporate relationship is decreasing, because they are not complemented by interpersonal relationship. The majority

of faculty (55.3%) believe that the interaction among faculty is open, full of care, and consideration about others and their problems. 11.7% of respondents said that the interaction with colleagues is based on the emotional support that is in its turn based on the "family" relationship. The disadvantage of such relations is the lack of control, reduced demand for business relationships in the team. Unfortunately, 1.1% did not respond.

The following statement: "When cooperating in social activities, developing projects, drafting legal documents, organizing and conducting conferences, scientific-methodological seminars, etc." is supposed to determine the ways faculty establishes relationship in professional activities. The survey results are presented in Table 4.

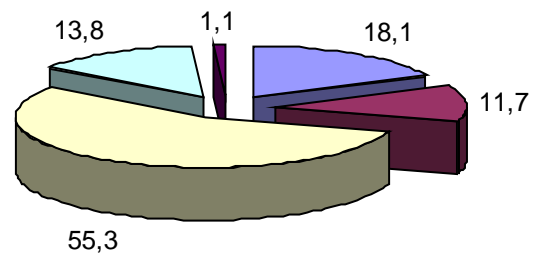


Figure 2. The nature of the interaction among university professors (survey results)

Table 4. Faculty willingness to establish relationships with colleagues

Questionnaire Statement	Responses in %
I am willing to establish positive relationships with other people, I try in every way to cooperate, but if the relationship hampers business, I stop cooperating	28,7
The relationship with colleagues is more important for me than business	5,3
I'm trying to adjust the relationships with colleagues and achieve the desired result	60,6
I do not care about the relationship, business is more important	4,3
Did not respond	1,1
Total	100,0

The results analysis showed that 60.6% of the university faculty tries to adjust relations with colleagues and achieve the desired result. This suggests that this group of faculty (which is the majority) is not satisfied with the nature of relationships with colleagues. 28.7% of respondents said that they did not have any relationship, and interact only if it does not hamper the business. Among the faculty we found a small percentage of respondents for whom business is more important than relationships with colleagues (4.3%), and those for whom relations with colleagues are more important than business (5.3%).

5. Conclusion

The study of corporate relations as a structural component of the corporate culture at the university enabled us to analyze the business (formal and informal) relationship among the faculty, describe their specific characteristics, establish typical examples of how the faculty break corporate relations norms at the university.

The study found that most of the surveyed faculty considers the success of the university policy to be the result of cooperation between the leader and the team. They believe that the relationship among colleagues are described as friendly, open, and rely on assistance from their colleagues. It is statistically proved that there is a correlation between relationship among faculty and the

assistance they render each other. While performing most common projects university faculty try to adjust their relationships with colleagues and achieve the desired result. This statement deserves further study though.

Based on the analysis of the interaction between educational institutions and faculty members we offered ways to describe different types of interactions.

The obtained data show that the university faculty corporate culture is not developed enough. A set of corporate relationships that are deformed and need adjustment were identified.

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Ukraine: Current Tendencies in Inclusion

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Abstract The article discusses the legislature in Ukraine that shaped the ‘inclusion’ trend to provide the disabled children and youth with equal access to education. The article focuses on secondary education system that helps understand the educational setting. It gives an overview of the terms referring to the special needs children. Areas of particular concern include the inclusion of the disabled youth in higher education that is currently lacking the concept. It examines the reasons that hinder ‘inclusion’ and measures to be taken to improve the situation.

Keywords: children with special needs, disabled, legislature, secondary and higher education

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1. Introduction

Ukraine, a country in Eastern Europe after gaining its independence from the Soviet Union in 1991, had to cope with multiple tasks to overcome economic and social instability. Public education faced the same difficulties that the country had to go through. Social inequality and economic stagnation affected the development in public schools. In this period European community was developing the international standards for the rights of the children that developed over the course of years and were reflected in many international documents. As Ukraine entered the 1990s the country faced many challenges in safeguarding children’s rights to education and providing quality education to children with special needs. Such was the context when Ukraine ratified UN Convention on the Rights of the Child adopted by the UN General Assembly in 1989. By signing the Convention in 1991 Ukraine acknowledged that children are an especially vulnerable group in view of their age, mental and physical development, and therefore they require special care and protection. By ratifying the UN Convention Ukraine committed to be legally bound by its principles and start reforming the national legislation to bring it in line with the international standards. This article discusses how Ukraine’s government pursued the UN policy of protecting children’s rights, especially the rights of disabled children by developing necessary legislature, and presents some of the pressing issues that hampered the process to make inclusion a reality for Ukraine’s young people and citizens with special needs.

2. Implementation of Inclusion

Education. The principal levels of education offered in Ukraine are: preschool level, primary general education (I

level), basic general secondary education (II level), complete general secondary education (III level), vocational technical education, education qualification levels for qualified workers, basic higher education, complete higher education including graduate, postgraduate and doctoral education, and self-education [1]. The general (regular) secondary school of I-III levels comprises primary general school – I level, basic general school – II level, high school – III level. There are the types of the general secondary schools including: specialized general school (boarding school) of I-III levels for gifted children that provides intensive learning programs in selected subjects and courses in addition to general education standard; “gymnasium” of II-III levels that provides intensive learning programs in the subjects of specialization emphasized by a particular school; lyceum of III level that provides specialized track education and prevocational training; collegium of III level that provides general education in the area of philosophical-philosophical and cultural-aesthetic tracks.

For many years, children with developmental problems, sensory disorders, brain dysfunction and complex disorders have remained at the margins of the Ukrainian secondary education system or have been totally excluded from it. These children were educated by a separate, special school system which consists of independent institutions, many of them operating as boarding schools for children who lived too far from the school to commute each day [2]. The variety of boarding schools includes: general boarding school that provides fully or partly for the children that need social care; special general school (boarding school) is for children who need correction of mental and/or physical development (this term is used in General Education Act); general education sanatorium school (boarding school) of I-III levels with impairment specialization is for children who need long term treatment; social rehabilitation school (boarding school) is for children who are in need of ‘special education’ (gender

separate); evening school of I-III levels is for those who are not able to study in the general school. The Ministry of Education and Science of Ukraine supervises both general schools and some special schools. According to its statistics there are 396 special secondary schools with 54,100 children, 40 educational rehabilitation centers for children with mental or physical disorders, 142 special preschool institutions and 1200 special education groups in mainstream preschools with 45,000 preschoolers [3]. Although new standards have been adopted, special education remains primarily segregated from general education in contrast to western trends.

The Ministry of Labor and Social Policy supervises 298 rehabilitation centers where 208 institutions are early rehabilitation centers for children with developmental disorders and 90 are centers for medical, social and professional rehabilitation. There is a group of special centers that fall within the scope of the Ministry of Health of Ukraine. Each ministry pursues its own goal. The Ministry of Education and Science offers educational and correction services. The Ministry of Labor and Social Policy pursues social care and renders support and social assistance. The Ministry of Health focuses on health care issues. Such differentiation in responsibilities is some sort of historical heritage Ukraine received from the Soviet system where general and special education was separated. Traditionally mainstream schools transferred their problems to special schools that developed in isolation.

The population of the children with disabilities was growing and the conditions in special schools were worsening with every year caused by the insufficient government funding. Children were put in special institutions often without their parents' consent. In many cases parents had to go through much pressure from state officials if they rejected the special institution services. Those who decided to raise a disabled child at home experienced financial difficulties that led to inadequate provision of the disabled child's needs. Because of the international agreements and conventions on human rights, the situation is slowly changing. Special education, social protection of children with disabilities, integration and inclusion of the disabled children in general and special education are slowly gaining some national attention.

Terminology. Although Ukraine developed its legislature in alignments with the UN Convention on the Rights of the Child where the term 'disabled child' was used, the term 'child-invalid' was common for most legislature through 2012 reflecting the medical model when discussing the issues of the children with special needs. The changes in terms show the evolution in the legislature and changes in the society awareness of the problem. The terms that were used in acts, decrees, orders, and regulations by year include: 1991 - 'child-invalid', 'children with hearing impairments', 'children with physical or mental developmental impairments', 1993 - 'children with language impairments', 1996 - children with sensory disorders, 'child-invalid', 'children with physical or mental developmental impairments', 1996 - 'children who need correction of mental or physical development', 1999 - 'children with special needs', 2000 - children-invalids', 'children with physical or mental developmental impairments', 2001 - 2002 - 'children with limited abilities', 'children-invalids', 'children with physical or mental developmental

impairments', 2003 - 'children who need correction of mental or physical development', 'people with limited abilities', 'people in difficult conditions', 2004 - 'children who need correction of mental or physical development', 'children with sensory disabilities such as visual impairment or blindness and deafness or hearing impairments', 'children with mental retardation', 'children with severe language disorders', 'pupils with special educational needs', 2005 - 'children with limited abilities', 'children-invalids', 2006 - 'persons with invalidity', 'persons who need correction of mental or physical development', 'persons with special educational needs', 'children with limited abilities', 2006 - 'children-invalids', 'children with limited functional abilities', 'children who need social and psychological correction, 2007 - 'children with limited physical abilities', 'children-invalids', 2008 - 'children-invalids', 'persons who need correction of mental or physical development', 'children with limited physical abilities', 2009 - 'persons with special educational needs', 'children who need correction of mental or physical development', 'pupils with developmental disorders', 'children-invalids', 2010 - 'children with special educational needs', 'children with limited physical abilities', 2011 - 'children with special educational needs' and all medial categories, 2012 - 'children with special educational needs' and all medial categories, 2013 - 'children with invalidity', 'persons with invalidly', 'children with limited physical abilities', 'children with special educational needs', 'children with special needs', 'children-invalids', and medical categories, 2014 - 'persons with special educational needs' is first defined in "Higher Education Act" (passed July, 1, 2014) [4] as a person with invalidity who needs additional support to be able to receive higher education.

The variety of terms can prove the confusion among politicians and misunderstanding of the 'inclusion' issue by the government. It can also show the dynamics of how Ukraine has been struggling to conform to European norms and values [5]. Lack of definitions caused messed rhetoric. Insufficient research into the 'inclusion' issue made acts inactive.

Legislature and Inclusion. Moving forward in providing disabled students with equal access to education the Supreme Rada (the legislative branch of the Ukrainian government) passed the laws to align the Ukrainian legislature with the European standards. The right to education is guaranteed by the Constitution of Ukraine. Article 53 of the Constitution recognizes the right of everyone to education and defines complete secondary education as compulsory. The first national law adopted after Ukraine ratified the UN Convention on the Rights of the Child was Invalids Social Security Basics Act (875-12 issued March 1991) [6].

Between 1991 and 2000 education and practical guarantees of children's rights were governed by the laws of Ukraine Education Act (1991), President's Decree on the National Program 'Children of Ukraine' (1996), the Concept on State Special Education for Children with Special Needs (1999), General Secondary Education Act (1999). The National Program refers to the UN Convention on the Right of the Child and declares the early rehabilitation of the disabled children to be the national priority. As the Program stated 60 % of children that start elementary school are with disabilities. 10 % of

elementary students have learning difficulties. This is the first national document that used the term “integrated”. It stated that ‘...segregated special education in the boarding houses should be replaced by integrated education’ [7]. In 1999 the Ministry of Education of Ukraine and Presidium of Pedagogical Sciences Academy signed the Concept on Special Education State Standards for Children with Special Needs that was meant to reform the special education content [8]. Although the Concept uses the term ‘children with special needs’, it is limited to disabilities. Children with special needs are qualified as children with visual impairments, hearing problems, severe speech disorders, mentally retarded children, children with disorders in mental development, children with cerebral palsy placed in special setting. Whereas the Framework for Action on Special Needs Education states that special needs children ‘include disabled and gifted children, street and working children, children from remote or nomadic populations, children from linguistic, ethnic or cultural minorities and children from other disadvantaged or marginalized areas or groups. In the context of the Framework, the term ‘special educational needs’ refers to all those children and youth whose needs arise from disabilities or learning difficulties when placed in inclusive setting [9].

The Concept admitted that the special schools were insufficient in providing services to the children with special needs because it was guided by the State general education standards. It stated that the efficiency could be improved by complete replacing the existing organization techniques, curricula, teaching methods, and instructional content to meet the special needs of the children with disabilities. This direction contradicted the Framework statement that did require the curricula to be adapted to children’s needs. Children with special needs should receive additional instructional support in the regular curriculum context, not a different curriculum. The guiding principle should be to provide all children with the same education, providing additional assistance and support to children requiring it [10].

The Concept didn’t exclude the opportunities for the children to study at the general school or special unit or class in the general school, implying that those will be the rare cases. The Concept overlooked the main statement given in the Salamanca Framework that the assignment of children to special classes or sections within a school on a permanent basis should be the exception, to be recommended only in those infrequent cases where it is clearly demonstrated that education in a regular classroom is incapable of meeting child’s educational or social needs or when it is required for the fare of the child or of the other children [11].

There were no provisions for making special schools valuable resource for the development of inclusive education or servicing as training and resources centers for staff in regular schools. It did not state either that special schools or units within inclusive schools may continue to provide the most suitable education for the relatively small number of children with disabilities who can’t be adequately served in regular classrooms or schools.

The General Education Act of 1999 made the major change in assigning pupils to the special schools. In the well-established system of special institutions medical boards were responsible for assigning children with

special needs in schools with specific impairments. Now though parents received the right to disagree with the medical-pedagogical board verdict and reject sending their child to a special institution and provide individual schooling at home. That was the only option stated by the Act at that period [12].

The end of 2000 was marked by two important regulations aimed at rehabilitation and equalization of opportunities and social integration of all people with disabilities. The Cabinet of Ministers Ruling №1545 of October 10, 2000 approved the Concept of Children-Invalids Early Rehabilitation. It worded the statement given in the 1996 President’s Decree that ‘...segregated special education in the boarding houses should be replaced by integrated education [13].

The State Social Welfare for Children Invalids Act 2109-III of November 2000 forbade discrimination against the disabled children. It provided financial support to families with disabled children and insisted on removing the architectural barriers to provide equal access to full participation in social life and take fuller account of the different needs of children [14].

Between 2001 and 2010 there were adopted about 40 different laws, decrees, and regulations aimed at developing inclusive education. The Pre-School Education Act, Extracurricular Education Act, Vocational Training Act, Higher Education Act, National Education Development Doctrine were intended to recognize the principle of equal opportunities for all children, youth and adults with disabilities in primary, secondary, and tertiary education carried out in integrated setting.

In July 2005 the President’s Decree on urgent measures to provide for the ongoing development of education in Ukraine (N 1013/2005) was passed. Three months later in October 2005 the Supreme Rada passed the Invalids Rehabilitation in Ukraine Act. In terms of clarity, that was the first law to have identified about 30 terms relating to rehabilitation services, education, medical support, and social provision. However, the definitions of the terms ‘invalids’, ‘children-invalids’, ‘invalidity’ ‘functional limitations’ were added to this law only in 2011. The regulation states (2011) that ‘a child-invalid is a person until 18 years old, with constant functional disorder which causes some functional limitations when interacting with the environment, therefore requires the government to provide for necessary conditions to ensure that children realize full potential, enjoy equal rights and are socially protected [15].

However, the act that inspired legislative measures in the sphere of inclusive education was adopted in 2009. It was the National Program ‘The National Action Plan to Realize the UN Convention on the Right of the Child’ through 2016 Act (№ 1065-17 of March 2009). Before it was adopted and came into force it had been under discussion in the Supreme Rada for three years. The Preamble to the Act states that the National program is aimed at wider changes and coordination of many institutions to improve the quality and access to education for all children. The law did not use the term ‘inclusive schooling in general schools’. However, by stating that all disabled children will have been provided with psychological, social pedagogical, medical, and judicial, information services to meet their special needs by 2016, the law implies full inclusion [16].

The law (N 1065-17) was followed by the Ministry of Education and Science Order N 855 to approve the Ministry's Action Plan to realize the inclusive schooling in general secondary schools between 2009 and 2012 [17], and Cabinet of Ministers Regulation (N 1263-p) on Action Plan for the 2010 State Program 'National Action Plan to Realize the UN Convention on the Rights of the Child through 2016' to approve measures to realize the program in 2010 [18] in which the term 'inclusive' was first used. It stated that the inclusive schooling should be introduced in the general school setting.

The legislative efforts resulted in the Concept of Inclusive Schooling (№ 912 of October 10, 2010) approved by the Ministry of Education and Science [19].

In terms of legislative advancements to develop inclusive education the period between 2011 and 2014 was very intensive. There have been about 20 different regulations referring to the inclusive schooling in general school setting in terms of organizational issues, curricula, assessment, loads, psychological support provision, pedagogy, and new staff to assist the general teacher with inclusive schooling. The Supreme Rada introduced some changes into the General Secondary Education Act (1999) adding that 'general schools can have special and inclusive units for disabled children'. Exclusion deeply rooted in the country's historic context, started slowly giving way inclusion tendencies after almost twenty years.

The Ukrainian Parliament Commissioner for Human Rights Mrs. N. Karpachova emphasized in the special report on the occasion of the 20th anniversary of ratification by Ukraine of the United Nations Convention on the Rights of the Child that on January 1, 2010, there were 157,474 children with special needs in Ukraine. Most of them suffer from nervous system pathologies, mental and behavioural aberrations, as well as congenital development defects. More than 23,000 Ukrainian children suffer from cerebral palsy. Protection of disabled children's rights requires improvement of their material status, as well as special conditions for their integration into social life [[20], p. 126]

Higher Education and Inclusion.

Dr. K. Kolchenko, President Adviser for Inclusion at Open International University of Human Development 'Ukraine' considers that 'the present stage of integration of students with disabilities in higher education of Ukraine started only in 1999 when the University 'Ukraine' was founded. It is the first university in Ukraine that admitted students with disabilities. The university branches (affiliates) were opened in 20 cities throughout Ukraine that year that provided educational services for the students with low mobility and income. The mission of the university is to provide equal access to education for people with special needs [21].

In 2002-2003 there were about 1,000 disabled students at the university and 8,000 disabled students countrywide who came from special "segregated" schools or from homes being excluded from society. By analyzing the legislature at that period we can conclude that the government considered the restricted environment to be the main reason that hindered the inclusion of the disabled students, because of the President's Decree of June 2005. Among the priority measures to be taken to provide the conditions for the disabled persons was to build ramps in all educational institutions and to introduce relevant

courses at Construction departments [22]. Although the plan was well developed, it was impossible to realize because of the constrained deadlines and lack of funding. Among other priorities that needed to be addressed were assessment as to what students with disabilities would need to fully participate in an educational program, provision for the disability support, professional care staff, accommodation adapted to the needs of students with disabilities, support with day-to-day living. It resulted in difficulties that faculty and disabled students experienced in the classroom. "The notion of systematically providing accommodations for university students with disabilities is foreign to most instructors in Ukrainian colleges and universities. Instructors tend to be at a loss as to how to facilitate learning and evaluate students with disabilities. Some immediately assume that students with visible disabilities such as cerebral palsy or blindness will not be able to manage the academic demands of higher education [23]. The government lacked the Concept of how to include the disabled students in higher education and accommodate them, satisfying their special needs.

The Ukrainian model of inclusive higher education was first developed at Open International University of Human Development *UKRAINE*. Its mission, objectives and directions were explained in 'The Concept of inclusive education for the disabled students' and published on the university site and some scholarly publications. BESO volunteer professors Peter Mittler from Manchester University and Joahim Klaus from Karlsruhe University (Germany) assisted the university faculty in developing this document. There is no National Concept for the inclusive higher education in Ukraine that would ensure continuous educational services to the disabled people. Thus, the experience accumulated at the University could serve as the foundation to design the National Concept for the inclusive education in universities in Ukraine to provide inclusive setting for students with special needs. The greatest concern that the university faculty express about their disabled graduates' future is that society is not prepared to accept qualified disabled people as equals; their needs are ignored; and they are again excluded [24].

Inclusion Stakeholders. Inclusion in Ukraine has been driven by movements for civil rights from outside international forces. The legislative documents refer to international acts such as Standard Rules on the Equalization of Opportunities for Persons with Disabilities, UN Declaration of the Rights of the Child, Salamanca Statement and Framework for Action on Special Needs Education, UN Declaration of the Rights of Persons with disabilities.

Non governmental organizations, including parents associations are key factors in promoting changes in Ukrainian society. They are considered to have initiated the inclusive education discussion to focus on disabled and homeless children. The most effective work in inclusion today is being accomplished by the Ukrainian Step by Step Foundation, a non-governmental, non-profit organization that aims at promoting democratic reforms in education.

The foundation fosters quality education for all children, especially children with special needs, children of national minorities, children from socially unprotected families or homeless children. Since being launched in 1999, the project implemented demonstration integration programs

in 17 regions, reaching more than 15,510 children and their families. The project attempted to reform Ukraine's educational system through 3 programs: teacher training, inclusion, and educating minorities [25].

The International Renaissance Foundation (IRF) accomplished two projects "Disabled children rights to quality education" (2005 – 2006), and "Implementation of inclusive education in Ukraine (2007). Ukrainian Step by Step foundation jointly with the International Step by Step Association (NL) and the Every Child organization (UK) and with support of the Institution Building Partnership program of the TACIS launched a project "Creating centers of Excellence for Inclusive Education of Children with disabilities in mainstream schools" (2003 – 2004). TACIS carried out a project "Civic education in Ukraine" (part of this project is teaching children with special needs for civic education) (2004 – 2007). CIDA projects on inclusion for disabled and homeless children (2005 – 2007) attempted to promote inclusive philosophy [26].

Because of the NGO active involvement the term "children with special needs" replaced the terms with negative meaning like 'children with limited abilities', 'children with disorders in development' in recent documents [27].

Due to the National Assembly of Disabled People of Ukraine and the Ombudsman, Ukraine signed the UN Convention on the Rights of Persons with Disabilities and its Optional Protocol on September 24, 2008 and ratified it on December 16, 2009. Parliamentary ratification of those international documents have established a sound legal ground for more effective and fair protection of the rights of people with special needs, for instance, disabled children [28]. The reality was different. In 2007-2008 50,300 children who needed correction of their physical or mental development studied in 387 special educational institutions. However, only 6,100 of those children studied in specialized classes in general schools. The Ombudsman was convinced that Ukraine didn't yet establish a proper environment for integration of disabled children in the general education system. Besides, special methodologies and teaching aids should be developed to improve teaching for students of the boarding schools under the Ministry of Labor and Social Policy of Ukraine [29].

The Ombudsman believed that special programs and material resources should provide the setting to realize the constitutional right to education for talented young people with special needs. This is particularly relevant for their vocational and university education. Given that more than 2% of children are disabled, they constitute only 1% of the total number of students of vocational schools and less than 0.5% of university students. Most disabled people who are physically able and mentally capable of attending higher educational institutions can't do that because of the lack of such facilities as ramps. Only a few instructors have been trained to work with children with special needs. Inability to get higher education makes prestigious work unreachable for the disabled people, too. The Commissioner paid special attention to make sure that all institutions and public authorities establish appropriate conditions for the disabled people and particularly children, and that the latter feel no obstacles or disadvantages. Barrier-free environment should become the norm of life in Ukraine. The Ombudsperson implied that the standard reference to a lack of funds for this

purpose was groundless as the government expenditures on office renovation and equipment exceeded the costs of threshold-free environment by far. By 2010 only a few public institutions and cultural centers were accessible for the disabled people [30].

Researchers identified different barriers that challenge the implementation of inclusion in Ukraine including policy, funding, public attitudes, and instructional methodology. S. Phillips reported the policy to be ineffective due to the many disconnects between state rhetoric and state action [31]. A. Kolupayeva argues that only an economically stable and developed country can afford to mainstream the majority of it children with special needs [32]. S. Raver thinks that the laws alone will not change the public attitudes. It may take years and generations for people to transform and reform [33]. Implementation of inclusive education requires mandatory primary, secondary, and higher education teacher training, control of class size, availability of appropriate materials, and the presence of additional adults in the classroom to offer more individualization. It also requires educational methods that are culturally-appropriate and empirically-based. [34]. Further, differentiated curriculum will need to be developed, written and implemented which can be a slow process [35].

3. Conclusion

In summary, although Ukraine makes effort to conform to European disabilities law, the mechanisms to implement and enforce this law are largely ineffective. To reform the special education system and make inclusion reality the law has to be economically justified and have community support. Further, it is necessary to coordinate Ministries to pursue the national policy and involve other interested groups that can render assistance in removing the barriers to inclusion. Effective implementation of every inclusion 'step' requires consistent data collection regarding legislative policy, funding, public attitudes, social assistance, health care issues, and ways towards merge of general and special education. The data collected will ensure the continuous movement towards inclusion. By ongoing effort to make the educational system accessible to all, Ukraine will reform society, making it more inclusive and humane.

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Didactic Features of Modeling Professional Competence of the Physics Education Students

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

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

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1. Introduction

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

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

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

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

2. Conceptual Basis

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

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

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

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

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

3. Methodology

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

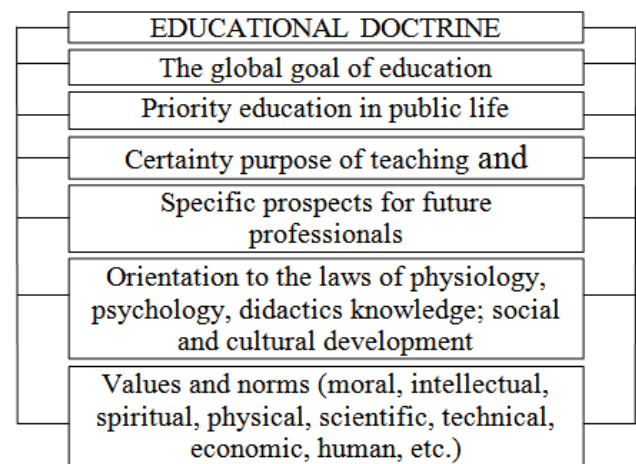


Figure 1. The structure of educational doctrine

Table 1. Scheme-matrix targeted curriculum

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

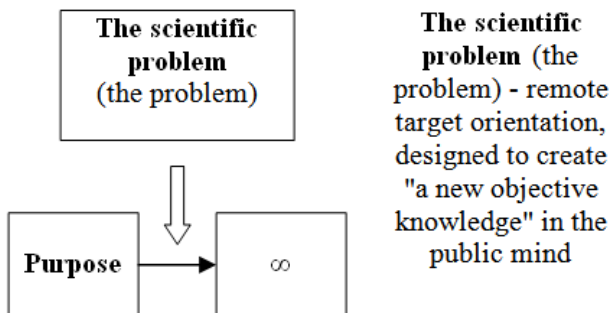


Figure 2. The essence of the scientific structure of the problem (the problem)

3.1. Summary of Tasks Set by Learning Physics

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

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

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

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

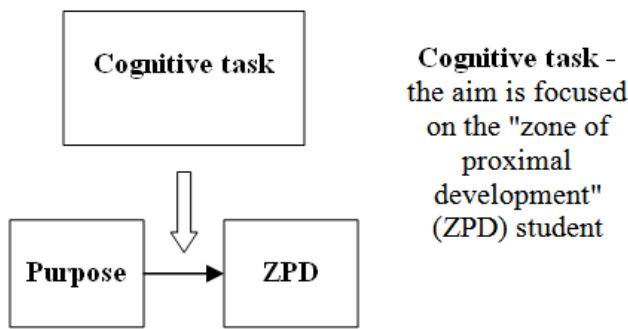


Figure 3. The essence of the structure of cognitive problems

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

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

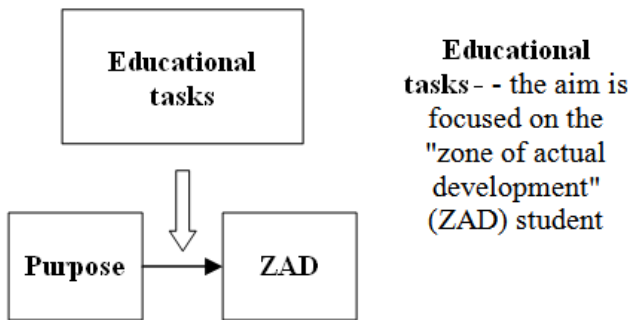


Figure 4. The essence of the structure of educational tasks

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

3.2. Technology Perception and Learning

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

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

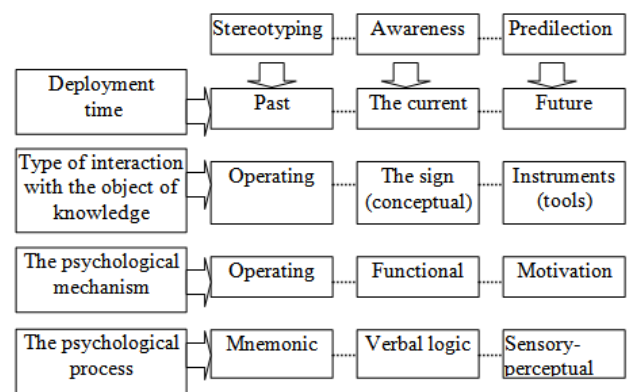


Figure 5. Main activity characteristics parameters of learning

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

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

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

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

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

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

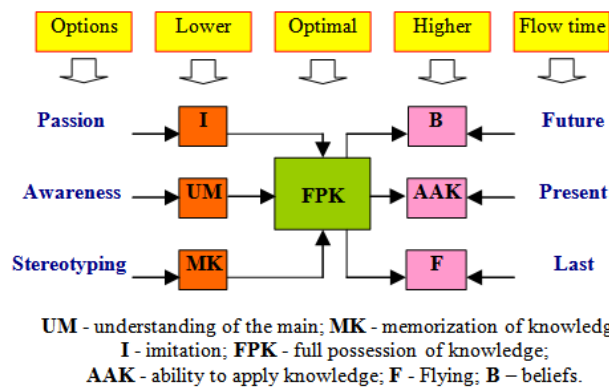


Figure 6. The content and activity patterns

3.3. Summary of Standard Requirements

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

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

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

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

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

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

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

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

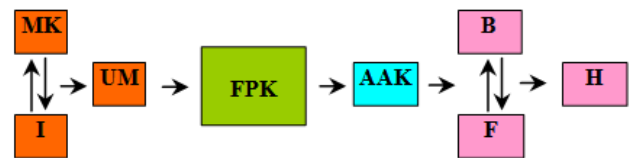
With the option highlighted passion qualitative "types" of knowledge - an imitation of full ownership, beliefs:

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

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

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

4. Prediction of Forming Personal Competences



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

Figure 7. Plausible scheme of self-regulated learning process

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

everyday knowledge relevant to higher levels of competence and outlook.

Management impacts as follows:

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

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

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

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Statement of Competing Interests

The authors have no competing interests.

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The Problem of Forming and Developing Students' Logical Thinking in the Context of Subject Specialization in Secondary School

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Abstract The article considers the certain features of the development of learners' logical reasoning in classes with different subject-specialization at secondary school. A short author's review of literature suggests that three main directions have been formed in the theory of teaching mathematics in the last 50-60 years in Ukraine. The author investigates them in brief. The analysis shows that the current approach to forming pupils' logical thinking, significantly varies depending on the subject-specialization and the level of mathematics training. More detailed investigation of particular methods and techniques of teaching the elements of mathematical logic in classes with advanced study of mathematics are given in the article.

Keywords: *learners' logical reasoning, subject-specialization at secondary school, teaching the elements of mathematical logic, advanced study of mathematics*

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1. Introduction

Modernization of education system in Ukraine nowadays is realized through subject-specialization at complete secondary school [24,25]. The following ideas form the basis of mathematical preparation of senior students during school training: mathematical preparation is carried out in several directions and few levels (Standard Level, Academic Level, Subject-specialised Level and Level of Advanced Mathematics Study [24] (2003), or Standard Level and Level of Advanced Mathematics Study [25] (2013)) but only after the pupils receive a general base of education and decide on the further choice; one should make free choice of the direction and level of math training and the school should provide as many directions of training as possible; the mathematics is included to the list of basic subjects in any direction (physical and mathematical, technical, humanitarian); realization of subject-specialized training of mathematics should be carried out in terms of its objectives, its features of the content and form in comparison with training mathematics in general educational classes.

The analysis of mathematics teaching objectives in classes of different directions allows us to identify core goals common to all of them. One such purpose, for example, is an intellectual personality development, especially the development of students' logical thinking. Logical and coherent way of thinking is necessary for

pupils of different directions as it is essential for investigating phenomena of various origin (social, humanitarian, polytechnic, natural) and contributes to the development of personal qualities, critical attitude towards oneself and the environment, and because it helps to build pupil's ability to produce a wide range of hypotheses, innovative ideas and solutions of problems based on identification of the core elements of the studied phenomenon. Therefore, the development of students' logical reasoning has always been in the center of attention of both theory and practice of mathematics teaching.

The purpose of this paper is to investigate the features of the development of learners' logical reasoning in classes of different directions with more detailed focus on particular aspects of student learning of mathematical logic elements in classes with Advanced Mathematics Study Level.

2. Methodology of Research

To achieve the objectives we will consider four directions each requiring corresponding level of mathematics instruction. Firstly, "social and humanitarian" direction requires mathematics instruction at a standard level. Education Content is directed at the students' perception of mathematics as a component of general culture. Secondly, "natural sciences" direction prescribes mathematics instruction at academic level and focuses on applied aspects of mathematics. It is supposed

for those cases, when mathematics is closely connected with the subject-specialized disciplines and assists in their effective mastering and also for those senior students who have not made up their mind yet concerning the sphere of their future specialization. Thirdly, “physics-mathematical” direction considers mathematics to be taught on Subject-specialised Level with a focus on abstract mathematical concepts. In this case mastering mathematics is oriented to the future students’ profession which is closely connected with mathematics or its practical application. Finally, “pure mathematical” direction in which math is explored in depth level.

2.1. Literature Review

Our review of literature suggests that in the theory of teaching mathematics in the last 50-60 years, three main directions have been formed. The first direction is to introduce a special course “Logic” in secondary school. This direction was supported by A. Ivin [1], V. Sereda [2], I. Khomenko [4], V. Gladunsky [3], etc. According to these authors, the study of set theory and mathematical logic as a separate course creates a unified methodological basis for mastering different disciplines such as social, humanitarian, natural and mathematical sciences.

The second direction is represented in the works of the authors, who consider the problem of including a minimum amount of classical formal logic concepts in the regular course for their special study (A. Stolyar [5], I. Nikholskaya [7], K. Malaniuk [9], T. Malikov [10] etc.). The specifics of such work in secondary school is pointed out by I. Nikholskaya [8], for grades 1-5 by K. Malaniuk [9], for grades 7-8 by - L. Latotin [11], while A. Stolyar [5] and A. Markushevich [12] consider the problem of using elements of mathematical logic to streamline and improve the logical construction of the school mathematics course. In particular, A. Stolyar [6] works out the questions of reasoning as to the gradual development of culture in the process of mathematics teaching in primary, middle and secondary school through the logical structuring the empirical data and by using the elements of logical-mathematical language as tools for special type of visibility: “logical visibility”. He also considers the use of formal logic concepts while studying advanced mathematics in elective classes.

A. Kuzhel [13] stresses the logical foundations of proper construction of school mathematics course in several papers. I. Nicholskaya [8] considers the problem of reducing logical illiteracy and forming logical culture as a necessary and important part of the general culture of thinking, and investigates the theoretical possibility of incorporating elements of logic to modern school mathematics courses.

The third line of research focuses on the development of methodological provision, mediated formation and development of pupils’ logical skills in the process of learning mathematics. It is reflected in the works of N. Tereshin [16], D. Poya [14], G. Sarantsev [15], Z. Slepkan [17] etc. The dissertation research of A. Grishko [18] is devoted to the peculiarities of forming the junior pupils’ ability of thinking clearly.

R. Zagoruy [19] analyzes the process of forming the specific children’s skills of doing different kinds of reasoning in primary school; M. Shardakov [20]

formulates the requirements for the system of tasks aimed at developing the ability of making inductive inferences. We propose the method of forming the special differentiated system of exercises with an increased logical capacity that serves to develop the junior pupils’ logical thinking.

In the practice of mathematics teaching, one can witness the whole range of approaches: from a lot of efforts to implement actively the elements of logic, together with the appropriate symbols and terminology in school mathematics in 1960’s to the complete abandonment of them in 1980’s. Changing priorities in the education of early 1990’s again pay attention to the need of logical foundations of school mathematics and the methodical support of forming pupils’ specific logic knowledge and skills.

2.2. Practical Implementation of Theoretical Research

Now the results of theoretical and practical research on the problem, made during previous years, actively put into math training practice at primary, secondary and comprehensive high school. A special course on the choice “Logic” is offered for pupils of primary schools, the section “Elements of Mathematical Logic” is included to the program and mathematics textbook in advanced mathematic classes [23].

3. Discussion and Results

3.1. Elements of Mathematical Logic in Classes with Different Level of Mathematics Training

Analysis shows that the methodology of forming pupils’ logical thinking, significantly varies depending on the direction and level of mathematics training (Table 1).

3.2. Elements of Mathematical Logic in Classes with Advanced Study of Mathematics

For more detail we will focus on the features of methods and techniques of teaching students the elements of mathematical logic in classes with advanced study of mathematics.

The program of mathematics for schools and classes with advanced study points out that the students, who master it on the advanced level should be focused on further activities in the development of mathematical science, and, therefore, should have skills in operating mathematical logic. So, at the beginning of the 10th grade, they study the theme “Elements of Mathematical Logic”, designed for introducing the relevant apparatus of mathematical logic.

There are some methodological approaches for teaching students the elements of mathematical logic. One of them proposes the introduction of key concepts on the basis of deductive scheme, beginning with more precise definitions of key concepts. In our opinion, such approach is methodically substantiated in higher school. The study of mathematical logic theory elements school should be

motivated by considering the examples of problems with solution based on the use of so-called “common sense”.

Table 1. Guidelines of the Formation and Development of Pupils' Logical Thinking

Direction	Objectives	Education Content	Methods and techniques	Organizational forms	Tools
Social and humanitarian direction. Standard Level	Formation of logical skills of students on the basis of common mental actions and logical methods	Concept. Statement. Inference. The logical implication. Logical laws. Inductive, deductive reasoning. Syllogisms. Some schemes of valid reasoning. Proof. Rebuttal. Argumentation. Discussion and debate	Explanatory and illustrative partial search, heuristic conversation, project method	Elective course	Educational-methodical complex
Natural-mathematical direction (chemical-biological, chemical, biological, ecological profile) academic level	Formation of elements of logical knowledge and logical skills of students based on common mental actions and logical methods	Concept. Statement. Inference. The logical implication. Logical laws. Inductive, deductive reasoning. Incomplete and complete induction. Methods for establishing a cause-effect relationships. Finding patterns. Analogy. Reliability induction. Mathematical induction	Explanatory and illustrative partial search, heuristic conversation, project method, case method	Elective course	Educational-methodical complex
Natural-mathematical direction (Physics and Mathematics Profile) Subject-Specialised Level	Formation of elements of logical knowledge, knowledge of mathematical logic, appropriate symbols and logical skills of students based on common mental actions and logical devices	Elements of calculus of statements (logic operations, truth tables). Logical implication. Tautologies and contradictions. Logical laws. The logical equivalence of statements. Inductive, deductive reasoning. Incomplete and complete induction. Mathematical induction. Contact-relay circuits, simplifying circuits. Predicates. Elements of predicate calculus. Fallacies and valid arguments	Explanatory and illustrative, partially-search, development, problem experiment, teaching, heuristic conversation, project method, case method	Elective course	Educational-methodical complex
Natural-mathematical direction (mathematical structure) Level of Advanced Mathematics Study	Formation of elements of logical knowledge, the corresponding symbols and logical skills of students on the basis of knowledge	Elements of calculus of statements (the logic operations, truth tables). Logical implication. Tautologies and contradictions. Logical laws. The logical equivalence of statements. Incomplete and complete induction, used in the proof of mathematical facts. Mathematical induction and its applications. Validity, satisfiability, and logical consequence. Contact-relay circuits, simplifying circuits. Predicates. Elements of predicate calculus (quantifiers, universal quantifier, existential quantifier, domain of discourse). The logical equivalence of predicates. Proof. Negation. Fallacies and valid arguments	Explanatory and illustrative partial problem search, heuristic conversation, project method, case method	Lessons (10).	Educational-methodical complex

Table 2. Logical Laws

If “A”, then “A”	Law of identity
“A” or not “A” is true	Law of Excluded Middle
“A” and “not A” is false	Law of Non-Contradiction
If it is not the case that “A” and “B”, then it is not the case that “A” or it is not the case that “B” (and vice versa) If it is not the case that “A” or “B”, then it is not the case that “A” and it is not the case that “B”(and vice versa)	De Morgan's Theorems
If “A”, then “B”, and if “B” then “C”, therefore, if “A” then “C”	Hypothetical Syllogism
If “A” then “B”, therefore, if not “B” then not “A”(and vice versa)	Contraposition
If “A” then “B” and “A” is true, therefore, “B” is true	Modus Ponens
If “A” then “B”, and “B” is not true, therefore, “A” is not true	Modus Tollens

In the process of solving such problems students demonstrate the ability to think sequentially, to refute wrong conclusions, to select relevant and valid arguments. These capabilities require further involving, improving and developing both actual mathematical skills and social experience of students. To achieve this goal, the so-called problem of “knights and liars”, the task to establish a correspondence between objects, “the problem to the truth” (when it is required to establish the truth or falsity of one or more statements) can be used.

For example, firstly, one can offer the students the following problems.

Objective 1. Imagine that you are in the room that has two doors. One door points the way to freedom, and the

other – to an imminent death. There is one guard near each of the doors. One of the guards tells only the truth, the other only lies. Guards can answer only “yes” or “no”. You don’t know where the door to freedom is and which of the guards stands at that door. However, you know that the guards are aware of the point, who of them is the liar and who tells the truth. You can ask only one question and only to one of the guards in order to find the correct door which leads to freedom. What question should you ask?

Objective 2 (“Three Friends”). Three school graduate friends Igor, Ivan and Oleg were going to enter colleges in different cities of Ukraine: Donetsk, Kiev and Kharkov. A graduate of the class with advanced study of mathematics tried to enter a college in Donetsk, but failed. A graduate

of the class with advanced study of chemistry entered Kharkov University. Oleg confirmed his deep knowledge of jurisprudence during the interview, which he had received in the class of the corresponding profile and entered the faculty of law. Ivan refused to accept the parents' advice to study in Kharkiv. In which city did the boys continue their studies?

In the process of solving these problems it is advisable to emphasize that students have used the logical laws intuitively, but these laws can be represented verbally (Table 2) or with the help of symbols.

However, it should be pointed out that intuitive knowledge may not always be sufficient to reach a conclusion on the validity of reasoning. For example, the students may be asked to determine if the conclusion below is valid (objective 3).

Objective 3. Determine if the conclusion below are true: "If a quadrangle happens to be a rhombus, then its diagonals are mutually perpendicular. If the diagonals of a quadrangle are not mutually perpendicular, then the quadrangle cannot be a square. If a quadrilateral is a square, then it can be fitted into a circle. What is not true means that a given quadrangle cannot be fitted into a circle or that its diagonals are not mutually perpendicular. As a result, the quadrangle is neither a rhombus, nor a square".

Trying to give a reasonable answer to this question may cause some difficulties. It proves the need for instruction in the field of mathematics that allows to "calculate reasoning", without being bound to the content. Students are encouraged to seek historical information related to the inception and development of mathematical logic, outstanding mathematicians that have contributed to this field of science and it's current and relevant problems.

Next, we provide a list of key concepts that, according to the program in mathematics for schools and classes with advanced study, the students should be able to define and describe:

- statements and logical operations applicable to them;
- predicates, and logical operations applicable to them;
- equivalent statements and equivalent predicates;
- truth functions;
- domain and range of the truth predicates;
- quantifiers, both existential and universal;
- formulas of Boolean Algebra;
- formulas of predicate calculus.

Let's now discuss distinct features that characterize how these concepts may be introduced.

Introducing the concept of statement, it is advisable to carry out the following concrete inductive scheme (in the process of practicing exercises), pointing out the characteristic features of this concept, giving examples and counter examples, practicing exercises with the purpose of leading the object to the concept and making conclusions of belonging of the object to this concept.

Introducing the concept of a "truth function" is possible through the exercises such as the ones we list below.

Exercise 1. The set of true statements is pointed by symbol T (from English word, True), and the set of false statements is pointed by symbol F (from English word, False). 1) Give the examples of the elements of the sets T and F; 2) which of the claims $T \subset F$, $F \subset T$, $T \cap F = \emptyset$ is true?

If the statement A is true, it is pointed as $\text{val}(A) = 1$ or $|A| = 1$. And in this case it is said that A has the meaning of truth 1. If the statement A is False then it is said that A has the meaning of truth 0. In other words, a function can be defined with the range of meanings $\{0, 1\}$ on a set of given statements. This function is called the function of truth.

Exercise 2. Determine the truth value of statements:

1) the equality $x^2 - 2x + 1 = 0$ is true if and only if $x = 1$;

2) the equality $\frac{x^2 - 10x + 25}{x^2 - 25} = \frac{x - 5}{x + 5}$ is true for all $x \in R \setminus \{\pm 5\}$;

3) the equality $x^2 - 16x + 64 = -x^2 + 10x - 25$ is false for any value $x \in R$;

4) the inequality $x \geq x$ is proved for any values $x \in R$;

5) the equality $\frac{2p - q}{pq} - \frac{1}{p + q} \left(\frac{p}{q} - \frac{q}{p} \right) = \frac{1}{q}$ is true for all $p, q \in R \setminus \{0\}$.

We introduce the concept of predicate on concrete inductive basis, proposing to determine which of the items 1) - 7) are statements:

1) $[-5.5] = -5$; 2) $\{-6.03\} = 0.3$; 3) $\sqrt{x^2} = x$; 4) $|x| = x$; 5) $[9.05] = 9$; 6) $|ab| = |a| \cdot |b|$; 7) $a + \frac{1}{a} \geq 2$.

We define characteristic features of sentences which are not statements. Thus, the truth value of 3) and 4) depends on the variable x . Item 6) is true for all a and b . Item 7) is true for all $a > 0$. We emphasize that if a sentence has a variable, it is necessary to define the domain of this variable. Another specific feature of items 3, 4, 6 and 7 is that if a variable takes a value, then the sentence becomes a statement.

Together with pupils we list characteristic properties of predicates: 1) expression should contain a variable; 2) the domain of the variable must be defined; 3) if a variable takes a value, then an expression becomes a statement. We give the following examples of predicates: 1) on the set of triangles x : the square of one side of the triangle equals the sum of squares of the other two sides; 2) on the set of integers: $x \geq y$; 3) on the set of natural numbers: $2^x + 2^y = 2^z$.

After summing up, we point out that arbitrary numerical equality or inequality is the example of statement, arbitrary equation or inequality with variables is the example of predicate.

Pupils are offered to choose predicates. If the sentence is not a predicate, it should be completed to become a predicate:

- $x + y$ (this is not a predicate because properties 2 and 3 are not fulfilled);
- $x : y$ (this is not a predicate because the domain is not defined);
- let's say M is the set of students, "x practice sports" (predicate);
- let's say M is the set of students, "y come to me" (is not a predicate because it is not a statement if y takes a value from M);

- let M be the set of students, “ x and y are sisters” (predicate).

On the basis of the given examples pupils get acquainted with single-variable and two-variable predicates. Special attention should be concentrated on the fact that if one variable of a two-variable predicate takes a value from the domain, we obtain a single-variable predicate. A statement can be considered as a 0-variable predicate.

The following questions could be useful for the generalization of the concept of the domain: 1) Let’s consider number expression: $2^2 + 2^3 = 2^4$. Is it an example of a proposition? Prove your argument. 2) Give an example of single-variable, two-variable, three-variable, four-variable and six-variable predicates. Which of them induce the given proposition when all variable of a predicate take values from the set of natural numbers?

The concept of equivalent predicates is useful to introduce using the technique of analogues with preliminary actualization of students’ knowledge about equivalent equations or inequalities. For example, we could assign exercises (5 and 6).

Exercise 5.

Choose the equation, which is the consequence of equation $\sqrt{x+1} = x - 2$:

- A) $x + 1 = x - 2$;
- B) $x + 1 = (x - 2)^2$;
- C) $(x + 1)\sqrt{x + 1} = (x - 2)^2$;
- D) $\sqrt{x + 1} - (x - 2) = 0$;
- E) $\sqrt{x + 1} = \sqrt{(x - 2)^2}$.

Exercise 6.

Choose the equation, which is equivalent to the equation $\sqrt{5x - 2} + x = 4$:

- A) $\sqrt{5x - 2} = x + 4$;
- B) $\sqrt{5x - 2} = -x + 4$;
- C) $\sqrt{5x - 2} = -x - 4$;
- D) $5x - 2 = (4 - x)^2$;
- E) $5x - 2 = (x - 4)^2$.

It’s useful to remind students of definitions of concepts “equation consequence”, “equivalent equations” in the process of solving these problems. It’s also recommended to remind them which elimination of equations leads to the consequence of equations and which ones to equivalent equations. On this basis, while using analogy, one can introduce the meaning of predicate consequence concept and equivalent predicates. While using the method of comparison and analogy it is possible to give the meaning of operations with predicates.

The method of analogy is beneficial to use for introducing operations with statements. For realizing the meaning of logical operations of conjunction, disjunction, implications, equality of statements, students should be supplied with truth tables of logical operations completed in such a way (Table 3- Table 5).

However, not all the new concepts of the considered theme are to be introduced on concrete-inductive basis. Experience shows that definitions of operations with statements and operations with predicates are better to be introduced following a deductive scheme. This scheme is recommended when universal quantifier and existential quantifier are introduced.

Table 3. Truth Table for Negation

Logical operation	TruthTable	Analog in Ukrainian	Analog in the set theory	Example						
Negation (\neg)	<table border="1"> <tr> <td>A</td> <td>\bar{A}</td> </tr> <tr> <td>0</td> <td>1</td> </tr> <tr> <td>1</td> <td>0</td> </tr> </table>	A	\bar{A}	0	1	1	0	“not valid that”	Completing the set to universum	Since $A = “2 + 2 = 5”$; clearly, $ A = 0$, then $ \bar{A} = 1$
	A	\bar{A}								
0	1									
1	0									

Table 4. Truth Table for Conjunction

Logical operation	Truth Table	Analog in Ukrainian	Analog in the set theory	Example															
Conjunction (\wedge)	<table border="1"> <tr> <td>A</td> <td>B</td> <td>$A \wedge B$</td> </tr> <tr> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>0</td> <td>1</td> <td>0</td> </tr> <tr> <td>1</td> <td>0</td> <td>0</td> </tr> <tr> <td>1</td> <td>1</td> <td>1</td> </tr> </table>	A	B	$A \wedge B$	0	0	0	0	1	0	1	0	0	1	1	1	“and”	Intesection of sets	Since $A = “2 > 5”$, $B = “0 < 1”$; Clearly $ A = 0$; $ B = 1$, Then $ A \wedge B = 0$
	A	B	$A \wedge B$																
	0	0	0																
	0	1	0																
	1	0	0																
1	1	1																	

Table 5. Truth Table for Disjunction

Logicaloperation	Truth Table	Analog in Ukrainian	Analog in the set theory	Example															
Disjunction (\vee)	<table border="1"> <tr> <td>A</td> <td>B</td> <td>$A \vee B$</td> </tr> <tr> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>0</td> <td>1</td> <td>1</td> </tr> <tr> <td>1</td> <td>0</td> <td>1</td> </tr> <tr> <td>1</td> <td>1</td> <td>1</td> </tr> </table>	A	B	$A \vee B$	0	0	0	0	1	1	1	0	1	1	1	1	“or”	Union of sets	Since $A = “2 > 5”$, $B = “0 < 1”$; Clearly $ A = 0$; $ B = 1$, Then $ A \vee B = 1$
	A	B	$A \vee B$																
	0	0	0																
	0	1	1																
	1	0	1																
1	1	1																	

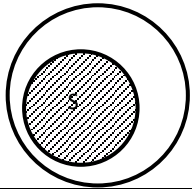
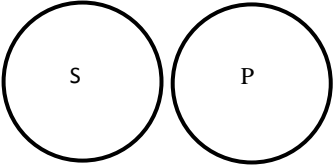
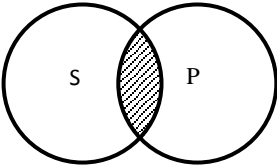
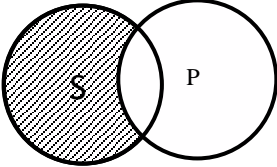
Teachers should pay special attention for reviling the logical structure of mathematical statements and theorems. “Elements of mathematical logic” for pupils who study advanced mathematics in this context is very significant. It should be noted that mathematical facts can be formulated as either categorical or implication statements. Students are proposed to provide examples of theorems formulated with either categorical or implication statements. Then students are recommended to re-formulate theorems

formulated with categorical statements using implication statements and vice versa.

To it is necessary to remember while formalizing the formulae of theorem that four types of categorical statements should be chosen (affirmative, partial affirmative, negative, partial negative. It is suggested to use Table 6 for the demonstration of examples of matching symbols and means of formulization. It is advisable to start with examples followed by illustrations

using the Euler-Venn diagrams while working with Table 6. The generalized formulation of a certain kind of categorical statements should be considered then and the way they are formalized.

Table 6. Four Types of Categorical Statements

Type of statement	General statement	Symbol	Example
Affirmative 	All S are P or $\forall x(S(x) \Rightarrow P(x))$	SaP or A	1) All terminal or periodical decimals are rational numbers; 2) All squares are rhombs; 3) All collinear vectors have proportional coordinates
Negative 	All S are not P or $\forall x(S(x) \Rightarrow \overline{P(x)})$	SeP or E	1) Any infinite non-repeating decimal fraction is not a rational number; 2) No quadratic trinomial with a negative discriminant has real roots; 3) None of the trapezoid has equal opposite angles
Partial-affirmative 	Some S are P or $\exists x(S(x) \wedge P(x))$	SiP or I	1) Some quadratic equations have real roots; 2) Some natural numbers are simple; 3) Some of the trapezoid have equal angles at the base
Partial-negative 	Some S are not P or $\exists x(S(x) \wedge \overline{P(x)})$	SoP or O	1) Some functions are not linear; 2) Some functions are not increasing ones; 3) Some lines in a plane are not parallel to each other

It should be recalled that the record of theorems in the form of implicative statements has the structure $\forall x \in M(S(x) \Rightarrow P(x))$ in which $S(x)$ is the condition of the theorem, $P(x)$ is a conclusion. Explanatory part of the theorem contains a list of sets M, on which the predicates $S(x)$ $P(x)$ are specified. The explanatory part of the theorem is often omitted for shortening formulations. Students are suggested to create all possible types of implicative statements and matching theorems on the basis of predicates (Table 7).

Table 7. Four types of theorems

Symbolic denote	Type of theorem
$\forall x \in M(S(x) \Rightarrow P(x))$	Direct theorem
$\forall x \in M(P(x) \Rightarrow S(x))$	Inverse theorem
$\forall x \in M(\overline{S(x)} \Rightarrow \overline{P(x)})$	The opposite of the direct
$\forall x \in M(\overline{P(x)} \Rightarrow \overline{S(x)})$	The opposite of the inverse

Students can be suggested to prove the equivalence of the direct theorem, and the opposite of the inverse one. They can do it in the following way. Since $S(x) \Rightarrow P(x)$ is a direct theorem, then $(S(x) \Rightarrow P(x)) \equiv (\overline{S(x)} \vee P(x)) \equiv (P(x) \vee \overline{S(x)}) \equiv (\overline{P(x)} \Rightarrow \overline{S(x)})$. The

system of exercises directed on pupils' mastering of mathematical statement formulation should provide performing direct and opposite action. Taking this into consideration, it is useful to complete the following exercises together with pupils.

Exercise 1. Write down a statement with a help of quantifiers and specify their negations.

- Every single number is an odd number.
- All natural numbers are whole numbers, but not all whole numbers are natural ones.
- A set N (natural numbers) contains the smallest number.
- A set R (real numbers) contains neither the smallest nor the largest number.
- For the preassigned arbitrary triangle there is a matching triangle equal to it in the specified location on a given ray.
- For the arbitrary straight line, there are points lying and not lying on it.
- For any two points on the straight line, there are points lying between them.

Exercise 2. "Move" symbolic record into the native language, determine the validity of each of the statements:

$$\forall x \in M(\overline{P(x)} \Rightarrow \overline{S(x)});$$

$$(\forall a \in Z)(\forall b \in Z)(\exists q \in Z)(\exists r \in N \cup \{0\})(a = bq + r);$$

$$(\forall x \in Z)(\forall y \in Z)((x : y) \vee (y : x) \Rightarrow (x = y)).$$

Exercise 3. Write down stereometry axioms and some theorems with the help of quantifiers and symbols.

Axiom 1. There are points lying in the given plane, and points not lying there.

Axiom 2. Through 3 arbitrary points that are not lying on the same line, we can draw only one plane.

Axiom 3. If two points of a line lie in a plane, then every point of this line lies in this plane.

Theorem 1. One and only one plain can be drawn through two intersecting lines.

Theorem 2. Only one plain can be drawn via a line and a point not lying on it.

Theorem 3. The diagonals of a rhombus intersect at right angles.

Theorem 4. A line parallel to one of two given parallel lines is parallel to other given line.

3.3. Considering the Applied Aspect of the “Elements of Mathematical Logic”

As it was mentioned in the mathematics curriculum for advanced classes, different approaches should be applied for the mathematical training of students: they should be prepared for obligatory mastering of specific concepts and facts of mathematical curriculum (the theoretical aspects), as well as for using the skills for modeling of real processes, and solving applied tasks. Students should be oriented on systematic use of ideas and methods of mathematics in natural sciences. The applied aspect of the “Elements of mathematical logic” can be realized through the analysis and synthesis of relay-contact or combined circuits. Students are suggested with a problem situation.

Problem situation. At the entrance of a three-story house, there is only one lamp. It is necessary to create the electrical circuit of the house in the way by using one’s own key: a lamp on each floor could be switched on and switched off at the entrance regardless of the position of switchers on other floors.

It is possible to solve the given problem by using elements of the theory of relay contact circuits. It is necessary to point out the idea of relay contact circuit of connecting and disconnecting contact, of function of conductivity matching the relay contacting circuit among the ideas which deserve to be considered.

The consideration of sequent and parallel connections of conductors makes it possible to establish some specific analogy with calculus of statements, to be more exact: the consequence circuit realizes the operation of conjunction, and the parallel - the disjunction operation (Figure 1).

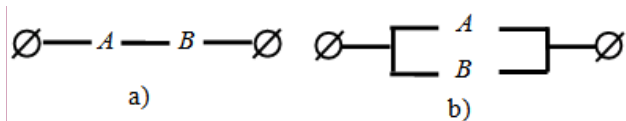


Figure 1. Sequent and parallel circuit

The main task of the relay contact circuit theory is the analysis (building on the given circuit with its matching formula and the function of conductivity) and the synthesis (building of the circuit according to the formula or the function of conductivity). For consolidation of basic ideas the following exercises can be suggested.

Exercise 1. Create the function of conductivity for the ladder circuit (relay contact circuit) given on Figure 2.

The solution can be built this way: the contact A is connected successively with a group of contacts (they are limited by a dotted line), which, in its turn, is the parallel connection \bar{A} or B . For this reason, the matching formula looks like $A \wedge (\bar{A} \vee B)$. It can be simplified by using equal logical formulas $A \wedge (\bar{A} \vee B) \equiv A\bar{A} \vee AB \equiv AB \equiv A \wedge B$.

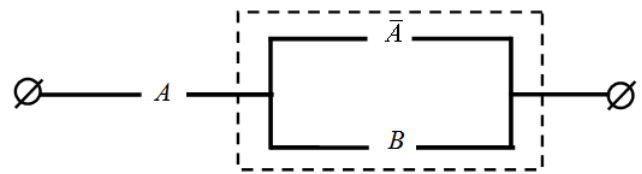


Figure 2. To the exercise 1

Now, it is necessary to build the truth table for the last formula to find the matching function of conductivity.

Exercise 2. Simplify relay contact circuit shown on Figure 3.

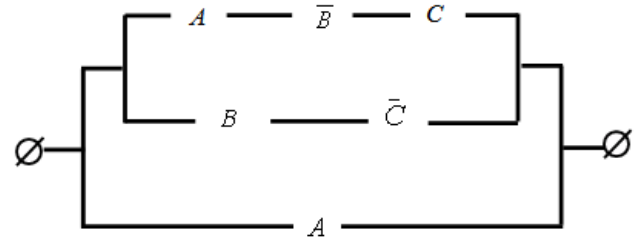


Figure 3. To the exercise 2

To solve this problem, it is possible to recommend students the following three stages: 1) to build formula according to the circuit; 2) to simplify the formula (if it is possible); 3) to build a new circuit on simplified formula.

The circuit on Figure 3 matches the formula:

$$\bar{A}BC \vee B\bar{C} \vee A, \text{ can be simplified:}$$

$$\bar{A}BC \vee B\bar{C} \vee A \equiv (\bar{A}BC \vee A) \vee B\bar{C} \equiv A \vee B\bar{C}.$$

The last formula can be used to build the simplified circuit.

4. Conclusion

Current instruction practices related to the introduction of elements of mathematical logic in secondary schools, though intense, deliver mixed results. There are a number of approaches for introducing concepts of set theory and mathematical logic in school curricula. However, the curricula do not adequately investigate applied aspects of mathematical logic. This study argues for the inclusion of the applied aspects side by side with the abstract aspects of mathematical logic and set theory in school curricula. The applied aspects of math logic are also worth focusing on in the process of mathematical and methodical training of future Mathematics teachers. Since they form, as our research reveals [26,27], “problem areas” in students’ mathematical and methodical training and predetermine their beliefs about the nature of Mathematics.

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On the Problem of Shaping Teaching and Research Skills of Mathematics Students

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Abstract Social demand for educational services currently requires disclosure and capacity development of each individual, formation of desire for self-improvement, self-determination and creation of conditions for self-fulfillment in different types of teaching and learning activities, including teaching and research activities. Singling out teaching and research activity among other types of teaching and cognitive activities in the article and emphasizing its systemic and systematic organization is significant considering that the delineated area of activity is seen, on the one hand, as one of the most effective means of personal development, on the other, as a method aimed at the development of the students' teaching and research skills. The suggested theoretical rationale and guidelines allow a teacher to realize these approaches practically in the educational process of teaching mathematics.

Keywords: *activities, research activities, teaching and research activities, teaching and research skills, teaching and research tasks*

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1. Introduction

The global socio-economic changes in our society identified the need for creative, active, innovative thinking people who can solve set problems in different ways and formulate new promising tasks on the basis of critical analysis of the situation. Life requires from school to train a graduate who is able to adapt to changing conditions, sociable and competitive. Today scientists agree that every person has a huge amount of features that are stored in this person as abilities. Public school usually faces the problem of identifying and developing abilities of a student. Considering the system of work with students, we stress the importance of organization of the educational process of work with all students to maximize the development of their skills, cognitive and creative abilities. As a result of changes in the current development of mathematics education we can observe a decrease in the overall level of mathematical preparation of students, particularly, low is the quality of knowledge of geometry, which is necessary to understand many phenomena and processes occurring in the world. This indicates a need to find new approaches and appropriate ways of developing content, techniques, forms and methods of teaching.

In view of the above, we identify relevant issue of teaching mathematics - amending methodological system of teaching maths, and base of bias of priority emphasis, firstly, from student's activity to teacher's activity, and secondly, from behavioral training, which provides the formation of ability to acquire knowledge independently,

optimally and flexibly use them in the process of life, acquire the skills of creative style of activity, the implementation of autonomy in decision-making, etc., to the dominant cognitive-reproductive. Such retrogressive replacement is unacceptable for a modern style of teaching because, firstly, it makes students passive "consumers" of the finished product, and secondly, the teacher is perceived by pupils as a single informant of social experience.

Analyzing innovative teaching, it should be noted that the production of new knowledge, creation of new technologies, methods and systems for communications, globalization of social relations are constantly updating requirements for the process and result of interaction between the teacher and students, followed by which the last masters all components of the content of training, developing and educating.

1.1. Distinguishing the Research Range of Problems (Analysis)

To define the innovative trajectory of methodological system renewal of teaching mathematics, we have organized and carried out a survey of teachers. The questions of the survey allowed us to determine the level of understanding of an actual problem in the formation of teaching and research skills of students in learning mathematics. Let us discuss some questions where the answers require scientific theoretical and practical rationale.

Question 1. "What activities with students of secondary school can you name teaching and research activities, to

your point of view?". The respondents gave different formulations (e.g. Fig. 1). It is obvious that there is identification of the concept of "teaching and research activities" with the term "activities related to solving the problematic learning situations." Obviously, this fact requires a theoretical explanation and justification, because the teachers do not understand the conceptual apparatus of innovation that leads to disruption of technology of its use.

Possible answers: a) activities related to solving the problematic learning situations; b) project activities; c) search activities; d) the activity involves the use of information and communication technologies; e) it is difficult to determine; f) there is no answer.

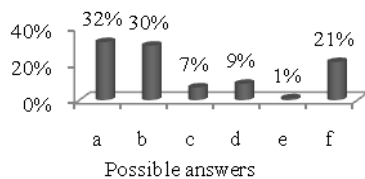


Figure 1. Respondents' answers regarding the definition of "teaching and research activities"

Question 2. "How do you understand the content of the phrase "teaching and research skills of students with mathematics"?" For most teachers this issue turned out to be difficult, that is why 60% of respondents did not formulate a response (e.g. Fig. 2).

Possible answers: a) skills, that are formed in the process of solving the problematic learning situations; b) skills that are formed in the course of the project; c) skill, which are formed in the process of searching for information; d) there is no answer.

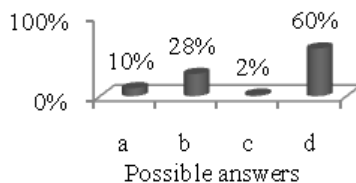


Figure 2. Respondents' answers regarding the understanding the concept "teaching and research ability of students in mathematics"

Question 3. "Can undersigned skills or some of these skills be considered the components of teaching and research skills? Highlight an entry if you consider the skills to the list of training and research skills in mathematics: a) social and interactive skills; b) intellectual and creative skills; c) perceptual and informational skills; d) reflective and analytical skills; e) organizational and adaptational skills" (e.g. Figure 3).

Possible answers: a) no component is selected; b) one component; c) two components; d) three components; e) four components; f) all components.

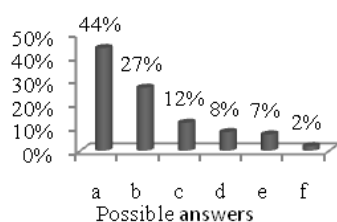


Figure 3. Respondents' answers regarding determination of the components of teaching and research skills

Question 4. "What types of activities of students can be a part of teaching and research activities and facilitate the process of formation of teaching and research skills in adolescent children? In the chosen list underline those activities that you prefer in your work" (e.g. Figure 4).

Possible answers: a) organization of students' work in a training project; b) implementation of design tasks; c) solving the problematic learning situations; d) preparation of informational reports; e) solving the problems of an application content; f) there is no answer.

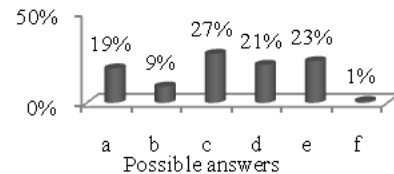


Figure 4. Types of activities that are a priority for teachers in teaching students

Given the results of the survey there is a need for a scientific explanation of basic concepts of the studied problem.

2. Theoretical Aspect of Teaching and Research Activities of Students (Theory)

Theory of activity is seen as a system of methodological and theoretical principles of study of mental phenomena. The main object of study is the activity. This approach is examined on two levels: the principle of unity of consciousness and activity (L. Rubinstein [14]) and the problem of common structure of external and internal activities (O. Leontiev [11]).

In his writings, L. Rubinstein considers the activity as a set of actions aimed at achieving the objectives. According to L. Rubinstein, the main features of the activity are such features: sociality (activity is held only by a subject of activity); activity as the interaction of subject and object is meaningful, substantive; activity is always creative and independent. Activity is determined by its object not directly, but only indirectly through its internal specific patterns (due to goal, motivation, etc.). This is a partial manifestation of the general principle of determinism: the external forces act only through the internal conditions of to whom or to what these external influences are indicated. From these perspectives a theory of thinking is created as an activity and as a process [14].

According to O. Leontiev theory, the person is described only by those mental processes and features that facilitate the implementation of the person's activities. The hierarchy of activities forms the core of the personality. The main characteristic of the individual is self-awareness, that is the awareness of a person himself/herself in the system of social relations. Each age period of a personal development, according to the theory of activity, corresponds to a certain type of activity that takes a leading role in the formation of new mental processes and traits of the personality.

G. Shchukina considers activity as a major form of manifestation of human activity, human's social purpose. The essence of human activity is to transform reality, the active influence of the individual in the objective world.

The scientist identifies the following main features of a common phenomenon of activities:

- 1) goal-setting (transformation of general purpose into specific tasks);
- 2) transformative in nature (activities with the prospect of improving the environment, transformation of the world);
- 3) objectivity (expressed its objective material basis, its relation to the objective world);
- 4) deliberate nature (reveals its subject, which is found in goal-setting, in forecasting activities, in promising aspirations) [16].

So, we can say that not certain properties determine the feature of human activity, but their relationship makes the unity and integrity of any activity and its variability. During activity there is not only child's development of an objective world, but also the formation of attitude to it, to a place in this world, to society, to people with whom the child is learning.

The development of a problem of leadership activities became a fundamental contribution of O. Leontiev to the development of the child and age psychology. The scientist has not only described the change in leadership activities in the development of the child, but also initiated the study of the mechanisms of these changes, a transition of one leadership activity to another. Let's note that the leading activity (by O. Leontiev) is an activity that has three characteristics:

- 1) activities, in the form of which other new types of activities occur and within which they differentiate;
- 2) activities where mental processes (thinking, perception, memory, etc.) are formed or develop;
- 3) activity, which determines the basic psychological personality changes in this period of development.

D. Elkonin believes that as a leading activity in adolescence is communication based on different types of socially useful activity [2].

Recently the issues related to the specification of students' activity have been discussing in the literature, in particular, a research activity stands out as one of the types.

According to M. Kniazian, the research activity is called one of the type of students' creative activity, which is characterized by several features:

1. Research activities are related to students' settlement of creative tasks.
2. It is necessarily that research activities have to take place under the supervision of a specialist.
3. The main is to obtain new knowledge. The task should be feasible for students.
4. Research activities can engage all students: those who have a high level of training and those who have an average level [9].

In this description the features are listed very clearly that you can arrange them in a linear chain for cause-and-effect relations: research activity – a kind of creative activity → solving creative problems | teacher-led | to acquire new knowledge | students of high and average levels.

Another controversy is the generalization that in the process of research activities students can perform only creative tasks. Take into account the opinion of L. Shelestova who defines that "a creative task is a task during which the student creates a creative product" [7], p. 35], the

organization of the students' research activities is limited by the content of the tasks that performed in the study of mathematics and the level of the students' achievements.

More comprehensive is the definition of "research activities" submitted S. Serova and N. Fomina, including "Research activities are cognitive activities aimed at developing new knowledge about objects and processes, deepening gained knowledge about the subject, the realization of their own desires and capabilities, the satisfaction of interests, disclosure of instincts and abilities of each child. This activity involves obtaining by each participant a specific result in a set of knowledge and skills ... " [15], p. 27-28].

We agree with the authors who distinguish the research activity as a component of cognitive activity that is directed on the formation of new and deepen existing knowledge through interest and intrinsic motivation of students to the formation of knowledge and skills.

Without dwelling on the analysis of the other options' nature of definitions of a notion "the research activity" and taking into consideration its multidimensional nature, which became the basis for the emergence of new scientific studies, particularly in the sphere of teaching and research (S. Korshunov, N. Nedodatko, I. Kravtsov), search (B. Skomorovsky, V. Redina), scientific and research (G. Tsehmistrova, O. Anisimova, L. Shevchenko) work, let's single out for further disclosure of the concept of "teaching and research activities".

According to a definition given by O. Obukhov, teaching and research activity of students is a creative process of common activities of the two entities (a teacher and a student) to find the unknown, in the course of which the transmission between cultural values is carried out, which results in the formation of ideology [13]. Describing the teaching and research activities, he emphasizes the basic function: the desire of students to the knowledge of the world, themselves, and themselves in this world. We believe that the purpose of teaching and research activities of students is to provide a focused personal development, acquisition of research skills, mastery of knowledge that are perceived as new and personally meaningful only in relation to specific individual. The object of these activities can be an educational and research objective, which in its essence is informative and oriented to the "zone of proximal development" of the child. Teacher's training of the formation of the students' teaching and research skills is preceded by a successful, effective implementation of teaching and research activity of students.

In organization of scientific and research activities of students we should observe several principles [12]:

- students' research activities are close to the scientific and research activities, its beginning and has often continued in further scientific activities;
- a content of the study must be combined with an educational purpose, general public needs and issues of today;
- scientific research is a continuous process, it can not be run in a few days;
- scientific and research activity is always a controlled process.

Such work of students must meet the scientific methods of knowledge, enhance the content of their education and improve the training to future activities.

3. Methodological Aspect of Teaching and research Activities of Students (Methodology)

In order the work with students was not episodic, but consisted in a certain system, the teacher should identify the main challenges and areas of teaching and research activities of students based on their individual characteristics and qualities. In contrast to the stereotypical traditional teaching, teaching with the organization of teaching and research activities is characterized by feasibility of individualized, differentiated, problem-based, integrated, intersubject approaches to modeling the learning process and is carried towards the creation of conditions for effective implementation of teaching and research tasks in school-time and extracurricular time.

In the process of carrying out teaching and research assignments the students form teaching and research skills, such as: intellectual and creative (skills that ensure efficiency implementation of abstract thought of comparisons, analysis, synthesis, generalization, classification and provide effective mental activity); social-interactive (skills, which are based on actions aimed at establishing and maintaining effective interaction between participants of activity); perceptual-informational (skills, supported by the actions of active perception, memorizing, preservation, restoration and structuring of information; they are found in the implementation of an effective process of perception of information and operating with its contents); organizational and adaptational (skills that provide a productive entry of a child into informational and educational environment, performed by an independent action planning activities in accordance with its objective, the choice of methods to achieve a goal and of the

necessary means of determining the sequence of actions in the structure of activity); reflexive and analytical (skills, implemented through actions as a process of introspection to obtain a certain result, and self-regulation as a process of self-formulation of the goal of activities and implementation of its realization).

Teaching and research tasks allow us to: develop learning motivation; stimulate mechanisms of student's orientation; provide independent targeting of future training activities; form general and special students' skills for learning; enhance moral and volitional and physical quality of teaching and cognitive goals of the student to achieve results; maintain a working capacity of the child; provide a self-assessment of activities; create the conditions for implementation of the highest personal functions.

We selected components of teaching and research tasks (tasks for compiling classificational and integrated schemes, tables; tasks for updating methods or ways of solving, task for selection of generalized algorithm, technique or method of solving; tasks for setting properties of shapes; tasks for research properties of geometric configurations which are based on different mathematical descriptions of real processes and situations; tasks for the development of algorithmic and heuristic advice; tasks for modeling; tasks for summarizing the conclusions that can be used to solve personally meaningful problems), based on the formation of mathematical subject competence of secondary school pupils, in a clear systematic sequence of implementation it allows you to create teaching and research skills of students.

In the selection of the components of teaching and research tasks aimed at forming and development of teaching and research skills of students, it is advisable to adhere to the following sequence of operation (Table 1).

Table 1. Technological aspects of formation of teaching and research skills of students through orderly system of tasks

#	The purpose of the organization of students	Activities of students	Technological comment for a teacher
1.	Determine the level of formed educational experience of students of mathematical concepts that will be studied according to the topic of the next lesson.	Formulation of objectives and hypotheses of teaching and research tasks.	A frontal survey is carried out. The responses are summarized. The misconceptions are identified. The stated purpose and the hypothesis of teaching and research tasks are adjusted.
2.	Form the students' skills in planning, working out the stages of the teaching and research tasks.	Independent reading and understanding the stages of implementation of teaching and research tasks.	Attention is paid to the sequence of stages of implementation of teaching and research tasks.
3.	Form students' attitudes towards mathematics as a tool for modeling and study of the world, discussing examples from the environment, which can be correlated with the geometric concepts under study.	Students independently analyze images on the drawings. They summarize information and offer their own example that will continue series of drawings, given specified properties and attributes of the object corresponding images.	A part of the problem, which concerns the choice of an example of the environment and its image, students perform at home as a part of homework.
4.	Motivate the feasibility and importance of formation of the idea or concept, its role and place in the mathematical knowledge system.	Students are introduced to the historical material about the origin of the term or concept.	Students independently complete the task "Refresh the meaning of the text entitled" Historical origins of the term or concept".
5.	Form the ability to argue logically and justify mathematical statements, apply mathematical methods in the process of learning and solving practical problems, use mathematical knowledge and skills while learning other subjects.	Students perform tasks by modifying the shape of teaching activities in accordance with the type of a task.	The teacher leads students to understand the nature of the geometric material and gives them an opportunity to move informing their teaching and research skills, changing the form of learning activities of students. The teacher determines the tasks that students perform at home and in the classroom.
6.	Summarize and organize the material studied.	Students complete the task independently, summing up digestible training information.	The teacher checks the validity of the assignment. The formulated hypothesis of teaching and research tasks is checked.

4. Results

Testing of the above theoretical and methodological aspects of the research topic for the organization of teaching and research activities of students while learning mathematics, is based on the general educational institutions of the region within the framework of the innovative educational project "Heyday" on the topic "Creating scientific and methodological principles of formation of teaching and research skills of children" [1]. To realize the objectives of the experimental work teaching and research tasks were specially designed [3,4,5], which at the first stage allowed to reveal the nature of the students and teachers' difficulties related to the organization of teaching and research activities on the formation of teaching and research skills of students while learning mathematics.

Evaluation of the results of the experimental study is based on determining the level of teaching and research skills along with using teaching and research tasks.

The data from diagram (e.g. Figure 5) show the growth dynamthe of formation of teaching and research skills students.

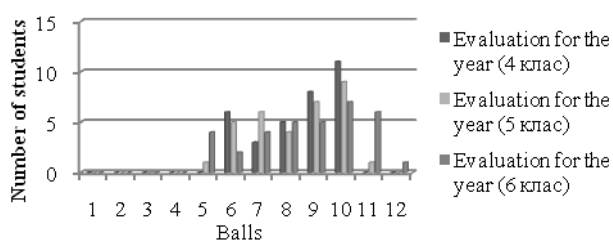


Figure 5. Diagram The level of educational achievements experimental classes

5. Conclusions

The first stage of the experiment revealed a number of areas that need to be taken into account in further work, including a clear definition of indicators of forming teaching and research skills through organizing teaching and research school-time activities and extracurricular activities.

We should also pay attention to the activities of students during the implementation of teaching and research objectives with regard to the following levels of manifestation:

- reproductive-imitative (conscious perception of knowledge, their memorizing in the form of direct assimilation of the image of the object under study; the acquisition of certain abilities and skills; reproduction of knowledge and a direct application of abilities, skills);

- partial search-executive (independent solution of the standard learning tasks in the application of guidance

materials and algorithms; assimilation of techniques for applying knowledge according to a model, including simple versions of this model);

- creative (self-setting of training objectives, unconventional way to solve them, using the obtained knowledge in unusual situations to solve problems, issues, challenges that are distinguished by global, latent subtext, creative essence, open-type solution, etc.).

Extraction of features of using semantic-symbolic methods in teaching mathematics based on research of N. Tarasenkova [17], and taking into account the level of students' activity will allow to extend component content of teaching and research skills.

The above areas require further research – theoretical and methodological rationale and practical testing and discussion.

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Synergetic Approach in Shaping the Content of Teaching Stochastic to Economics Students

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Abstract This paper demonstrates the possibility of using non-linear approach to formation of the study content of Stochastics to the students of economic specialties of the universities. The author suggests a synergistic model of content based on the interaction of three elements: 1) the trajectory as a succession of content units and topics; 2) connections that can create synergies content; 3) content, which is represented as a combination of basic concepts and methods of stochastic analysis of random phenomena. The document also reveals the possibility of practical application of the proposed model.

Keywords: *synergetics, Nonlinear Dynamics, complexity, self-organization, Synergetic Educational Model, Stochastic Training of Economists, the Content of Teaching Stochastics*

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1. Introduction

Current economic activity is influenced by a large number of external and internal random factors that cause stochasticity, nonlinearity, unpredictable, risky social and economic processes [2,3]. These processes are characterized by complexity, dynamics, increasing interaction between different kinds of elements (which, in turn, are influenced by qualitative and quantitative changes), regardless of the subjective behavior of the process, the level of scientific and technological process, changes in consumer demand, the impact of climatic and socio-cultural changes [11].

Sources of random effects are the random nature of possible outcomes, availability of alternatives, uncertainty, in which economic processes occur and of loss or additional income. As a result, it is necessary to analyze the impact of possible uncertainties in economic performance and assess its risks. An effective instrument of this analysis is stochastic as a mathematical discipline that aims to research situations or patterns that characterized accident, multiplicity, uncertainty.

Competence in the use of stochastic methods in the profession is one of the important characteristics of an economist. In addition, the stochastic training is the basis for the study of many economic disciplines, such as econometrics, insurance, economic analysis and more. Therefore, in most educational institutions that train future specialists economic sector, Stochastics is one of the basic courses.

Analysis of curriculum of disciplines aimed at the formation of knowledge and skills with stochastics

showed that there are two basic approaches to the structuring of linear stochastic training content: differentiated ($P \rightarrow S$) and integrative ($S \rightarrow P \rightarrow S$). The essence of a differentiated approach is that the first deals with basic concepts and theorems of probability theory (P): random events, random variables, sometimes random process, then the notions of Statistics (S): descriptive statistics, theory assessments, tests of hypotheses, regression, sometimes dynamic series analysis and analysis of variance. Integrative approach involves the study of the first topics of statistics (S) concerning the selection, presentation and research of statistical data, the next step introduces the basics of probability theory (P) and study the theories of statistics (S) related to estimation of parameters, verification statistical hypotheses, regression, analysis of variance and analysis dynamic series.

In our view, both linear approaches have one significant drawback is that the basic concept of stochastics (random event \leftrightarrow result of the experiment, the probability \leftrightarrow relative frequency, random variable \leftrightarrow sampling, distribution of a random variable \leftrightarrow statistical distribution of the sample, etc.) are given separately, which reduces understanding of educational material, infringes logic perception of stochastic phenomena, complicates the search for methods of analysis. Susanne Prediger indicates on the problem of the gap between the perception of everyday random situations and mathematical concepts used for their study too [7]. The author emphasizes the need to revitalize the concept of probability as a strategic instrument for decision making in practical situations involving random factors. Carmen Batanero and Carmen Diaz [1] emphasize the difficulty in materializing of

probabilistic concepts during simulation or experiments with random results. Scientists argue that such complexity can be overcome through the use of the complementary nature of classical and frequentist approaches to probability.

Therefore, there is a need to find non-linear approaches related to formation of the content of stochastic training of the future economists. New approaches should reflect the interaction of the basic concepts of Probability and Statistics and their complementary nature and, due to that, contribute to complex understanding of educational material.

2. Basic Principles of Synergetics

Today one of the main methods of knowledge of reality is the Postnonclassical method of scientific rationality that considers the development of processes and phenomena as nonlinear evolution of complex systems. Direction of evolution depends on the coherent action of all elements of the system and can be changed (under certain conditions), even with negligible impact on the system (both internal and external) [12]. Among of approaches that are based on Postnonclassical method of scientific knowledge, a multitudinous methodological instruments of research of complex of open nonlinear systems capable of self-organization, has Synergetics [8]. The term "Synergetics" put into scientific apparatus by H. Haken [13], who described it as the science that studies the general actions cooperation of a large number of similar elements of open complex systems that ensure the transition of the whole system from disorder to order. In current research [4,5,6] together with the term Synergetics is used as the name Nonlinear Dynamics, Chaos Theory.

Principles of synergetic systems were proposed by Vladimir Arshinov [9] and Vladimir Budanov [10]. The authors identified two groups of principles: the first group - the principles of Genesis describes the behavior of dissipative structures in phase Order; the second group - the principles of Formation, describing the behavior of the system in phase Chaos. Consider these principles in more detail.

Phase Order. *The first principle* of Genesis system - is its ability to *homeostasis*. Homeostasis - a coherent system of action elements aimed at maintaining the system within certain limits, guiding the system to its aims or development program, called the Attractor. Thus the Attractor system receives signals to adjust the process of development and not allowed to deviate from the set course. The adjustment system is due to negative backward linkages submitted from the output of the system at its entrance.

The second principle: Genesis is a *hierarchical system*. Dissipative structures can be divided into three levels: Micro-, Macro- and Mega-levels. Elements of Micro-level in the construction phase structure begin to act collectively (coherently), and they transmit the structure of its functions; will now represent elements of the Micro-level as a single system. Functions characterize the collective action of Micro-level elements are formed at the Macro-level. They are called Order Parameters (OP) and act by self-organization dissipative structures. The elements of

the Macro-level using the Control Parameters (CP) manage elements that are on the Mega-level.

The system is in equilibrium as long as using negative feedbacks can control the level of fluctuations within acceptable limits. But under the influence of entropy coming from the external environment as well as their own, internal, the system may lose equilibrium state and move to phase Formation. Stage of Formation characterizes the evolution of the system: transition to chaos, loss of a structure, change Attractors, Control Parameters and Order Parameters and the transition to another level of development.

Phase Chaos. The principle of *non-linearity* in Synergetics is the result of impacts on the amount of dissipative structures is not equal to the sum of their results. That is, as a result of entropy in the system increases, the internal fluctuations of dissipative structures micro-level, leading to output of the system a state stability, with even a minimal impact on the system can lead to catastrophic events and direct the system into chaos.

The principle of *openness* characterizes the ability of systems to exchange energy at the level of the hierarchical structure of the system and with the environment.

The principle of *instability* of the system indicates that due to the nonlinearity of processes in the system and its openness to external influences, the system has the ability to move from a state of homeostasis (a state of stable fluctuations around the Attractor) to a state that is characterized as chaos and reflects the unstable oscillation system. System instability leads her to the point of bifurcation, which determines the possible ways of further development of the system.

The development of dissipative structures in the transition through the bifurcation point is described by the principle of *emergence*. This principle describes the formation of a new dissipative structure due to the loss of the previous hierarchy structure, the emergence of order from chaos

The principle *observation* emphasizes the limitations and relativity of our perceptions about the system. From one side this limitation arises from the relative scale of observation, on the other - in relative observation time.

Using a synergistic approach to pedagogy based on the representation of the learning process of the evolution of dissipative structures, that is passing two stages: the stage of chaos, when arise situations of instability, uncertainty, alternative choice of the future path of development; stage order when the collective activity of structural elements contributes to its optimal functioning and self-development. So:

- *openness* of educational system provided by: 1) changing the values of the subjects learning and teaching content and instruments under the influence of external factors, 2) due to the impact of subjects learning and teaching and products of their activities on the environment;

- *nonequilibrium* of educational system caused entropy by coming to her in the form a certain amount of information and leads to fluctuations in the learning process. The level of entropy defined using positive and negative backward linkages. In the educational process the entropy increases abundance of information you want to learn students. Reduce the entropy can be optimized by

training content, rational use of methodological tools, activation of attitudes of learning;

- *non-linearity* can be realized by multiple content, alternative forms and methods, differentiation and individualization of the learning process, all of which are field ways to develop the system;

- *the ability to self-organize* into coherent action expressed structural elements of the educational process aimed at achieving attractor-learning goals by reducing the entropy entering the system;

- *complexity* is in constructing a hierarchical educational system that reflects the features of the interaction elements, such as teachers, students and representatives of educational management.

3. Synergetic Model of Formation of the Content of Stochastic Training of Future Economists

Synergetic model of formation content of stochastic training of future economists are presented in Figure 1.

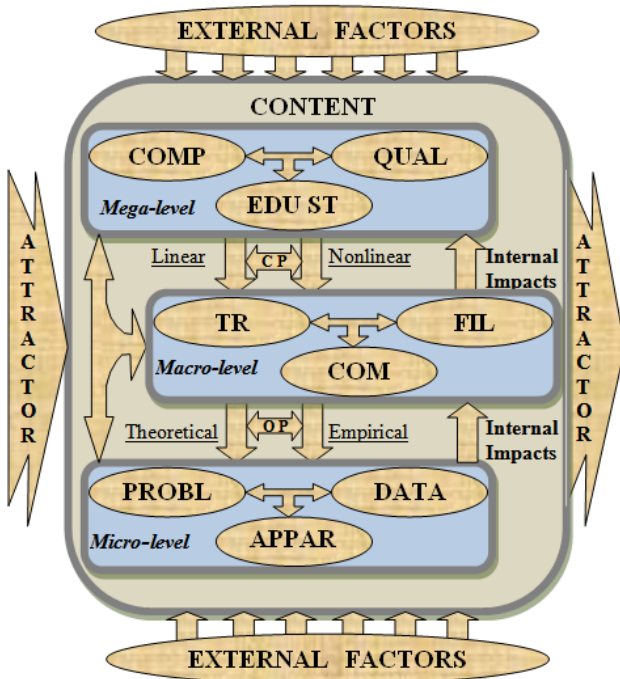


Figure 1. Synergetic model of stochastic training content

The construction of a synergetic system begins with a stage of Chaos. At this stage under the influence of **Attractor**, which is the formation of the content of Stochastics for economists, begins the interaction between the elements of the Mega- and Micro-level.

To construct the model let us present a **Mega-level** as a set of three groups of elements which are slowly changing under the influence of external and internal factors:

- *Competencies (COMP)* that characterize the individual's capacity to solve problems of defined range;

- *Qualifications (QUAL)* that determine the level requirements of employers regarding worker readiness to perform professional duties;

- *Education Standards (EDU ST)* that define the place of the stochastic training in the study of future economists.

Micro-level – is a level of high rate changes and the interaction of the following groups of elements:

- *Problems (PROBL)* related to the study of random phenomena and situations;

- *Data (DATA)* that are subject of the analysis;

- *Apparatus (APPAR)* that includes theoretical knowledge and technological tools necessary to solve the problem.

During the direct interaction between the elements belonging to the Micro- and Mega- levels formed **Control Parameters (CP)** that contribute to the emergence of Macro-level elements and direct their evolution in the direction of Attractor. In the investigated model Control Parameters define approaches to formation of the content of Stochastics: *Linear* (differentiated, integrative) or *Nonlinear* (synergistic).

Elements of the **Macro-Level**, determine the long-term development of the system - the content of stochastic training of future economists and divided into the following groups:

- *Communication (COM)* that reflects the logic of interaction between structural units of disciplines

- *Filling (FIL)* which is a list of topics that form the content of the discipline;

- *Trajectory (TR)* - a sequence of input concepts in the structure of the content.

Due to the interaction of Micro-level elements are formed **Order Parameters (OP)** of the system, defined as methods of calculating the probability of occurrence of a random phenomenon: *Theoretical (T)* and *Empirical (E)*. Order parameters causing the phenomenon of self-organization on the content of stochastic training of future economists, the system creates a complex structure and proceeds to phase order. In order phase synergetic system closest to its attractor around which makes slight changes under the influence of internal and external factors.

4. Practical Implementation Model

Consider the possibility of practical application of the proposed model.

The **Trajectory** of the content discipline represented as a sequence of three content blocks: 1. Random Events; 2. Random Variables; 3. Random Processes and a list of related topics. Element of Macro-level **Communication** defined as the basic concept that enables create synergies content of each block. **Filling** represented as a set of basic concepts that characterize the Order Parameters, and methods of stochastic analysis of random phenomena, which are formed by the interaction of these parameters. In Table 1 shows the logical structure of the learning content Stochastics future economists.

Acknowledgement

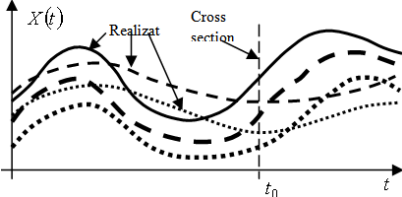
The proposed system of formation of training the content of Stochastics to students of economic specialties of universities is synergetic because it:

- Difficult, as it has a hierarchical structure of a process;

- Dynamic, relative to trajectory content;

- Non-linear in the case of interconnection between the basic concepts and thus, capable of self-organization;

Table 1. Logical Structure of Learning Content Stochastics

TRAJECTORY: RANDOM EVENTS		
COMMUNICATION	The measure, which characterizes the possibility of events: $Mes(A) = \frac{n(A)}{n(\Omega)}$	
ORDER PARAMETERS	<p><u>Theoretical:</u></p> $Mes(A) \equiv P(A) = \frac{n(A)}{n(\Omega)}$ <p>- probability of random events $A = \{ \text{a random event that may occur as a result of theoretical research} \};$ $\Omega = \{ \text{sample space is a set of elementary consequences trials} \};$ $n(A)$ – number of possible consequences trials that are contributing to the event A; $n(\Omega)$ – total number of all possible elementary consequences of the trials</p> <p><u>Empirical:</u></p> $Mes(A) \equiv Rf(A) = \frac{n^*(A)}{n^*(\Omega)}$ <p>- relative frequency of the studied characteristics $A = \{ \text{characteristics, the possibility of which is determined during the empirical research} \};$ $\Omega = \{ \text{sample space is a set of all the experimental results} \};$ $n^*(A)$ – number of trials, in which appeared characteristic A; $n^*(\Omega)$ – total number of all the attempts that were made during the experiment</p>	
FILLING	BASIC CONCEPTS	
	Topic 1. Basic concepts of Probability and Statistics	
	STOCHASTIC ANALYSIS OF RANDOM EVENTS	
	Topic 2. Elements of Combinatorics	
	Topic 3. Addition and Multiplication Theorems of Probability	
Topic 4. Bernoulli Trials		
TRAJECTORY: RANDOM VARIABLES		
COMMUNICATION	Function that sets the ratio between the possible outcomes of stochastic experiment and unique numeric values that determine the possibility of these results $Z = f(Out; Mes)$	
ORDER PARAMETERS	<p><u>Theoretical:</u></p> $Z = f(Out; Mes) \equiv Pdf = f(X; P)$ <p>- probability distribution function $X = \{ x_i \in \Omega \}$ – possible values of a random variable; Ω – sample space; $P = \left\{ p_i \in [0; 1], \sum_{i=1}^n p_i = 1 \right\}$ – probabilities corresponding to possible values; $i = \overline{1, n}$, n – number of possible values of a random variable</p> <p><u>Empirical:</u></p> $Z = f(Out; Mes) \equiv Rfdf = f(X^*; Rf)$ <p>- relative frequencies distribution function $X^* = \{ x_i^* \in \Omega \}$ – experimental results; Ω – sample space; $Rf = \left\{ rf_i \in [0; 1], \sum_{i=1}^n rf_i = 1 \right\}$ – relative frequencies that correspond to the results of the experiment; $i = \overline{1, n}$, n – number of different experimental results</p>	
FILLING	BASIC CONCEPTS	
	Topic 5. Random Variable Definition	
	Topic 6. Numerical Characteristics of Random Variables	
	Topic 7. Multidimensional Random Variables	
	Topic 8. Numerical Characteristics of Multidimensional Random Variables	
	STOCHASTIC ANALYSIS OF RANDOM VARIABLES	
	Topic 9. Classic Distribution of Random	
	Topic 10. The Law of Large Numbers and the Central Limit Theorem	
	Topic 11. Parameter Estimation	
	Topic 12. Hypothesis Testing	
	Topic 13. Regression Analysis	
	Topic 14. Analysis of Variance (ANOVA)	
	TRAJECTORY: RANDOM PROCESSES	
	COMMUNICATION	Way of representing a random process $X(t) = f(CS; Real)$
ORDER PARAMETERS	<p><u>Theoretical:</u></p> $X(t) = \{ CS(t_i), i = \overline{0, \infty} \}$ <p>Cross section as a random variable $CS(t_0)$, defined for any fixed value of $t=t_0$</p> <p><u>Empirical:</u></p> $X(t) = \{ Real_i(t), i = \overline{0, \infty} \}$ <p>Realization of a nonrandom function $Real(t)$, which becomes a random process as a result of trials</p> 	
FILLING	BASIC CONCEPTS	
	Topic 15. Random Processes	
	STOCHASTIC ANALYSIS OF RANDOM PROCESSES	
Topic 16. Queuing Theory Basics		

- Opened and non-equilibrium due to internal and external influences that can alter the substantive content (eg, due to the important economic activities tasks as stochastic simulation of random processes, expert evaluation, qualitative analysis of random factors).

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Modeling Cultural Competence in Teaching Humanities to Medical Students

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Abstract The article highlights the issue of humanization of higher medical education, based primarily on expanding the informational content of culture competence in training humanities. Humanitarian education as a part of culture should form the capacity for introspection, self-awareness, self-reflection to personal actions and to surrounding events. Culture competence plays especially essential role in further practice of medical specialists. The background of cultural competency at higher medical universities can be understood as those acquired skills which help medical students recognize cultural differences and facilitate communication between patients, their relatives and colleagues who have various ways of understanding health, sickness and body functioning. Culture competence includes cultural knowledge, sensitivity, awareness, clinical skills and abilities which constitute rules, norms and strategies. The teachers of humanitarian disciplines should elaborate and implement into educational process confirmed strategies for empowering medical students to become active, responsible life-long learners and self-motivated, interdependent, self-aware, self-managing, self-confident, emotionally intelligent and culturally competent specialists. Learning humanitarian subjects at higher medical educational establishments can offer an exceptional opportunity to help medical students develop learning skills, especially relating to cultural competence.

Keywords: *culture competence, culture, medical students, higher medical education, humanitarian disciplines*

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1. Introduction

Currently, modern Ukrainian higher medical education as a complex developing system cannot be left to the canons of old ideas, norms, values, rules of culture and human activity. Thus, advancement of higher education presupposes the implementation of completely new scientific methodologies and pedagogical theories in training future specialists of higher medical education. Nevertheless, the necessary step for successful reform of higher medical education is to develop culture competence of higher medical educational institutions in general and the organizational culture of their staff, leaders and students in particular. Culture is known to be an important part of modern Ukrainian society from the view of technocratic development, high-tech technologies and even current situation. Accordingly, supporting the statement "if culture is considered to be a specific way of mastering reality, knowledge, technologies (skills) and the meaningfulness or priorities (values) should be constituent structural elements of culture" [4].

That is why humanization of higher medical education, based primarily on expanding the informational content of culture competence to teaching humanities, ensures mastering of humanistic values, forming of humanistic

outlook, and creating harmoniously developed personality. It is suggested that the concept of "culture" cannot be separated from the concept of "activity", as both these categories are historically interdependent and closely interconnected in the teaching process of medical students. It is believed that the concept of "culture" is based on the eternal values of goodness, truth and beauty. Thus, developing the concept of "culture", Western specialists distinguish the following levels of organizational culture as artifacts and objects of human activity, values and basic installation of human being. It is necessary to note that humanitarian education as a part of culture competence creation should form the capacity for assertiveness, introspection, self-awareness, self-reflection to personal actions and to surrounding events: spiritual, historical, political, economic, environmental, social and natural.

Therefore, the development of culture competence in future doctors as a planned process, based on a certain algorithm of foreign language study and humanities in particular becomes principally significant at higher educational establishments. Today, contemporary social progress in Ukraine depends on both the intellectual and cultural level of human development, personal knowledge and moral position of young people. Consequently, it is essential to trace the content and direction, tactics, strategy and immediate prospects of higher medical humanitarian

education, which constitute culture, nature and ideology of future generations, particularly medical caregivers.

2. Research Methodology

Recently, Ukrainian higher medical schools have begun to recognize a need in cultural competency training in the process of teaching humanities. Therefore, teaching process requires the enhancement of existing skills rather than developing new abilities. The teachers of humanitarian disciplines may encounter some barriers, including situational, philosophical, pedagogical, social, and cultural issues caused by the lack of personal culture or complex difficulties in the learning environment. Thus, the background of cultural competency at higher medical universities can be understood as those acquired skills which help medical students understand cultural differences and facilitate communication between patients, their relatives and colleagues who have various ways of understanding health, sickness and body functioning.

It should be noted that culture competence plays especially essential role in further future practice of medical specialists as velocity and accuracy of decision making in the choice of treatment or diagnosis tactics as it may cost life, emergency and even urgent operations for the patient. In other words, culture is considered to be the system of shared values that define the style of activity, communication and behavior of doctors and distinguish them among patients, relatives and their colleagues. As scientist P. Sorokin correctly pointed out that without individual's assessments "all the phenomena of human interaction become simply biophysical phenomena and deprived of their significant aspects" and thus value is the foundation of any culture [4]. It means that cultural and linguistic competence is a set of congruent behaviors, knowledge, attitudes, relations and policies that come together in the system that enables effective work among professionals in cross-cultural situations.

Thus, in teaching humanities to medical students it is obvious to model four clusters of culture competence interpreted as:

- (1) *patient's cultural background* (e.g., information on customs, traditions, culture, habits, values);
- (2) *health provider and health care* (e.g., clinical skills and abilities, ethics, bioethics and deontology, awareness, patient-centeredness, and professionalism);
- (3) *communication skills* (e.g., history, stereotype avoidance, terminology, and health disparities);
- (4) *cross-culture* (e.g., idiomatic expressions, examples of effective communication);
- (5) *resources for management of cultural competency diversity* (e.g., translator guides, instructions and community resources).

So, the methods for enhancing cultural competency in a multicultural Ukrainian society should be regarded as strategies presented to address the challenges of assessing teachers, parents and families of diverse culture, their beliefs, customs, traditions, and special needs. It is assumed that culture competence defines a leadership style at the educational institution and even in the group, makes key supervision of personnel actions and has a direct impact on the educational, humanitarian and learning process of medical students. Therefore, the

purpose of this article is to improve the incorporation of cultural competency, cultural awareness, and cultural sensitivity in the process of teaching humanities in the medical education curricula.

3. Discussion and Results

Higher education is aimed at providing fundamental scientific and general culture, practical training of medical professionals. Higher medical training at the universities is specialized in improving of person's education and upbringing by enriching, amplifying and updating their professional knowledge, skills and abilities which are based on the previously received knowledge, family traditions, culture and experience. Only university education may bring up deeply moral, cultural, intellectual and highly qualified workers in the medical field. General culture includes ethical culture, general, religious and other knowledge that should be followed in one's own activities by each member of our society.

It is important to mention the influence of the family on the formation of an individual's culture competence since culture implies the received customs and traditions taken from the family but knowledge, practical experience and behavior are acquired during the study of humanitarian disciplines at higher establishments. "Culture" refers to integrated patterns of human behavior including the language, thoughts, actions, customs, beliefs, and institutions of racial, ethnic, social, or religious groups. "Competence" implies possessing the capacity to function effectively as an individual or an organization within the context of the cultural beliefs, practices, and needs presented by patients and their communities [5]. Despite the professional identity there are important characteristics of the present-day medical specialist as a sensible, balanced, restrained, moderate, intelligent and educated physician who should strictly follow ethical, bioethical and deontological norms and ethics of communication. But all these medical students' qualities may be achieved with the help of culture competence training in teaching humanities.

Moreover, teachers of humanitarian subjects have an opportunity to more thoroughly model and estimate a student's thinking processes by evaluating all the discussion and other practical assignments. The main and the most important point is the teacher's spirituality and culture, one's ability to determine the optimal intensity and quality of obtained information delivered to the students. It is known that learning environment is typically composed of 4 elements: teacher-student relationship, atmosphere of inclusion, school facilities and services, and school departments and bureaucracies [10].

According to general rules, the teacher is responsible for modelling culture competence in the process of teaching humanitarian subjects. As the researcher correctly suggests that teaching process should be focused on the "sets of rules, norms, and strategies" [11]. The teacher plays the key role in implementing the main norms and rules of culture competence into the learning process. Thus, culture competence includes cultural knowledge, sensitivity, awareness, clinical skills and abilities which constitute above-mentioned rules, norms and strategies. Every time the level of teachers' requirements obliges

proximal development of personality and personal character in the process of teaching humanities at higher medical universities.

Supporting the idea that “Recognizing the value of positive teacher-student relationships, many education scholars have included the importance of these relationships, although usually as a side note, in their analyses of and recommendations for successful teaching and schooling” [3,9]. Therefore, the teacher has to bring language and culture into the classroom as culture is a landmark for behavior, attitude, activity and thinking at any social place or work, whether it is social or academic behavior. The better teacher understands a student’s culture; the sooner one’s can more fully accommodate their social and academic behavior. Nevertheless, in teaching humanities it is necessary to encourage students to express their points of view and opinions on different medical and ethical issues and share information about their culture and ethical norms creating routine medical situations.

Therefore, it is significant to analyze students’ personal, social and cultural value studying humanities. Thus, it is required to support the idea that “Activities that challenge students to identify and to analyze their internalized categories enable them to see others’ categories when they encounter them, and to relate that new learning to their own lived experience” [2]. Thus, students have to build meaningful and trusting relationships with other students and adults at the university; medical students should interact with each other creating culture competence, they should be motivated and be ready to learn. Hence, the institutions should compose a collaborative and cooperative environment at the universities, promoting teachers’ efficiency in the capacities of culture, knowledge, values, skills and professional development, as well as enhancing the university’s productivity and improving its overall performance. Nevertheless, it is useful to introduce practical strategies for empowering medical students to become active and responsible learners. Students should be motivated to take charge for their own lifelong learning and future medical carrier.

It is known that noble medical profession in accordance with special status requires not only general culture competence, but also the meaning of organizational culture, particularly in the process of higher educational training, which is aimed at advancement since the problem of cultural development stands in front of the entire Ukrainian society, and especially higher medical schools. All the same, professional culture constitutes a collection of knowledge, abilities and skills, the possession of which makes the specialist of each specific type of activity as the master of one’s business [8].

Thus, the importance of interdisciplinary integration in teaching humanities to medical students becomes evident. Therefore, the degree and state of modern organizational culture of the higher medical institution depends on the level of organizational culture of teaching staff and the rector. Hence, supporting the idea that the organization is a kind of creations at the higher medical university, the leader of the educational institution like any creation, displays features of student’s personal culture, one’s attitudes and mistakes. The formation of normative values and basics of the student’s behavior and culture provides the main features of the individual for future medical

career and becomes compulsory for successful management of organizational culture, which also depends on the educational environment. It is proved that 21st Century Educational Goals suggest a reconstruction based on different educational principles which to a degree of urgency include citizenship preparation, inclusion, and the creation of an optimum learning environment [10].

It should be emphasized that organizational culture is a complex interaction of various psychological concepts, including professional values, beliefs, norms, and ethics of members of the teaching staff, which create the motives and models for organizational work behavior, which are displayed and comprehensive to the customs and traditions of the medical university. All these concepts should be included into teaching process of humanitarian subjects to medical students.

Meanwhile, culture for doctors means not only professional communicative skills, but also clinical thinking of medical professionals and emotional exhaustion of specialists in the working place. As researcher notes “Culture contains samples of human relations: ways of perception, feeling, thinking, behavior, expressed in symbolic form” [4]. Therefore, the communicative approach focuses medical students on the need in new words, terminology, and, hence, new knowledge and even emotions. This approach activates cognitive activity, contributes to the search for modern, unusual and original forms of students’ personal development that has implications for teacher-student interaction. Thus, updating the learning content of the studied humanitarian subjects, the curriculum at the medical institutions helps improve the communication skills of future medical specialists modeling cultural situations at every lesson.

Though, it should be assumed that among health professionals exists greatly developed sense of mutual support and to whose background the work and communication does not bring disappointment, especially micro-professional environment. That is why it is apparent to demonstrate the impact of different cultural, socio-economic factors and personal characteristics of the patients’ confidence in health care professionals:

- independence of opinions, combined with respect for the opinions of patients, their relatives or colleagues;
- self-esteem, assertiveness and reflection;
- the ability to navigate the world of ethics and spiritual values in the environment;
- the ability to act, make decisions and take responsibility for their actions;
- perform independent choice of the content of culture, life, thinking, behaviors, and ways of development.

All the same, it is considered that learning can provide an excellent opportunity to help medical students develop student-centered, self-directed learning skills, especially relating to cultural competence. It is necessary to build cultural environment that will support students’ learning. Students as future doctors can be presented with standard cases to discuss issues relevant to current medical situations that they encounter in the clinical practice.

In supportive and responsive educational environment students feel more confident and capable of accessing the language and content, and humanitarian teachers feel more competent, and know they have done their best to meet the needs of their students. This is the basis for a logic

conception “just in time” as a learning model that works extremely well for medical students and allows the humanitarian program to more fully integrate a permanent curricular component into the first and second year of study. It is assumed that humanitarian education at the medical university is a rather complex process due to the fact that the character of many students is predetermined by culture and family traditions which are considered to be a crucial factor in formation of young medical personality.

Therefore, formation of culture competence as a personal trait primarily implies that a person is aware of how behavior is determined by one’s own inclinations and motivations, and how someone imposes settings. During the seminar medical students should discuss the activity in which they participated, what happened, what the experience meant and what they learned from it. Seminars may be used to deliver the curriculum or issue in cultural competence, but may not provide an opportunity for students to address the “whole patient” as well as problem-based or case-based sessions do, although, students may focus on specific aspects of cultural competence during the seminar or practical lesson [1]. Case-based and problem-based learning are types of seminars or practical lessons with slightly different structures, methodologies and expectations of students and teachers at the medical university. Practical lessons are intended to encourage medical students to learn at a deep level, and to apply that knowledge in a practical activity. Seminars are more generic, more loosely structured, and possibly more flexible in that students may work with a case, a selection of readings, a set of problems, or other general topics for discussion or debate. All these types of activities may be more useful for generating theoretical discussions and dialogues, such as philosophy of medicine, ethics or humanities which will be applied in future practical experience.

There are four basic cultural competence skill areas which should be implemented into teaching process of humanities:

1. *Valuing diversity*: Accepting and respecting different cultural backgrounds and customs, different ways of communicating, and different traditions and values.

2. *Being culturally self-aware*: Understanding that educators’ own cultures - all of their experiences, background, knowledge, skills, beliefs, values, and interests - shape their sense of who they are, where they fit into their family, school, community, and society, and how they interact with students.

3. *Understanding the dynamics of cultural interactions*: Knowing that there are many factors that can affect interactions across cultures, including historical cultural experiences and relationships between cultures in a local community.

4. *Institutionalizing cultural knowledge and adapting to diversity*: Designing educational services based on an understanding of students’ cultures and institutionalizing that knowledge so that educators, and the learning environments they work in, can adapt to and better serve diverse populations [6]. They may be applied to individual educators, to the higher institutions where they work, and to the educational system as a whole.

Nonetheless, pre-clinical students may participate in the same settings, or may be involved in service-learning

projects with a variety of organizations, such as various discussions, conferences or round-table programs, etc. As medical students participate in various settings, they develop an appreciation and empathy for the predispositions, stressors, and patients’ problems encountered on doctors’ daily routines. Students of higher medical universities should provide a service to another person or group while developing knowledge, skills, abilities and attitudes consistent with the overall goals of the curriculum. As it was previously mentioned, medical students should demonstrate their acquisition of knowledge, ethics, behavior, attitudes, abilities and skills through reflections in seminars, projects or presentations, and even small investigations. Some studies have demonstrated that learning process in a multicultural background helps medical students to develop cultural competence at higher medical establishments and to contribute its improvement in future medical job and civic engagement.

It is suggested that cultural competence is the key component to thriving in culturally diverse groups and higher medical institutions and it can be learned, practised, and institutionalized to better understanding of diverse students, their families, and their communities. Cultural competence is the ability to successfully teach students who come from culture or cultures other than their own. It entails developing certain personal and interpersonal awareness and sensitivities, understanding certain bodies of cultural knowledge, and mastering a set of skills that, taken together, underlie effective cross-cultural teaching and culturally responsive teaching [7].

Nevertheless, the course of humanitarian disciplines may include formal or informal presentations based on the topic, discussion of the readings, raise questions, debate urgent issues or concepts, and interact with each other to develop a deeper understanding of cultural competence and basic medical concepts in future medical caregivers.

Therefore, future health professionals should learn to apply knowledge in a future clinical practice where they actually encounter real patients. That is why, it may be useful for the teacher to actively use both problem-based and project-based learning and teaching technologies in order to acquire the necessary knowledge, skills and competence in decision making under multi-changeable and variable cultural context or during difficult and risky situations. In the process of training medical professionals, tutors of humanitarian disciplines should develop medical and clinical thinking, communication, risk analysis and management, as well as students’ acquaintance with different strategies in coping with stress and uncertainty that are part of medical practice. Thus, it is recommended for medical students to work with groups to identify strategies of culture competence for interacting with their class.

However, significant steps toward cultural self-understanding for medical students are to become fully engaged with personal perceptions, behaviors and communication patterns. Cultural competence focuses on the capacity of the health workers to improve health status by integrating culture into the clinical context. It is recommended to distinguish the following concepts of cultural competence in teaching humanities at higher medical educational establishments:

- *understand the meaning of culture competence for health care providers;*

- *achieve cultural competence as future doctors;*
- *apply cultural competence to studying process and future doctor's job;*
- *increase students' organizational cultural competence;*
- *form cross-cultural communication skills.*

As it was declared formerly, prospective teachers should give medical students the chance to examine one's personal role in the process of education and formation of culture competence. The teachers of humanitarian disciplines should elaborate and implement into educational process proven strategies for empowering students to become active, responsible life-long learners and self-motivated, interdependent, self-aware, self-managing, self-confident, emotionally intelligent and culturally competent specialists in the field of medicine.

4. Conclusion

The content of modern medical education as the first level of the educational system in Ukraine is reoriented intensively into the idea of humanitarian culture, which is based on the formation of awareness, humanity and spirituality. New methods in teaching humanities are promoted by innovation, mobility and implementation of new technologies. Learning humanitarian subjects at higher medical educational establishments can provide an exceptional opportunity to help medical students develop learning skills, especially relating to culture and cultural competence. The formation of cultural competence identity in medical students is a moral requirement of humanitarian teachers. Students as future doctors can be presented with standard cases to discuss issues relevant to current medical situations and to demonstrate the impact of different cultural, socio-economic factors, personal values and characteristics of the patients' confidence in health care professionals. Thus, it is necessary to identify, prioritize and organize thoroughly components of cultural competence curriculum at higher medical educational institutions. The main and the most important point in modeling culture competence is the teacher's communication, spirituality, attitude and culture. Updating the learning content of the studied humanitarian subjects, the curriculum at the medical institutions helps improve the communication skills of future medical specialists modeling cultural situations at every lesson.

5. Recommendation

It is useful to introduce culture competence program into the curriculum of medical students as a separate subject that will help the humanitarian teachers to effectively teaching. If the program to "teach" cultural competence, it is generally accepted that it should be integrated throughout the entire curriculum rather than as a separate course, and so the whole university teaching staff must be involved in it and embrace it. It would be essential to elect the expert in culture competence among humanitarian teachers at higher medical establishments. The level of culture and concepts of cultural competence should be implemented into the educational process at higher medical educational institutions. It is imperative that the teachers of humanitarian disciplines should increase their intercultural competence and be involved in activities designed to enhance their ability to develop and maintain effective staff-student relationships and to increase their self-awareness.

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Educational Environment and the Application of IT in Pharmacy Education

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Abstract The article deals with the problem of educational environment and application of information technology (IT) in Pharmacy education. It has been investigated the formation of professional knowledge using information technology in Pharmacology and its application as an educational tool in the professional training system aimed at teaching future pharmacists and preparing students to use IT in their professional activity. For this purpose the training course "Information Technology in Pharmacy" has been developed and included into the curriculum. The development and implementation of this course into the curriculum proved to be efficient and successful. The pedagogical conditions of the application of IT in professional training of pharmacists have been theoretically grounded. Computer science in the sphere of health care or medical computer science is a new branch that requires appropriate personnel training. Thus, it is necessary to develop training programs to ensure efficient training of specialists and implement information technology in medical science and health care.

Keywords: *information technology, pedagogical conditions, professional training, pharmacy education, training of highly-qualified specialists, competency approach*

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1. Introduction

According to the concept of reforming the medical education in Ukraine and bringing it into line with the requirements of the Bologna Declaration, the main purpose of practical professional training is "consolidating the theoretical knowledge through practical training, mastering the modern methods and approaches of providing medical care, learning the new technologies, forming and developing professional skills and competences in order to make independent decisions, developing the need for systematic upgrading of knowledge and long life learning and finally, psychological adaptation to the specific forms of professional activity." [1].

In modern conditions the quality of education is associated with the objectives of the Bologna Process. The main goal of education in such conditions is the preparation of well-qualified professionals who will be efficient in performing their work and competitive in the labor market. In order to achieve this goal students are to gain the high-level knowledge. Moreover, the new technologies which are adapted to the specific working environment should be developed and included in the education process on its various stages. Also, the new technology should become a guide for new solutions [3].

A special attention is paid to the training of new professionals – clinical pharmacists who are supposed to work together with a doctor and carry out ward rounds, work in a hospital, conduct therapeutic practice, be acknowledged of the state medical policy, regulation of medication provision and reserves, the concept of essential medicines and their rational use. The main objective of a clinical pharmacist is to improve the medical care of patients as well as to create appropriate conditions for safe and rational use of drugs. The main aspects of improving the training of pharmacists are as follows: fundamentalization of education, gradual transition to the problematic investigative approaches of studying, continual and steady functioning of the cycle «educational institution – student – employer», enhancing the role of scientific and pedagogical forecasting of all the components of the teaching and educational system as well as applying information technologies in the educational process.

In modern pedagogical science the great attention is paid to research of the problems of professional training of future pharmacists (I. Boichuk, O. Zalyubovska, L. Kaidalova, O. Velchynska, V. Chornykh, V. Tolochko and others), application of information technology in professional training (A. Kolomyiets, V. Izvozchikov, V. Lapytev, M. Potyomkin, E. Tumalyev and others) and issues of application of IT in Pharmacy and pharmaceutical education (V. Mozul, Ye. Knysh, T. Raikova, T. Zarichna, A. Mazulin, O. Surikov and others).

However, the educational environment and pedagogical conditions of the application of IT in the professional training of pharmacists have not been researched sufficiently and that was the reason for choosing this subject to be discussed in the paper.

2. Research Methodology

The objective of the article is to introduce the theoretical grounds for educational environment of the application of information technology in the professional training of pharmacists.

Nowadays there is a demand for the new approach to criteria development for the effective use of information resources in the system of professional education. According to this approach the system of information requirements appropriate to the professional education system in terms of structure, composition and context should be developed. Also, there is a need for the mechanisms of effective application of information resources within the system of professional education which can be based on the analysis of efficiency of information resources used in various departments of the professional education system operating in the mode of innovations.

The emphasis is put on training of new professionals – clinical pharmacists. The main objective of a clinical pharmacist is to improve the medical care of patients as well as to create appropriate conditions for safe and rational use of drugs. The main aspects of Pharmacy education are fundamentalization of education, gradual transition to the problematic and investigative approaches of training, continual and steady functioning of the cycle «educational institution – student – employer», enhancing of the role of scientific and pedagogical forecasting all the components of the teaching and educational system as well as applying information technologies in the educational process.

3. Discussion and Results

Based on the competency approach a number of features of the professional information competence of pharmacists could be outlined. They include computer skills sufficient to the level of professional education, the necessary minimum of command of foreign languages, the high level of communicative culture, having theoretical basis and experience in organizing the communicative information interaction, possessing the skills of receiving, selecting, reproducing, transforming the ways of presenting information, transmitting and integrating information, combining professional knowledge and computer skills in the due course of professional activity as well as the ability to foresee the results of their professional and information activity and the formation of professional experience in modern information environment both national and international.

The system of values according to which a man acts is his personal choice. However, such subject as Computer Science and Information Technology helps a person to perceive the surrounding reality. [4] This determines the need to use the cultural approach to the application of

information technology in the professional training of pharmacists. Taking into account the above stated, the factors necessary to the process of the formation of information culture of pharmacists during their professional education have been identified. They are as follows: objective or external factors which are characterized by the influence of the whole society; objectively subjective or complex factors such as a type of educational institution, social requirements to the content and level of education of the future pharmacists, demands of a labor market, etc.; subjective or internal factors like the real space of teaching-learning interaction between teachers and students in a particular institution.

There are four complementary aspects of the systematic approach to training of students specializing in Pharmacy: interdisciplinary, a balanced combination of professional and computer training, systematic study of subjects of the information and computer sciences cycle as well as systematic professional training in general.

Accordingly, the competency, cultural and systematic approaches constitute the methodological basis of the application of information technology in Pharmacy education.

On this ground the pedagogical conditions of the application of IT in training of pharmacists could be outlined. The first pedagogical condition provides the formation of knowledge on how to use information technology in Pharmacy.

With the development of medicine and pharmacy certain criteria for the effectiveness of treatment were introduced. For a long time laboratory parameters have played a role of such criteria. The important question is to determine the list of reference drugs and to create and publish directories establishing a therapeutic equivalence in Ukraine [7].

Under current conditions modeling helps to determine directions of the development of pharmacy computerization and to improve the current versions of software by introducing expert systems.

In order to be professional a clinical pharmacist should use modern information technology. A special attention is paid to the application of modern information systems which allow pharmaceutical companies and medical institutions to maintain contact with each other on the regular basis. Only those manufacturers that apply new technology in the analysis of clinical implementation of new drugs can achieve maximum success.

Computer science in the sphere of health care or medical computer science is a new area that requires appropriate personnel training. For this purpose it is necessary to develop training programs to ensure efficient training of specialists and implement information technology in medical science and health care.

In their professional activity pharmacists apply information technology on the following stages: creation of a drug; pharmacological screening (there are programs which are used to foresee the biological effects of a synthesized substance); marketing research of the pharmaceutical market; registration and accounting of medicines and the information and reference service of pharmaceutical companies and pharmacies.

In modern conditions instrumental, hardware, software and pharmaceutical support of advanced medical technologies is the only process that can integrate the

intellectual potential of specialists in various fields of science and technology and is characterized by the formulation of a field of science with an integrated structure – medical and technical science.

There are such programs that apply a new classification of drugs and by using certain mathematical models can determine the possible success or failure of a new drug and examine the therapeutic possibilities of drugs which have the same pharmaceutical properties as well as further horizons of the development of drugs.

In the process of synthesis of a new drug there is a constant need for information on pharmacological activity of different substances and drugs. There is a database (DB) to service such requests. Moreover, there is a specially designed coding system which describes the effects of a particular drug as well as their mechanisms, allowing to select an effective drug taking into consideration similar properties. The ethical aspects associated with drugs seem to be equally significant – ranging from research and production to support of marketing departments and pharmaceutical companies.

The main directions of the development of modern information technology in pharmaceutical industry include the automation of document circulation; specialists' adaptation to the flow of information; the ability to select, evaluate and use information; the ability to self-education and a need for upgrading the knowledge and regular advanced training; competence in IT tools and practical skills on how to use them; communication skills and the ability to work in a team, etc.

The second pedagogical condition involves the application of information technology as a means of professional training of pharmacists.

At present there is a demand for a new approach to the development of criteria of the effective use of information resources. In the framework of this new approach a system of information requirements appropriate to the structure, content and nature of the system of vocational education will be created. Also, there is a need for the mechanisms that can ensure the effective use of information resources based on the analysis of effective application of information resources in terms of vocational education [9].

The main attention in addressing problems related to teaching of computer technology in vocational training should be paid to the development of content, methodological support and organization of information and technical training in vocational educational institutions. Based on the knowledge of new information technologies gained at school, the main areas of information and technical training in the system of professional education are developed. The main focus is put on the knowledge and skills in processing the digital and textual information based on the integrated information and communicative networks, automated control and regulation technology during the process of production, conducting measurements, during the operation of equipment containing the microprocessor technology as well as automated construction and design systems [5]. This creates prerequisites for designing the integrative course on computer technology with the elements of professional knowledge that allows to combine professional knowledge with the fundamentals of computer technology and later apply them jointly in professional activity.

The role of a computer in education is identified by the type of a training computer program. Such programs have great possibilities to implement the learning tasks. These systems perform reflexive management of the educational process. Typically, they take into account not only the correct answers but also a way of solving the problem.

Describing the various training programs, it is necessary to take into consideration what students' functions are activated. The following types of functions can be outlined: creating positive motivation, explanation, command and fixation of learning skills and knowledge; organization and monitoring of the students' performance; transfer of the routine component of learning process to a computer; development of training programs appropriate to different stages of the learning process as well as to individual peculiarities of students [2].

The analysis of various aspects of the problem of information support of Pharmacy education defines the relevance of the use of instruments for the creation of information environment adequate to current information conditions.

The above suggests that the use of information technology in professional training of pharmacists includes the following issues:

- Considering the specifics of professional activity of pharmacists;
- Maintenance and computer support of the entire educational process;
- Development and implementation of the course "Information Technologies in Pharmacy";
- Orientation on the current state and prognostic trends in the development of pharmaceutical industry in the context of the application of computer technology;
- Organization of students' independent work using information technologies;
- Adjusting the general objectives of computer use in education to the specifics of professional training;
- Information culture as a component of the professional culture of a specialist;
- Using multimedia technology in the educational process.

The third condition involves training students by offering them the course "Information Technologies in Pharmacy" so that they could efficiently apply information technology in their professional activity.

Modernization of educational content within the computer science education provides for implementation of the optimal content of information and computer training of a specialist. Nowadays the fundamental information knowledge is being shaped on a qualitatively new level having a general social, technical and technological importance for each of groups of specialties which are specific in terms of information. Educational standards for computer science education cannot be considered as such developed once and for all. We believe that this problem can be solved in the framework of the formation of the theory and technology of dynamically updated educational standards for a particular education field. One of the most important issues is the development of ways and methods of the controlled independent work of students. The significance of the increasing focus on self-education that has been theoretically grounded and experimentally tested is obvious. This can be explained by

the fact that according to the educational standards a significant amount of educational hours is allocated to self-education, the methodological support and control of which are not regulated [9]. The priority of the creative approach to mastering and performing the information activity focused on the dynamically changing information needs of the individual and society seems to be a specific issue.

Integration of information technologies into the work of pharmaceutical companies requires the introduction of new forms and tools in the educational courses for pharmacists-interns and pharmacists-trainees. This would contribute to the intensification of work and development of operational thinking while performing professional duties.

Availability of digital communications creates conditions for the formation of a common information educational environment that ensures the implementation of the principles of democratic education and open access to information and knowledge. The transmission speed and volume of information received by society in the process of its development are increasing in exponential progression. This is especially true for medical and pharmaceutical information [6]. Correspondingly, the requirements to education content of a modern specialist are also changing. The modern education system should not only give a certain amount of knowledge, skills and abilities but also technologies for self-education of specialists, the system of professional knowledge and practical skills based on information and communication technologies.

In order to become a professional pharmacist it is necessary to gain the knowledge and practical skills in the use of information technology. Production of pharmaceuticals is based on new technology that requires the knowledge of modern computer programs and the proper use of databases available on the Internet. The course "The Basics of Information Technology" is studied by the first and second-year students. The ultimate objectives of this subject is as follows:

- to identify the possibilities of applying information technology and means of computer technology in medicine and pharmacy;
- to demonstrate the skills in working with a personal computer and the ability to search for biomedical and pharmaceutical information using information technology;
- to explain the principles of formalization and algorithmization of medical and pharmaceutical tasks, the principle of modeling in biology, medicine and pharmacy;
- to use the methods of processing biomedical and pharmaceutical information;
- to apply the tools of information technology for solving problems in pharmacy;
- to use the special professional software;
- to apply modern computer communication technologies;

The fourth-year students study the course "Computer Technology in Pharmacy" the main objectives of which are as follows:

- to learn the approaches and principles of search for specialized biomedical as well as chemical and pharmaceutical information;

- to familiarize with the main packages of modern computer programs used in pharmacy;
- to learn to use databases of specialized information available on the Internet or electronic storage media;
- to be able to search for specialized information;
- to familiarize with the innovative technologies in pharmacy, particularly in pharmaceutical and medical chemistry and proper software;
- to learn the basic techniques of obtaining structural information, creating of databases, virtual screening (molecular modeling, docking, QSAR-analysis, optimization of the structure of leader compounds, combinatorial chemistry, high-performance screening, etc.) as well as appropriate software for their implementation;
- to familiarize with the latest pharmaceuticals and leader structures that have been designed using computer technology;
- to explain the principles of formalization and algorithmization of the medical and pharmaceutical problems, the principles of modeling in biology, medicine and pharmacy;
- to use the methods of processing medical and biological information as well as pharmaceutical information;
- to apply the tools of information technology for solving problems in pharmacy;
- to use the special professional software;
- to apply modern computer communication technologies.

The topics of the course "The Basics of Information Technology" are based on the curriculum of a school course of Computer Science. In this subject the function of control and self-management of the process of learning is clearly distinctive whereas the teacher's task is to create learning situations and guide the activities of students.

In this context it is useful to outline the common requirements for the development of the course "Information Technology in Pharmacy":

- formation of the professional knowledge and skills associated with the use of computer technology;
- formation of students' skills to work independently with computer technology;
- practical orientation of computer training aimed at the development of professional skills of students;
- successive and perspective development of the content, organization forms, methods and means of integrative learning of computer technology in professional training;
- ensuring the professional orientation of computer technology learning depending on the specifics of profession;
- differentiation of the course by the level of complexity of teaching material;
- variability of computer technology learning in vocational education depending on the level of proficiency.

The course "Computer Technology in Pharmacy" is studied as a profile subject and its content is coordinated with the objectives of other major subjects which determine the education profile of a particular profession. The study of information technology as a means of addressing professional tasks and using information systems are of the priority importance [8].

4. Conclusion

From this standpoint, training of highly-qualified specialists depends on the continuity of education and the balanced combination of fundamental and professional education. Therefore, the following grounded pedagogical conditions of the application of information technology in pharmacy could be outlined: the formation of knowledge on the use of information technology in Pharmacy, application of information technology as a means of the system of professional training of pharmacists, training students on how to apply information technology in their professional activity and training students by offering them the course "Information Technologies in Pharmacy" so that they could efficiently apply information technology in their professional activity.

5. Recommendation

The further areas of research include the development of the appropriate forms and methods of the application of information technology in professional education of pharmacists.

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How the Cycle of Scientific Knowledge is Reflected in the Course of Solid State Physics: the Effect of Magnetic Flux Quantization

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Abstract The article focuses on the practical realization of idea on presentation of cycle of scientific cognition in the process of arrangement theoretical problems of Physics on the example of study of Magnetic-Flux Quantization at a superconductor. The author examines the comparison of classic and quantum approaches in the process of theoretical explanation of Magnetic-Flux Quantization in Superconductors in a Solid State Physics.

Keywords: studies of Solid State Physics, integration of knowledge, principle of recurrence, superconductivity, Magnetic-Flux Quantization

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1. Introduction

Development of basic science and technological progress cause growth of humanity knowledge base, prompting scientists to search and develop new approaches in education and training to enable the assimilation not only of ready knowledge but leads to mastering new techniques studying. Teaching methods improvement aimed at individual personal development, free orientation within informational society, formation the universal abilities to overcome difficulties is an important today problem. Training activities in physics aimed at forming ability to think independently, to acquire and apply knowledge, properly consider and plan of operations, to seek solutions to the tasks, require implementation into the educational process of alternative forms and ways of life in which the significant role is assigned to research. Such activity aims at learner's cognition formation through investigation – inalienable quality of every person.

Under research activities, we understand such form of educational work that is related to solving those creative ones who study learners, research problems in various fields of science, technology and art. The concept of research in teaching physics, offered by psychologists M.G.Alekseev, O.V.Leontovich, S.O.Obuhov, emphasizes the differences between scientific and research activities. When designing research activity the basis of a model and research methodology is taken into account developed and adopted in science for the last few centuries. This model is

characterized by the presence of several standard phases, presented at any scientific study, irrespective of the visual area in which it develops. Thus the main goal of educational research from the functional point of view is different from the one that exists in the field of science. If the main aim in science is to produce learner's new knowledge in the general cultural sense, thus the main aim in education lies in formation functional skills research as a universal way of reality understanding through providing motivation for training activities and personal position intensification of the subject study in educational process, based on a subjective gaining new knowledge (ie, independently obtained knowledge that is new and personally meaningful for the learners) [1]. Based on his own experience of research in physics, we found out that this type of activity is a developmental tool the learners motivation to learn and a major regulator of the quality of education [2,3]. Therefore, students' research activities are considered as one of the conceptual foundations of teaching physics. However, while teaching students physics there always be an urgent problem left in the formation of future professionals not only relevant subject competencies in the context of strengthening their professional training, but also from the point of their variable and critical thinking as to formation a scientific outlook of mankind. In our opinion, the most favorable conditions for solving the problem created while teaching students with the methodology of scientific knowledge based on the principle of teaching physics recurrence. That allows the teacher to engage students into research activities, to enrich their experience of its implementation

and, at the same time, take care of ability conditions in educational information student's perceptions.

2. Research Methodology

Scientific method of cognition – is a tool for learner's cognitive development and creativity, it enables their independent thinking and encourages them to work. In our opinion, one of the main sources of teaching physics methods development and practice modernization is the methodology of teaching and learning activities, which is based on modern scientific methods of physical phenomena and processes studying.

2.1. The Principle of Cycling

In the methods of teaching physics at secondary school at Soviet Union in the 70's of last century B. Razumovsky was the first to offer universal methodological facility of academic knowledge organization - the principle of cyclic, submitted by the following logic of students' teaching and learning "facts problem – hypothesis, model - result - experiment, practice" [4]. This idea turned out to be the most appropriate for us and has been implemented in practice-level objective while forming of students' functional research skills while solving experimental problems in physics [2] and in the series of scientific knowledge organization and implementation through a number of experimental tasks formulation (study of solids elastic properties, strain gage actions, the definition of the liquids surface tension) [3].

Cycles of teaching physics at high school we consider in the approximation methods of scientific knowledge on methods of teaching physics by presenting a comprehensive experimental and theoretical methods of physics to their subject-level [5]. Variant of uncertainty complex representations is offered and based on continuity and teaching physics cyclical at Pedagogical University. Specifically, we found that the idea of varied theoretical approaches comprehensive presentation to the use of uncertainties ratios in a series of basic courses, future teachers of physics professional training based on teaching physics cultural approach contributes to formation the mankind scientific outlook. However, the variability of ratios input methods of uncertainty is useful in applications to perform semi-quantitative microworld phenomena estimations, coordination of corpuscular and microparticles wave properties, determination of the applicability criteria for these concepts to classical mechanics. But the main thing is that the study in various ways Heisenberg's uncertainty relations and explanation of their contents allows the teacher to engage students to research activities to enrich their experience [6].

2.2. Modeling

Modeling is an essential step in any purposeful activity and takes the lead in modern scientific research. In pedagogy, as the V.I. Myheyev says "widespread ... modeling ... explains the diversity of its epistemological functions, which lead to educational phenomena and processes study at a special facility - a model that is intermediate between the subject - teacher, researcher and

research subject, namely certain properties and relations between the educational process elements" [7].

The process of physics students teaching on the basis of scientific knowledge, we see in the use of different modeling features, reflected in its functions: *cognitive* - as the method of educational knowledge in the process of cognitive image of study object. In our opinion, the cognitive function implementation does not involve scientific knowledge process, its purpose lies in familiarizing students with the most rational way of physical process or phenomenon investigation; *Heuristic* – as the means of efficient assimilation of new teaching material. In applied methods of teaching physics simulation oriented primarily on developing students' skills to carry out mathematical modeling of real physical processes and phenomena; *Visual* - the principle of modeling is the highest degree of visibility principle manifestation, its development and generalization connected with critical changes in the purposes and types of educational process; *Integrative* - as a means of systematization and generalization of knowledge, including mathematical models standardization of physical objects under study is a means of summarizing the studied physical phenomena and processes generalization; *Activity* - as the means of planning and management of training and search (research) activities; *Developing* - as the means of theoretical thinking, students' creative abilities, knowledge perception activation.

Taking into account all these features enables modeling, in our opinion, adequately plan and implement learning activities for students of physics consistency of the target, the semantic and procedural components of the suggested methods of teaching the discipline.

Mathematical modeling is the means of introducing students to the cognitive activity of Physics, aided content course in theoretical physics. It provides integration of physical and mathematical knowledge of students into the educational activities applied dimension. However, we realize that we must try to teach students theoretical physics relying on an experimental basis, which are both the basis and the criterion of theoretical research validity. Therefore, in our opinion, the principle of teaching physics recurrence, implemented under these scheme "empirical facts, the problem → hypothesis → mathematical model theoretical result → experimental verification, the possibility of practical implementation, the prospects for further research" on how to present a series of scientific knowledge in theoretical research in physics. This idea we were guided in the development of curricula and textbooks of theoretical physics [8,9,10].

3. Tasks of Investigation

The scientific method of cognition is one of the human culture achievements that has come a long historical way of its developing and is the basis of cultural approach to teaching physics. Display logic cognition of theoretical physics research facility in the historical and genesis plan allows: display its physical meaning, the stages of research in science, scholars' controversial points of view while justifying its theoretical properties and manifestations; detecting imperfections of certain

mathematical models, consistency and criteria devolution of relevant theoretical concepts and perspectives of further development etc.. Therefore, the main objective of our research is to present methodological development of object-practical implementation of the scientific knowledge presentation idea in theoretical studies based on the example of students' study of the quantization of magnetic flux in superconductors' effect in the course of Solid State Physics.

4. Studying the Effect of Magnetic Flux Quantization

4.1. Program of Study

Macroscopic effect of magnetic flux quantization is one of the key problem of "Superconductivity" in the course of Solid State Physics, which is offered to be studied on the following program: superconductivity discovery; superconducting state of substance critical parameters; Meissner's effect; magnetic flux quantization; London equation; Cooper pairs; coherence length; superconducting materials magnetic properties; prospects for superconductivity practical application [10].

In our opinion, before starting to study this effect, students should be aware of the physical meaning of the phenomenon and the condition of substance transition to the superconducting state. Information to the content of teaching material of historical information on this phenomenon discovery, experimental facts as to justifying its content, variation of classical and quantum approaches to the study of its mathematical models allows the presentation logic of scientific knowledge constructing a series in theoretical studies and students' current views formation on the physical outlook.

4.2. The Main Material

4.2.1. Experimental Facts

For the first time the effect of magnetic flux quantization in the superconducting ring with a current was foreseen by the German physicist F. London (1948). Later, his idea was by a Norwegian physical chemist L. Onsager at the International Conference on Theoretical Physics at Kyoto (Japan, 1953). The effect content is as follows: non-singly connected conductor (e.g., a ring) is placed in a magnetic field that induces a current in the conductor. At low temperatures (conductor is immersed in liquid helium), below the critical temperature T_c , at which the ring passes into the superconducting state and "captures" the external part of magnetic field, that corresponds to discrete magnetic flux quantity:

$$\Phi = \frac{h}{2e} n = \Phi_0 n (n = 0, 1, 2, 3, \dots), \quad (1)$$

where h , e – fundamental physical constants: Planck's constant and the elementary charge. This superconducting current and the magnetic flux are stored indefinitely and during external field switching off, a structure is formed that resembles a magnet. The quantity $\Phi_0 = h/|2e| = 2,067833636 (81) \cdot 10^{-15}$ Wb is called *the quantum of magnetic flux*.

The quantity converted to the magnetic flux quantum $K_J = 1/\Phi_0 = 483597,9 \cdot 10^9 \text{ Hz} \cdot \text{V}^{-1}$ is called *Josephson constant*.

It is believed that the *superconducting current* is a cumulative phenomenon, caused by particles (electron pair of oppositely directed spins) which are at the same state (phase coherence). Macroscopic discontinuity is connected to the fact that the electrons at the external environment changes turn to another quantum state not separately but all at once. Therefore, attempts of a theoretical reasoning of the magnetic flux quantization effect in superconductors continued long enough.

First, F. London believed that the quantity of the magnetic flux quantum was $\Phi_0 = h/e$ (1948), as supposed that the superconducting current is formed by electrons. The necessity of formula adjustment for the quantum of magnetic flux calculating by replacing e to $2e$, that is, the idea that the quantum of magnetic flux can have a value $\Phi_0 = h/|2e|$, but $\Phi_0 = h/e$ was expressed by L. Onsager (1959) at a conference on superconductivity at Cambridge (England) and later, after its experimental verification (1961) became accepted.

This assumption in the mathematical model of the superconducting current, which is formed by paired electrons with opposite spins $2e$ and charge has been the basis of superconductivity microscopic theory BCS (1957), named after its developers, American physicists J. Bardeen, L. Cooper and D.R. Shrifera, for which they received the Nobel Prize in Physics in 1972. After the BCS theory creation, it became clear that the Londons' macroscopic theory formulas of superconductivity (1935), under the charge of current, which were identified with the charge of an electron e , is necessary to understand the Cooper pairs charge $|2e|$.

In June 1961, two groups of experimenters - B. Deaver and W. Ferbenk (Stanford University, CA, USA) [11] R. Doll and M. Nebauer (Bavarian Academy of Sciences, Germany) [12] announced the discovery of the magnetic flux quantum. Experiments were only fine character. The magnetic field quantum itself was very small and it demanded work with weak magnetic fields and magnetic rings and conducting rings with a minimal area. To create such conductors Doll and Nebauer sprayed on a quartz string a thin layer of metal (lead). Consequently they got cylindrical conductor with 10 microns in diameter. This conductor hung perpendicular to another string of quartz and by its twisting while providing additional magnetic field it could be the observed trapped magnetic flux process. Deaver and Ferbenkom made like a tin vacuous cylinder about 2 microns in diameter, which was set in oscillating motion that induced currents in the surrounding registration system, the value of which depended on the trapped magnetic flux ring size. The experiments found out that the field, which was less than a certain amount isn't touched during its increasing one quantum of flux was touched which corresponded the value of $h/|2e|$; during the next critical value exceeding two quanta flux were touched, etc., that fully confirmed the F.London's theoretical predictions with correction multiplier of 1/2 for the magnetic flux quantum. At the same time it was the first BCS experimental confirmation, which foresaw magnetic flux quantization.

4.2.2. Theoretical Studies (Classical Approach)

The attempt to build a *macroscopic theory* of superconductors, or rather their electrodynamics was carried out by brothers, German physicists Fritz and Heinz London (1935). Londons aimed to summarize the main experimental facts in mathematical form: the lack of Meissner effect resistance.

They supposed that the current carriers in superconductors, as well as in the metal, are the conduction electrons. Equal to zero resistance ($\rho = 0$) of superconductor means that the electrons during their motion are not subjected to collisions, i.e. accelerate under the influence of an electric field \vec{E} freely:

$$m_e \frac{d\vec{v}}{dt} = e\vec{E}, \quad (2)$$

where m_e and e – mass and charge of the electron. This equation applies to all electrons. Therefore, it can be offered through a current density

$$\vec{j}_s = n_s e \vec{v}, \quad (3)$$

in:

$$\frac{\partial \vec{j}_s}{\partial t} = \frac{n_s e^2}{m_e} \vec{E} = \frac{1}{\Lambda} \vec{E}, \quad (4)$$

where \vec{j}_s – superconducting current density; n_s – density of superconducting electrons; $\Lambda = m_e / n_s e^2$ – a constant. Equation (4), in its form - is the Newton's second law for superconducting electrons. It means that in a steady state, when $\partial \vec{j}_s / \partial t = 0$, there isn't electric field in the superconductor. Here we did not consider the possibility of dimensional changes of the superconducting electrons chemical potential. This effect occurs for example in the superconductor near the border with ordinary metals, when current flows through this boundary.

We use one of Maxwell's equations, the physical meaning of which is associated with the electromagnetic induction phenomenon:

$$\text{rot} \vec{E} = -\frac{\partial \vec{B}}{\partial t}. \quad (5)$$

Taking the rotor from both sides of equation (4), taking into account (5), we obtain

$$\frac{\partial}{\partial t} \text{rot} \vec{j}_s = \frac{1}{\Lambda} \text{rot} \vec{E} = -\frac{1}{\Lambda} \frac{\partial \vec{B}}{\partial t}, \quad (6)$$

or

$$\frac{\partial}{\partial t} \left(\text{rot} \vec{j}_s + \frac{\vec{B}}{\Lambda} \right) = 0. \quad (7)$$

It means that the value in parentheses (7) remains:

$$\text{rot} \vec{j}_s + \frac{\vec{B}}{\Lambda} = \text{const.} \quad (8)$$

But as the massive superconductor thickness is always $\vec{j}_s = 0$ and $\vec{B} = 0$, then $\text{rot} \vec{j}_s + \vec{B}/\Lambda$ does not only persist, but always equals zero,

$$\text{rot} \vec{j}_s + \frac{\vec{B}}{\Lambda} = 0. \quad (9)$$

Taking into account equation between the magnetic field and its intensity \vec{H} , $\vec{B} = \mu_0 \vec{H}$, (9) it can be written differently:

$$\text{rot} \vec{j}_s + \frac{\mu_0}{\Lambda} \vec{H} = 0. \quad (10)$$

Thus, *the macroscopic theory of superconductivity* is a simple theoretical attempt to describe the zero conductivity and Meissner effect in superconductor using London's phenomenological equations (4) i (9):

$$\begin{cases} \frac{\partial \vec{j}_s}{\partial t} = \frac{\vec{E}}{\Lambda}; \\ \text{rot} \vec{j}_s = -\frac{\vec{B}}{\Lambda}. \end{cases} \quad (11)$$

These equations establish the link between electric current \vec{j}_s and the magnitude of the electric \vec{E} and magnetic field \vec{B} in superconductors.

The system of Londons' equations (11) can be rewritten in a different way, the so-called *aggregate basis*, through the use of vector potential \vec{A} . Connection between \vec{A} and \vec{B} and \vec{E} has been installed in classical electrodynamics and is as follows:

$$\vec{B} = \text{rot} \vec{A}; \vec{E} = -\frac{\partial \vec{A}}{\partial t}. \quad (12)$$

Then both system equations (11) can be written as one:

$$\vec{j}_s = -\frac{n_s e^2}{m_e} \vec{A} \text{ or } \vec{j}_s = -\frac{\vec{A}}{\Lambda}. \quad (13)$$

4.2.3. The Contradictions between Empirical Results and Implications of the Classical Londons' Theory

The main reason for an alternative to the classical approach searching to describe the superconductivity phenomenon is the lack of mathematical model phenomenon. Let's try to explain this with on the example solution of the problem of the penetration problem of the *magnetic field in a massive superconductor* based on the Londons' theory according to Ersted law:

$$\text{rot} \vec{B} = \mu_0 \vec{j}_s. \quad (14)$$

Take the rotor from both sides of the equation

$$\text{rot rot} \vec{B} = \mu_0 \text{rot} \vec{j}_s \quad (15)$$

and take into consideration the second equation of the Londons' system (11),

$$\text{rot rot} \vec{B} = -\frac{\mu_0}{\Lambda} \vec{B}. \quad (16)$$

Using the known information from mathematical theory of field relations for second-order differential operations

$$\text{rot rot} \vec{B} = \text{grad div} \vec{B} - \Delta \vec{B}, \quad (17)$$

as well as the physical fact that magnetic charges do not exist, i.e.

$$\operatorname{div} \vec{B} = 0, \tag{18}$$

obtain a differential equation for the magnetic field \vec{B} in superconductors:

$$\Delta \vec{B} - \frac{\mu_0}{\Lambda} \vec{B} = 0, \text{ or } \Delta \vec{B} - \frac{1}{\lambda_L^2} \vec{B} = 0. \tag{19}$$

This second order differential equation of hyperbolic type, which is similar to equation-free sources of electromagnetic fields $\Delta \vec{E} - 1/c^2 \ddot{\vec{E}} = 0$ and $\Delta \vec{B} - 1/c^2 \ddot{\vec{B}} = 0$, but it instead of value c^2 – square of the circulation speed of electromagnetic waves in vacuum, appears another option

$$\lambda_L^2 = \frac{m_e}{\mu_0 n_s e^2}, \text{ or } \lambda_L = \sqrt{\frac{m_e}{\mu_0 n_s e^2}}, \tag{20}$$

called Londons' penetration depth.

To estimate magnetic field depth of penetration in the superconductor we consider a simplified case. Let a superconductor occupies the half-space of an area xOz ($Oz > 0$), and the magnetic field component \vec{B}_x outside the superconductor is equal \vec{B}_0 . Then, according to (19) for the magnetic field \vec{B}_x components in the interior of the superconductor $Oz > 0$ we get

$$\frac{\partial^2 \vec{B}_x}{\partial z^2} - \frac{1}{\lambda_L^2} \vec{B}_x = 0, \tag{21}$$

its solution is known from the differential equations general theory:

$$\vec{B}_x = \vec{B}_0 e^{-z/\lambda_L}, \tag{22}$$

so, the magnetic field at "e" times superconductor depth at the Londons' length λ_L penetration. We evaluate magnetic field depth penetration into the superconductor. According to (20),

$$\lambda_L = \sqrt{m_e / \mu_0 n_s e^2} \approx 532 \overset{\circ}{\text{A}}.$$

Thus, the magnetic field in the superconductor still penetrates, but a little depth. Experiments confirm this result for different substances λ_L it is $400 \div 1000 \overset{\circ}{\text{A}}$. But the problem is: the depth penetration λ_L also depends on temperature, approximately:

$$\lambda_L(T) = \frac{\lambda_L(0)}{\sqrt{1 - (T/T_c)^4}}. \tag{23}$$

In the point T_c superconducting transition λ_L turns to endlessness.

Attempts to overcome the contradiction between empirical results and implications of the Londons' theory failed. This is due to the fact that superconductivity is the quantum phenomenon and therefore to explain all its experimental manifestations using classical laws fails.

4.2.4. Theoretical Studies (Quantum Approach)

In superconductors, like metal, conduction electrons carry electric current. However, significant differences between them do still exist. In metal electrons move non-correlated under the influence of external electric fields (each on its own), in the superconductor a *correlation* electron motion appears. Part of the space within which electrons of superconductor "feel" each other is called the *coherence length* ξ .

Cause of the electrons motion correlation lies in the fact that in the superconductor there is an *effective attraction* between them. This attraction combines electrons with oppositely directed spins in pairs, called *Cooper pairs*. A typical size of such a pair is the coherence length ξ . In

pure metals value $\xi \approx 10^{-6} \text{ m} = 10^4 \overset{\circ}{\text{A}}$. Not understandable remains the question: how such pairs can move in the metal without obstructing each other? According to Londons' penetration depth follows that the concentration of electrons in the metal, which take part in the superconducting current, the order $10^{28} \div 10^{29} \text{ m}^{-3}$. This means that pairs penetrate one through another and the same time, like particles the electron gas, are free and do not interact with each other. This assumption is possible only from the quantum-mechanical point of view explaining the pass of Cooper pairs gas (similar to the electron gas) through the crystal lattice of the metal without spreading.

Let us find out the reason of the electrons attraction in a superconductor. Electrons are negatively charged particles and according to Coulomb's law, at first side, have repulse. But the Coulomb's repulsion occurs only in a vacuum, but in a superconductor (metal) electrons do not move in a vacuum, but in the vacant interstitial of crystal lattice. It is clear that during their movement they deform lattice. Deformation of lattices allows them to reduce the potential energy of the electrons to the place of deformation.

Consider a *simple example* to implement a *didactic principle ability* perception of educational information for students. Let the electron charge e , and the deformation of the crystal is near it x . Then the energy of electron interaction with the lattice deformation in general is a linear function of strain

$$E_{\text{int}} = Cex, \tag{24}$$

where C – is proportionality sector that is constant of interaction. The deformation of the crystal lattice results in electron energy reduction. As $C > 0$, energetically favorable compressive deformation with $x < 0$, and when $C < 0$ – tensile deformation, $x > 0$. The total energy of the system "electron-lattice" E_{tot} consists of electronic interaction power E_{int} , that decreases with increasing deformation and crystal lattice energy E_{lat} , which can be modeled as energy or tension of spring compression:

$$E_{\text{lat}} = \frac{kx^2}{2}, \tag{25}$$

where k – is the stiffness coefficient of the spring. Thus, the total energy of the "electron-lattice"

$$E_{\text{tot}} = E_{\text{int}} + E_{\text{lat}} = Cex + \frac{kx^2}{2}. \tag{26}$$

The resulting deformation is determined on the condition of minimum total energy:

$$\left. \frac{dE_{\text{tot}}}{dx} \right|_{x_0} = 0 \Rightarrow (Ce + kx)|_{x_0} = 0 \Rightarrow x_0 = -\frac{Ce}{k}. \quad (27)$$

Then the energy of "electron-lattice" at the point of minimum

$$E_{\text{tot}}(x_0) = -\frac{C^2 e^2}{2k}. \quad (28)$$

As can be seen, the minimum energy is proportional to the square of the constant interaction C , therefore, the result of the index C does not depend. But at the same time, another thing is important: *reducing the energy of the system due to the interaction is proportional to the charge square of the particle e^2* . Therefore, when we consider two electrons, they're energetically favored to interact with one and the same deformation, not different.

Indeed, if each electron will cause a deformation, independently of each other, then the resulting reduction in energy systems "two electron-lattice" is twice as long, i.e. $2E_{\text{tot}}(x_0)$. If two electrons are "combined" and will behave as one particle with charge $2e$, then the gain in energy will be $4E_{\text{tot}}(x_0)$, i.e. is twice more as electrons acted independently of each other. The difference between these two energies $\Delta E = 2E_{\text{tot}}(x_0)$ and the energy of attraction between electrons. If it exceeds the energy of repulsion, then Cooper pair is formed. Considerations being offered are rather schematic. We didn't take into account the fact that electrons move in a lattice (with sufficiently high speed). Nodes of crystal lattice fluctuate, etc. But a more correct consideration has a similar conclusion: the electron-lattice interaction always makes effective attraction between electrons. In some metals the effective attraction between electrons can prevail over their Coulomb repulsion, and this result into superconductivity. In other on the contrary - repulsion dominates and therefore these metals are not superconductors.

Such a mechanism of superconductivity is called *phonon* and was suggested in microscopic BCS theory of superconductivity. Phonon mechanism is called because the two electrons flying one past another, exchange virtual phonons (quantum of crystal lattice vibrations) with energy $\varepsilon_{\Phi} = \hbar\omega$ and impulse $\vec{p}_{\Phi} = \hbar\vec{k}$, as shown in Figure 1.

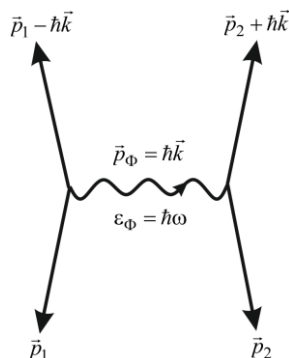


Figure 1. Feynman diagram: the interaction of two electrons of virtual phonons

Thus, the formation of Cooper pairs in a superconductor is energetically favored. Especially important is the fact that during the pairing of electrons in a Cooper pair, their spins are oppositely directed, so the total spin of the system equals to zero. Particles with integer or zero spin are called *bosons*, their behavior obeys quantum Bose-Einstein statistics. In the system of bosons Bose condensation takes place and the consequent manifestation of superfluidity similar to superfluidity of liquid helium phenomenon He^4 , which was discovered experimentally by Kapitza (1938) and theoretically grounded by Landau (1942). The main during its explanation is that liquid helium at extremely low temperatures behaves as a quantum liquid, quantum properties are able to express themselves at the macroscopic level.

The most important feature of quantum properties is that according to the concept of "quantum" a number of physical quantities characterizing quantum system, such as energy, impulse momentum, impulse moment projection on a random axis and so on can vary only discretely. For example, during the movement of the body in the usual viscous fluid friction, due to dissipation of energy, occurs at any speed of the body (even infinitely small). In quantum fluid everything is different. The dissipation of energy (and friction) is formed abruptly, provided that the body of certain critical speed. In a further slowing of the body friction for some limiting its value fully disappears. So superconductivity is superfluidity together with Cooper pairs ensembles - boson particles, like superfluidity of liquid helium He^4 , atoms of which are also bosons.

As Cooper pair formation is energetically favorable process, that's why to destroy a pair there's need to spend energy $\Delta\varepsilon_s$. Obviously, when the heat energy kT compared with $\Delta\varepsilon_s$, Cooper pair is destroyed and superconductivity disappears. Therefore, $\Delta\varepsilon_s \approx kT_c$. If we consider the existence and speed of the electrons in the metal - v_F (speed of electrons having the Fermi energy), then coherence length can be defined as $\xi \approx \hbar v_F / \Delta\varepsilon_s$. Speed Fermi for electrons conduction of metals is several units in 10^5 m/s. Taking into consideration, for $\Delta\varepsilon_s$, critical temperature of the metal transition into the superconducting state we can choose such for mercury in the fundamental experiment of superconductivity detection, $T_c = 4$ K (1911), we get that the coherence

length $\xi \approx 10^4 \text{ \AA}$, i.e. quantity, like we've obtained above.

4.2.5. Matching Effects of Classical and Quantum Approaches

Microscopic BCS theory is complex in the mathematical representation, but its ideas are very useful to justify some macroscopic manifestations of superconductivity, in magnetic flux particular quantum. With this aim, consider the features of the electromagnetic field modeling in terms of electrodynamics quantum.

The electromagnetic field of quantum ideas is examples of boson field. The intensity of its electric component $\vec{E}(\vec{r})$ can be regarded as the field amplitude. Energy

density of the electromagnetic field ε_{em} – is a stream of photons, so the quasiclassical approximation:

$$\varepsilon_{em} = \varepsilon_0 \left| \vec{E}(\vec{r}) \right|^2 = \varepsilon_0 \vec{E}^*(\vec{r}) \vec{E}(\vec{r}) \approx n(\vec{r}) \hbar \omega, \quad (29)$$

where $n(\vec{r})$ – is a number of photons with frequency ω , per unit volume; ε_0 – dielectric constant; $\vec{E}(\vec{r})$ – electric field amplitude, $\vec{E}^*(\vec{r})$ – its conjugating quantity. Or, because of its magnetic induction component $\vec{B}(\vec{r})$:

$$\varepsilon_{em} = \frac{\left| \vec{B}(\vec{r}) \right|^2}{\mu_0} = \frac{1}{\mu_0} \vec{B}^*(\vec{r}) \vec{B}(\vec{r}) \approx n(\vec{r}) \hbar \omega, \quad (30)$$

where μ_0 – magnetic constant; $\vec{B}(\vec{r})$ – magnetic field amplitude, $\vec{B}^*(\vec{r})$ – its conjugating quantity. From classical electrodynamics we know that for the energy density of the electromagnetic field without its sources regard:

$$\varepsilon_{em} = \varepsilon_0 \left| \vec{E}(\vec{r}) \right|^2, \text{ or } \varepsilon_{em} = \frac{\left| \vec{B}(\vec{r}) \right|^2}{\mu_0}. \quad (31)$$

That's why during its calculation we can choose one of the components of the electromagnetic field – $\vec{E}(\vec{r})$ or $\vec{B}(\vec{r})$. Let's choose electrical component $\vec{E}(\vec{r})$.

Suppose that the total number of photons in the volume is more than one. Then for the amplitude field can be written:

$$\begin{cases} \vec{E}(\vec{r}) \approx \left(\frac{\hbar \omega}{\varepsilon_0} \right)^{1/2} n^{1/2}(\vec{r}) e^{i\theta(\vec{r})}; \\ \vec{E}^*(\vec{r}) \approx \left(\frac{\hbar \omega}{\varepsilon_0} \right)^{1/2} n^{1/2}(\vec{r}) e^{-i\theta(\vec{r})}, \end{cases} \quad (32)$$

where $\theta(\vec{r})$ – phase field. It's necessary to take into account that from the quantum point of view, while mathematical modeling of electromagnetic fields as bosons flow, the amplitude of this field are amplitudes of probabilities. The quanta of such field are not photons, but Cooper pairs. Under these assumptions, the complete analogy with photons doesn't longer exist, but this analogy has proved to be very useful.

The main state of a superconductor is provided by weakly bounded Cooper pairs. Electron pair behaves like the boson, but each particular electron in pair is a fermion. Boson condensation temperature, which was calculated for the concentrations of electron charge, carriers in metals, equals Fermi temperature, i.e. $10^4 \div 10^5$ K. The transition temperature into the superconducting state to normal is many times lower, $0,1 \div 10^2$ K. Therefore they believe that the achievement of the transition temperature T_c each electron pair decays into two fermions.

Model of superconductor as a system of non-interacting bosons should not be considered, as the volume per one Cooper pair, contains a large number of electrons order

10^6 microparticles. So, suggested considerations are applicable to the bose gas with a very large number of bosons in the same quantum state. Then the probability amplitudes for bosons can be interpreted as classical quantities like the photon flux of the electromagnetic field. But this approach is not justified for the metal in the normal state, as in this state the electrons are free and unpaired, and each electron behaves like a fermion.

Let's demonstrate that for the charged bose gas the given London's equation (13) comes true. Assume that the wave function $\psi(\vec{r})$ – is the probability amplitude for bosons. Let the concentration of these particles be constant, i.e.

$$n_s = \psi(\vec{r})^* \psi(\vec{r}) = \text{const}. \quad (33)$$

For absolute zero bosons concentration temperature n_s is twice less than the concentration of electrons in the conduction area, as considering bosons - are Cooper pair of electrons, then for the probability amplitudes can be written:

$$\psi(\vec{r}) = n_s^{1/2} e^{i\theta(\vec{r})}, \psi^*(\vec{r}) = n_s^{1/2} e^{-i\theta(\vec{r})}. \quad (34)$$

We note that the phase $\theta(\vec{r})$ wave function $\psi(\vec{r})$ is a very important quantity in our case. Comparing (32) and (34), a good enough approximation to the interpretation ψ - functions as classical amplitude, but not as a quantum field operator. We present the speed of the particles in its quantum-mechanical coordinate image

$$\hat{v} = \frac{1}{m_e} \left(\hat{p} - q \hat{A}(\vec{r}) \right) = \frac{1}{m_e} \left(-i \hbar \vec{\nabla} - q \vec{A}(\vec{r}) \right), \quad (35)$$

where $q = |2e|$ – is a charge of Cooper pair. Then, according to the classical formula for the density of electric current in the superconducting ring (multiply connected region), it can be given not only as $\vec{j}_s = n_s \vec{v} q$, but in the quantum-mechanical representation, taking into account (33); (34) and (35), we'll get

$$\vec{j}_s = \frac{qn_s}{m_e} \left(\hbar \vec{\nabla} \theta(\vec{r}) - q \vec{A}(\vec{r}) \right). \quad (36)$$

Taking the curl of both parts of this equation, we get:

$$\begin{aligned} \text{rot } \vec{j}_s &= - \frac{n_s q^2}{m_s} \text{rot } \vec{A}, \\ \text{or } \vec{j}_s &= - \frac{n_s q^2}{m_e} \vec{A}, \end{aligned}$$

i.e. the London equation (13) was necessary to prove. Mind that warning, for the final results identity was taken into consideration: $\text{rot } \vec{\nabla} = [\vec{\nabla}, \vec{\nabla}] = 0$.

Quantization of magnetic flux in a superconducting ring is a direct consequence of the relation (36). Let's consider the closed circuit L , located inside the superconductor. Let the circuit L be located deep in the superconducting ring away from the surface (not to take into account the effect of the penetration of the magnetic field in the superconductor on the value of the penetration depth londonivskoy λ_L), as shown in Figure 2.

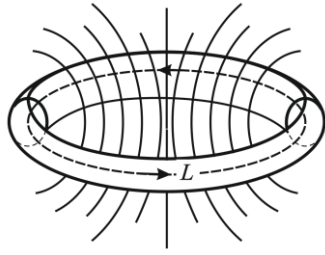


Figure 2. Circuit integration L location in the superconducting ring with flux

According to the Meissner effect, the magnetic field inside the ring \vec{B} and flux density \vec{j}_s equal zero, so the left hand part (36) equals to zero:

$$0 = \frac{n_s q}{m_e} (\hbar \vec{\nabla} \theta(\vec{r}) - q \vec{A}(\vec{r})). \quad (37)$$

The integrated form of this condition will have the following form:

$$\oint_L \vec{\nabla} \theta(\vec{r}) d\vec{l} = \frac{q}{\hbar} \oint_L \vec{A}(\vec{r}) d\vec{l}. \quad (38)$$

According to Stokes theorem the right side of the equation can be rewritten:

$$\oint_L \vec{\nabla} \theta(\vec{r}) d\vec{l} = \frac{q}{\hbar} \int_S \text{rot } \vec{A}(\vec{r}) d\vec{S}. \quad (39)$$

As $\vec{B} = \text{rot } \vec{A}(\vec{r})$, then

$$\oint_L \vec{\nabla} \theta(\vec{r}) d\vec{l} = \frac{q}{\hbar} \int_S \vec{B}(\vec{r}) d\vec{S}. \quad (40)$$

Let's discover the circulation of the vector field $\vec{\nabla} \theta(\vec{r})$ along the closed contour L towards its bypass $d\vec{l}$:

$$\oint_L \vec{\nabla} \theta d\vec{l} = \oint_L \frac{\partial}{\partial l} \theta d\vec{l} = \int_{\theta_1}^{\theta_2} d\theta = \theta_2 - \theta_1, \quad (41)$$

$\Delta\theta$ – is the phase change of the wave function of a single particle after passing circuit L . Probability amplitude for boson in the semiclassical approximation is the measured quantity, it's clearly defined, so,

$$\theta_2 - \theta_1 = 2\pi n, \quad (42)$$

where $n = 0, 1, 2, 3, \dots$ – integer. The right part of condition (42) is the flow Φ of vector field $\vec{B}(\vec{r})$ through the surface \vec{S} , based on the circuit \vec{L} , considering its traversal (mnemonic rule right-hand screw rule) and a constant factor q/\hbar . Then, the final:

$$2\pi n = \frac{q}{\hbar} \Phi, \text{ or } \Phi = \frac{2\pi\hbar}{q} n, \quad (43)$$

where $q = |2e|$ – Cooper pairs charge; $\hbar = h/2\pi$ – Planck's reduced constant. This result is consistent with (1), i.e. the effect of quantization of magnetic flux in a superconducting ring.

In general, the total magnetic flux through the ring is the sum of the two fluxes: Φ_{ext} – from the external sources and Φ_s – from superconducting current flowing in the ring: $\Phi = \Phi_{\text{ext}} + \Phi_s$. Current Φ is quantized as a whole; but the flow of external Φ_{ext} any conditions quantization do not impose, while the flow Φ_s should "selforganize" so the full flow Φ had only a quantum quantity.

5. Conclusion

Methodological aspects of physics analysis in its historical development indicate its value the cultural, educational and developing potential. Organization of students' research activity in physics should include the value attitude formation not only to scientific discoveries, but also to the method of scientific knowledge, research methods, the science methodology in general. Systematization of scientific discoveries promotes scientific world reflection and scientific outlook formation. The scientific method of cognition and methods of natural phenomena in the content of education orientate students to independent learning activities and give them the opportunity to develop their cognitive and creative abilities. In particular, the comparative approach of classical and quantum mathematical describing models of magnetic flux macroscopic quantum effect enables the presentation of scientific knowledge logic in physics theoretical research as to students' modern scientific outlook in the given problem research activities.

Implementing cognitive, heuristic, visual, integrative, active and developmental functions of students' process modeling and performing research activities on theoretical physics is one of the methodological foundations for formation an open methodical system of physics teaching mathematical methods at universities.

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Statement of Competing Interests

The authors have no competing interests.

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Improving the Parentally Deprived Children's Quality of Life in Ukraine (Based on the British Experience)

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Abstract The thesis highlights social protection of orphans and children deprived of parental care in Great Britain and in Ukraine. It is stated that social policy in Ukraine is aimed at searching effective forms of placements for orphans and children deprived of parental care. Adoption, family care, foster care and with biological family reunion are supported by current British social policy. Classification of British foster families based on the principles of time, the category of addressees, content and conditions of receiving are developed. The objective possibility of British social protection experience of orphans and children deprived of parental care transformation to Ukrainian welfare system is defined and substantiated. The comparative analysis of basic mechanisms of social protection of orphans and children deprived of parental care in the UK and Ukraine is explored. The implementation of some progressive aspects of orphans and children deprived of parental care welfare in the UK into social and educational work of Ukraine is offered. The following aspects of child welfare system may be implemented in Ukraine: different types of family forms of accommodation (according to the needs of a child), children hearing system, motivation of foster families creation and kinds of foster parents support.

Keywords: social care, orphaned children, children deprived of parental care, foster family, and social care experience

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1. Introduction

One of the major tasks today is to improve the situation of children in the society. A special place in solving this problem is the creation of adequate conditions to protect the rights of every child. Changes which are now taking place in the world and in Ukraine, have led to the increasing number of orphans and children deprived of parental care. In particular, according to official data, in 2013 there were 94,000 children of such category. A large number of orphans and children deprived of parental care in residential institutions, educational system of which does not create the necessary conditions to prepare them for independent life.

In this regard the problem of improving the social security and protection of orphans and children deprived of parental care in Ukraine became urgent. It causes its reconsideration and reorganization, which will promote to create the conditions for successful entry of these children into society.

Category orphans and children deprived of parental care require special attention. Britain is one of the countries where social work and social security system has a 100-year history. Nevertheless, the number of children who need of care is rather large and growing each year

both in Ukraine and in the UK. This problem requires a thorough study and analysis, with further practical implementation of existing achievements.

2. Methodology

This study is naturally comparatively analysis. Taking into account mentioned aspects, the introduction of comparative method (comparative analysis), the study of social protection and assistance to orphans and children deprived of parental care in the UK will be efficient and effective for implementation to the practice of the Ukrainian social and educational work with orphans and children deprived of parental care.

2.1. Objectives of the Study

The main objective of this study is to examine the nature and characteristics of social protection of orphans and children deprived of parental care in the UK and substantiate the necessary of transformation theory and practice of social and educational work in Ukraine on the basis of the usage of British orphans and children deprived of parental care welfare system achievements.

A set of objective that will govern this study is stated bellow:

1. Determine the nature of the basic concepts of research orphan child and children deprived of parental care in Ukraine and the United Kingdom.
2. Identify effective forms of these children placement in the UK.
3. Find out the types of placements for orphans and children deprived of parental care in Ukraine and compare them with the existing ones in British social protection system.
4. Identify and justify the possible directions of children's welfare in Ukraine transformation, taking into account social protection of orphans and children deprived of parental care achievements in the UK.

3. The System of Social Care of Orphans and Parentally Deprived Children Improvement in Ukraine

Today there is an urgent need for scientific problem analysis, comparison, systematization of theoretical and practical issues to solve a number of contradictions: between the growing number of orphans and parentally deprived children and lack in modern scientific theory and practice proved effective ways of this phenomena localization; the objective need for orphans and children deprived of parental care social protection and imperfection of such children social security system; the necessity to train social and pedagogical specialists for implementation of these children social welfare and the lack of theoretical, methodological and scientific methods of such training.

In Ukraine there are about 8000 children left without parental care every year due to the lessening the value of the family, difficult life circumstances, irresponsibility of parents to fulfill their responsibilities for children, drug and alcohol abuse, child abuse. In Ukraine a large number of orphans and children deprived of parental care stay in residential institutions, educational system of which does not create the necessary conditions to prepare them for independent life. Insufficiently effective are the results from the interaction between executive power and civil society organizations engaged in the children's rights protection, there are no effective programs for preventing child orphanhood, social protection and support for children left without parental care.

3.1. The Category of Orphaned Children and Parentally Deprived Children in Ukrainian and British Social Welfare System

Taking into consideration social protection in our work, we take into account the aspects relating to orphans and parentally deprived children. Orphan, according to the Law of Ukraine "On Child Protection" are those "whose parents died or were killed" [22]. The Law of Ukraine "On Providing Organizational and Legal Conditions of Social Protection for Orphans and children deprived of parental care" gives the following definition of children deprived of parental care - a child who "was left without parental care due to the deprivation of their parental rights, taking the children from parents without parental rights deprivation, recognition of parents to be missed or

incapable, announcing them to be dead, being taken to prison, searching them by law enforcement agencies, lack of information about their location, parents long-term illness that prevents them to perform their parental responsibilities. Also, this status applies to the children being left, whose parents are unknown, children being refused of by their parents, and homeless children "[80].

According to the British legal documents, the term "orphan child" is defined as the one whose parents-guardians were killed or died [6]. British social work dictionary, defines an orphan as "a child who has no parent or guardian" [6]. Merriam-Webster dictionary says that an orphan is "a child who does not have one or both parents because of their death" [19].

So, in general in the British legislation the orphanhood is determined by the criterion of parents' absence (death).

Children deprived of parental care in British scientific literature are defined as "children who are temporarily or permanently live with or separately from their parents. These children are deprived of care and protection, which are usually provided by parents as primary carers. To this the following groups of children may be involved: who ran away from home; who were forced to leave the house due to certain reason; children who have been removed from the family by governmental bodies or agencies; children who were separated from their parents due to extreme life situation [23,29].

The term "children deprived of parental care" is used in foreign scientific literature in the context of "transferring the child to the care of the judicial" authority or "parental rights deprivation" and is determined by court [25].

Thus, according to the British law and scientific literature, children deprived of parental care can have this status temporarily (due to temporary living separately from parents). In the Ukrainian sense, these are children who have been deprived of parental care as a result of inappropriate upbringing and care by their parents. Common features in the understanding of this phenomenon both in the British and Ukrainian society – are children being left by their parents, or they can not raise a child by themselves.

In our opinion, the definition of "children deprived of parental care" (given by British scientists) as those who are temporarily may not live with his family, points to the fact that returning a child to his birth family is possible. This indicates understanding the importance of bringing up children in their biological families.

In Ukrainian society there is the concept of "social orphans", which has something in common with "children deprived of parental care." This term is indicated by the existence of children's alive parents who do not raise a child properly. To this category we include homeless, neglected children, but the children of the category "social orphans" are not confirmed by law in Ukraine.

4. Searching the Effective Forms of Orphans' and Parentally Deprived Children as an Important Social Welfare Element

Great Britain has overcome historical stages of social protection of children development, till society has

realized the importance and necessity of this process and started to provide children protection and their rights as enjoying full rights members of society.

Modern scientists during their research all over the world are guided by scientific standards that are relevant to all mankind. In pedagogical science there always existed two opposite tendencies – on national traditions in education preservation and development, on the convergence of world models of science and education [30].

Views of the UK scholars on the investigated phenomenon of orphans and children deprived of parental care social protection, and the peculiarities of its system makes it possible to define common and different in theory of social and pedagogical science and educational research on the topic, to distinguish progressive ideas and achievements that can be offered for implementation use in Ukrainian social welfare system.

In our opinion, one of the child welfare effectiveness indicators is the existence of different forms of care for orphans and children deprived of parental care according to their needs, as it exists in the UK.

In Ukraine during the Soviet regime the priority forms of orphans' and children deprived of parental care placements were different types of boarding schools that were funded by the state.

The turning point in the field of child welfare has become the second half of the XX century after the adoption and ratification of the UN Convention of Children Rights, which stated that the best environment for the development of the child is the family which will prepare the child for independent life, provide the best social and pedagogical education. It was the late 90-ies of XX century when the family care including new interpretations were revived, improved and became ready for development and transformation. Foster families and family-type arrangements were created [4].

This leads to searching effective elements of orphans' and children deprived of parental care social protection and appealing to the foreign countries experience.

4.1. Causes of the Children Being Placed into Institutional Care Establishments

Among the main reasons why children are being placed into care institutions in Ukraine, scholars identified excessive usage of alcohol by parents, family financial distress and neglect (Table 1). The main reason why children are being placed in institutional placements in the UK is neglect, emotional and physical violence (Table 1).

Table 1. Causes of the Children Being Placed into Institutional Care Establishments or in Foster Families in Ukraine and Great Britain (%)

Country №	Ukraine		Great Britain				
	Reasons of orphanage	%	Reasons of orphanage	England (%)	Scotland (%)	Wales (%)	Northern Ireland (%)
1	Alcohol abuse	58					
2	Poverty	56					
3	Neglect	56	Neglect	44	44	43	29
4	Drug abuse	52					
5	Absence of progressive social programs	45					
6	Lowness of morality level	38	Emotional violence	28	26	27	11
7	Parents' crime activity	30	Sexual violence	6	7	8	9
8	Parents' aggressive behavior	25	Physical violence	14	22	15	27
9	Increasing the level of population death	25					
10	Psychical disorders	22	Mix of different kinds of violence	9	0	7	24
11	Others	2	Others	0	0	0	0

Source: Safeguarding children statistics: the availability and comparability of data in the UK, Department for Education; State report on the situation of children in Ukraine (by end of 2010.), Ministry of Social Policy in Ukraine.

In our opinion, country economic instability is another factor that influences the increasing number of social orphans and children deprived of parental care. Therefore, domestic [15,26] and foreign [13,14,24] scholars pay attention to the quality of social and educational support for these children, search mechanisms to improve the system of social child protection.

Thus, such situation requires finding new priorities, forms of social protection of orphans and children deprived of parental care. One of them we believe the study and implementation the British experience of social protection of these categories of children.

4.2. The State's Role of Orphans' and Parentally Deprived Children Social Protection

Protection of orphans and children deprived of parental care, the legislation of Ukraine. Child Protection in

Ukraine is carried out through the guardianship and care services for children, centers of social services for family, children and youth according to the law. The state protects children from physical or mental violence, exploitation, involvement into criminal activity, etc. [5]. In the UK, social protection of orphans and children deprived of parental care is carried out at three levels of the system: by the central government, by government agencies and by local government. The body which deals with this problem in Ukraine is the Ministry of Health. It is competent in making decisions as to adoption of orphans and children deprived of parental care. On the local level, the Committee of children protection supervises supports and protects and decides whether there is the need of appropriate services.

Ukrainian state improves the system of institutional care, introduces preventive measures to avoid orphanhood. In 2012 the President of Ukraine signed a Decree (from October 22, 2012 № 609/2012) "National Strategy of

Child Orphanhood Prevention in the period up to 2020" [1].

The strategy was developed and based on the analysis and results being achieved in the area of children and families with children social protection. The main goal of the strategy is to prevent child orphanhood by providing qualified services to families with children in need; implementation of obligatory support of families where the parents violated the rights of the child; creation and implementation of new social technologies aimed at preventing cases of removing the child from the parents without parental rights deprivation; introduction of social services for parents with children in institutions of care in order to family reunion.

This strategy will reduce the number of orphans and children deprived of parental care who are educated in institutional establishments; ensure the provision of qualified services to children and families with children who are in difficult circumstances; ensure effective activity of professionals working with families, children and youth to identify the families who are in difficult circumstances on early stage [1].

A significant difference in the role of providing social services in Ukraine, in our opinion, is that social workers in the Ukrainian system of social protection do not provide enough qualified social protection. It may be explained by the fact that one social worker in Ukraine deals with many problem families simultaneously. This leads to a lack of individual approach to each family, their problems and thus to inefficient cooperation and support. In Britain, a social worker deals with a small number of families (10-15) what gives to the specialist an opportunity to study the needs of the family thoroughly and to implement individual approach to solve them.

One of the objectives as for the category of orphans is the social protection of orphans and children deprived of parental care: reformation the institutions of care for these children; standards development of the system of institutions for orphans and parentally deprived children; development and implementation of a mechanism to ensure orphans and children deprived of parental care with quality and sufficient food, clothing and others. Important objectives of the program, which were gradually implemented, is the development of family-based care for orphans and children deprived of parental care; protecting the rights of children being in institutions for orphans and children deprived of parental care [2].

The analysis of given above gives reason to believe that all program areas aimed at increasing the number of foster families, foster care homes, adoption, reducing the number of orphans and children deprived of parental care who are educated in institutions, to facilitate the adaptation of children to independent living .

Changes in the number of orphans and children deprived of parental care in Ukraine are constantly changing. Thus, according to the Ministry of Ukraine for Family, Youth and Sport in 2005, there were 97.8 thousand of such children. Orphaned children and children deprived of parental care in 2006 were 102.9 thousand in number, 2007 - 102.9 thousand, in 2008 - 103.5 thousand, in 2009 - 100.8 thousand, in 2010 - 98.1 thousand [3].

Drawing parallels with the UK, we observe the tendency of increasing the number of children who need the arrangement because of the risk of becoming orphans

or being deprived of parental care. This pattern relates to all parts of the country (England, Scotland, Wales, and Northern Ireland). For example, in Scotland, in 2005 there were 12 185 thousand. Among these children with children in 2006 - 12 982 thousand., In 2007 - 14 060 thousand., In 2008 - 14 888 thousand., In 2009 - 15 287 thousand., in 2010 - 15 892 thousand [28].

According to these data, the number of orphans and children deprived of parental care in Ukraine is quite large, but it has a tendency to decrease comparing to previous years. This is due to the economic crisis the country that took place at that time. We believe that another cause of increasing the number of children placed in state care institutions was social orphanhood due cause for benefits provided by the state for care of children under the age of three. After receiving payment, parents leave their children in institutions, explaining their decision to economic incapability to child support, difficult circumstances, family problems (alcohol abuse, drug addiction, etc..).

As for Great Britain, in our opinion, this indicator depicts the number of children in need (due to orphanage or deprivation of parental rights) explaining the strictness requirements for parents who raise children and following for their rights. However, the country is taking effective measures to placement of the mentioned categories of children in family-based care and many of them return to their biological families.

4.3. Efficiency of Placements for Orphans and Parentally Deprived Children in Ukraine and Great Britain

Any kind of arrangement for orphans and children deprived of parental care has its advantages and disadvantages. The modern Ukrainian society is under the process of change in all sectors, including social sphere. From our point of view, if we extrapolate world achievements (one of these elements is the British social security system for category of children being into consideration) practices into social and educational work of Ukraine: to increase professional skills of foster carers, to teach adoptive parents to work with teenagers, to pay for this kind of work a proper payment, - it will have positive and effective results [16,31].

4.4. The Need to Transform the Institutional Forms of Placement for Orphans and Parentally Deprived Children in Ukraine

The main forms of placements for orphans and children deprived of parental care in Ukraine are boarding schools of various types and submission, adoption, guardianship (care), foster families and children home of family-type.

It is important that the child could get pedagogical influence, in order the placement, in which the child was placed; provide social, moral, psychological and physical support [20]. Therefore, new forms of arrangement only appears in Ukraine and function within the activities of charitable organizations, religious communities: such as the host family (family, which takes the child for the period of education at weekends or during holidays), urgent family placement (who are ready to take at any time of the day for a short period of a child who needs

emergency placement and care), arrangements like family ones - SOS Children's Village (which consist of few families living in the same area, but in different houses and have a small number of children in each family).

The main objectives of boarding schools for orphans and children deprived of parental care is to provide proper conditions of life for their development and training, carrying out rehabilitation services, provision of social security and the right to have proper living conditions, education, gaining a certain level of education and professional orientation.

In conditions of institutional facilities Ukraine still holds a large number of orphans and children deprived of parental care. Although the number of placements children of this category, this form of arrangement tends to decrease. This is because children in this category are cared and protected by the state, but they receive inadequate care, attention and education. This system is being criticized in Ukraine as in these institutions there is: lack of child care, lack of care for children who are placed there, they grow up non-adapted and frequent conflicts between pupils lead to escaping from their institution.

Ukrainian scientists (I. Bogdanov) outlined the following negative aspects of institutional facilities that harm the socialization of children: 1) lack of communication with their biological parents; 2) deformation relationships through hard experience of the past; 3) lack of love, attention, 4) closed environment; 5) cases of violence by staff and pupils; 6) regulation of time; 7) unformed image of "myself"; 8) increasing the feeling of anxiety; 9) emotional dissatisfaction; 10) lack of social skills in personal life; 11) lack of personal space; 12) economic deprivation - children do not have their own savings and experience to spend money; 13) long-term residence in the narrow communicative environment; 14) lack of personal things (except clothing and personal hygiene); 15) early sexual relations; cases of sexual violence; 16) have limited opportunities in the choice of profession; 17) lack of skills in solving their own problems with official structures; 18) social vulnerability after leaving residential care [9].

Although the country and has made important steps to realization and understanding the importance of placements of institutional care transformation, but those that exist in the modern format of Ukrainian institutions, cannot provide adequate social and pedagogical training. The main reason is the lack of individual approach to children, large number of children are placed there, limited emotional relationships with pupils and teachers, lack of their own psychological space etc.

In 2006, the conception was adopted by the state program facilities reformation for orphans and children deprived of parental care. The basic idea of it is to create conditions of life for orphans and children deprived of parental care, as much as possible close to the family ones. Thus, in residential institutions there must be no more than 50 children. In our opinion, the given concept is consistent with existing standards that are functioning in the UK as the number of children in state care institutions of the country is small. Another positive change in the system of boarding schools in Ukraine is the establishment of institutions with a new type of qualified teachers and social workers. We consider that these changes will allow each teaching staff institution find an

individual approach to a child and give him an assistance according to his needs, which will facilitate the development of adaptive capacity of the child (i.e. the level of personal opportunities to enter into new conditions of social environment, because they are constantly changing [32]).

Taking into consideration given the above, modern institutional institutions for orphans and children deprived of parental care in Ukraine require transformation. Therefore, the British experience in placement this category of children in foster homes of various types (due to the need, problem or duration) is appropriate for implementation into Ukrainian practice of social protection.

4.5. Family-based Placements for Orphans and Parentally Deprived Children in Ukraine and in the UK

The main reason for such extrapolation of UK achievements is that the foster placement is recognized as the most effective from the pedagogical point of view, since the benefits of this form arrangement are personal approach, continuous process of pedagogical influence on the children's social education. In the family environment a child has a sense of stability, security, permanence and confidence. This will help to accommodate the individual, his education, successful interaction in the community or in adoptive families [18].

The main forms of family placement of orphans and children deprived of parental care in Ukraine are adoption, foster families and family-type orphanages. A number of adopted orphans and children deprived of parental care, according to statistics in 2010 are given in numerical terms in the diagram (Figure 1) [3,11]. However, both in Ukraine and in the UK the children age has an influence on the number of adoptions.

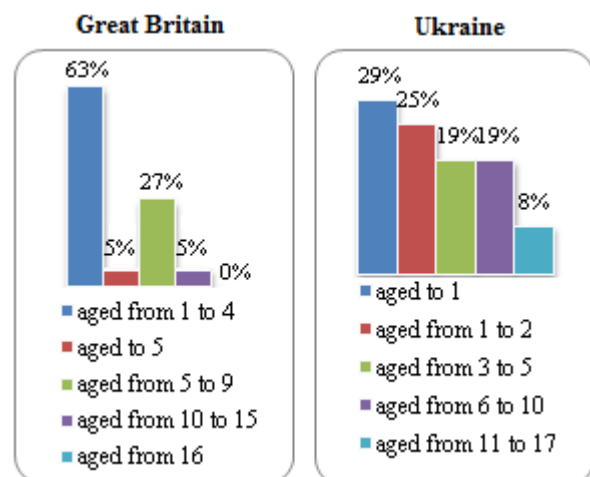


Figure 1. Figures of orphaned and parentally deprived children (according to their age) in Ukraine and Great Britain

Source: State Report on the Situation of Children in Ukraine (by end of 2010.); Children Looked After in England (Including Adoption and Care Leavers)

Data of orphaned children and parentally deprived ones illustrate that in Great Britain the number of adoptions for the last 5 years remains the same. According to official data of Ministry of Education in Ukraine, the number of such children was as follows: children from birth to 1 year

– 2%, aged from 1 to 4 – 70 %, from 5 to 9 – 24%, from 10 to 15 – 3%, from 16 - % [11].

The diagram analysis gives us the possibility to conclude: both in Ukraine and in Great Britain remains the tendency of adopting little children (aged from 0 to 2 years old in Ukraine and from 1 to 4 years old in Great Britain). Elder children in Ukraine (aged from 6 to 10) are mostly adopted by foreign adopters. The number of children aged from 11 to 17 adopted by foreign adopters in 2010 was 229 children, and by Ukrainian adopters – only 50 [3].

In the UK there is mainly family-based care for orphans and children deprived of parental care, each with its own specialization profile. In Ukraine, by contrast, there is an increasing number of establishments and institutional arrangement other than family ones (Table 2).

Table 2. Comparative Table of Family Types Placements for Orphaned and Parentally Deprived Children in Ukraine and Great Britain

Great Britain	Ukraine
Family-type placements	
<ul style="list-style-type: none"> - adoption - custody - foster family: <ul style="list-style-type: none"> • long-term • permanent • continuing • foster-to-adopt • time-limited • emergency • short-break care • short-break care for disabled children • support care • respite foster care • kinship care • parent and baby care • intensive care • remand care • treatment care • private fostering 	<ul style="list-style-type: none"> - adoption - guardianship - foster family: <ul style="list-style-type: none"> • permanent (innovational types) <ul style="list-style-type: none"> • emergency care • guest foster care - children homes of family type - SOS-children villages

Recently, however, in our country began to increasingly develop and introduced the idea of foster care and children homes care as primary forms of arrangement for orphans and children deprived of parental care. In Ukraine, the foster family started functioning in 1998 and its work is governed by the "Adoptive Family Regulations" (2002.) Since 2006, the "Family Code" of Ukraine began to regulate the functioning of the given forms of care.

Domestic scholars [7,8] emphasize that the number of foster families in Ukraine is increasing, but they're not enough in number to place all children in need and to meet the needs of all children in need. In the UK, almost all children of these categories are arranged in a foster family.

Almost in every part of Great Britain foster family is a main form of arrangement (50 to 78% coverage of the total number of orphans and children deprived of parental care). According to official data of the Ministry of Education of Great Britain in 2011, with 88603 children who're in need of arrangement in the UK, 60806 are arranged in a foster family [10]. We believe that such a large number of foster children is explained by the variety of types of foster families, where one each has its own specialty and can provide qualified protection of certain categories of children. This example demonstrates the need to review and facilitate the functioning of qualified foster care according to the needs of children in Ukraine.

Legislative changes in Ukraine was the adoption of (2006) "Act about Foster Family", which was introduced age restrictions (according to which all foster children are to leave the foster family of by the retirement age of carers) and placement of a foster child in a family with one foster parent was allowed (as before 2006 only a married couple was allowed to foster a child).

Thus, the number of foster families, children homes of family type and children in them is growing rapidly in Ukraine. It should be noted that the number of foster families has abruptly increased from 180 families (in 2005) to 744 families (2006). In 2010, according to the Ministry of Education, Youth and Sports of Ukraine, data there were 3 195 foster families and 535 children homes of family-type [3]. This fact indicates the readiness of the Ukrainian system of social child protection to development and transformations.

We support such opinion, as recently in Ukraine family-based care became more widespread, but the number of foster families and children homes of family-types is not enough to place all orphans and children deprived of parental care [17]. In our opinion, although the index of children placed in family-based accommodation in the United Kingdom (74%) [11] and in Ukraine (73.5%) [3] is almost the same, but in the UK the effective ones for such children is functioning of different types of foster care placements according to the needs of the child. We should not forget about the category of children who are "difficult" to place in the family - children with special needs, elder children, groups of brothers and sisters, children who had a negative experience of living in foster family.

Institutional care can not contribute to the optimal development of children, on the condition of adequate resources provision; such care may support their adequate cognitive development. Even if children of institutional care will be able to function in normal regime, their cognitive development and brain development is likely to be lower than of children's who are brought up in families [27]. Therefore, the earlier children from residential care will placed to family environment, the better will be the results. Early removal of children from residential care is important for their further development [21,24].

For Ukrainian state is helpful the British experience of orphans social protection and children deprived of parental care in Britain.

4.6. Main Points of Achieving Efficient Work of the Children Social Protection System in the UK

From the above, we can outline the basic points of achieving efficient work of the child social protection system in the UK that might be successfully implemented into the national system of Ukraine:

1. Focus on the child system: each child being involved to the social protection system must be recognized as an individual with his rights to participate in decision-making (according to his age).
2. The balance of the child's right to be with his birth families: family is the best environment for raising a child.
3. Interconsistency and professionals' co-working with the child's family and the child, himself, which is the necessary factor to achieve positive results.

4. Early intervention, prevention that is an important factor that reduces the period of the child's living in unfavorable environment.

5. A variety of social protection services according to the needs of children.

6. The use of modern scientific research in the professional practice of orphans and children deprived of parental care social protection.

7. Risk management as an integral factor of the child social protection.

8. The effectiveness of assistance in the child social protection (at different levels).

Ukraine has already made the first steps to improve the social protection of orphans and children deprived of parental care: created guest families, families who take children on weekends, and others. But such forms exist only within the activities of charitable organizations therefore require governmental support. We believe that the rapid decline in increasing the number of orphans in the country since 2009 (from 100.8 thousand children to 98.1 thousand children in 2010 [3]) and increasing the number of children placed in family care accommodations is the result of the tasks of social policy and tendency to preserve biological children in the family, to implement preventive measures to parental care deprivation, to support family care.

5. Conclusion and Recommendation

To achieve a high level in social protection of orphans and children deprived of parental care, Ukraine has to carry out a number of innovations, starting from the adoption laws and regulations concerning the types of family care placements and giving them professional level (with the appropriate state financial assistance, training candidates in order to get ready them to meet children needs, etc.). Based on the identified gains as to the implementation of social protection of orphans and parentally deprived children in the UK it's reasonably possible to outline the directions that might be successfully implemented in socio-pedagogical work of Ukraine:

1. Reformation the state care institutions. Reducing the number of children being placed in these institutions. This will help to perform by individual approach, it will lead to better child development, and better opportunities to adapt a care-leaver within a society.

2. Legislative approving and defining the functions and types of foster care. According to specialization to staff and train the carers, because in Ukraine fostering hasn't been widespread very much yet.

3. Ensuring the transition of foster parenthood into professional level, as a form of arrangement available today is a kind of "hidden adoption" (a process when the foster family doesn't cooperate with biological parents of the child and doesn't pursue the idea of a child and his birth parents being reunited, but at the same time do not adopt the child because of benefits and payments provided for a foster child).

4. Conducting obligatory training the prospective foster and adoptive parents, because children who live in institutional establishments require special attention and individual approach. This requires communicative skills

with this category of children, psychological and moral training and support.

5. Promoting the protection of foster parents, which is a very important factor in the formation of healthy relationships within the family, to provide effective assistance to children. Considering the experience of the United Kingdom, where the foster parents have right to have a vacation and the child at this time might be under the supervision of other qualified foster carers, is an effective tool in the process of prevention of "professional exhaustion" of caregivers. This item mainly concerns to children with special needs and treatment who require constant medical care and support of health professionals.

We believe that this problem solving, would increase the number of adoptions, or placement of orphans and children deprived of parental care with special needs in Ukraine. The number of adopted children in Ukraine of this category is small.

6. Providing support to the categories of children after leaving foster care or institutions and to provide further moral and psychological support to care-leavers [12].

7. Establishing organizations (private and public) of adoption and placement a child to a foster family, which would deal with the matching children and parents, would train and counsel them, advice and support the carers.

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Incorporating Inquiry Investigation into Language Arts Curriculum

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Abstract The article includes methodological and practical applications for improving Foreign Language students' performance through incorporating inquiry investigation. The key to high-quality performance is found in systematicity and systematization of interrogative practice included in the mini-course on elementary research skills building. Question-and-answer method is presented from the vantage point of learner-centered approach promoting assistance in moving through the stages of disciplined inquiry, nurturing research competence and the culture of learning the World.

Keywords: *disciplined inquiry, research competence, high-grade questions, Content-based guided inquiry learning*

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1. Introduction

In the global age when having information is much less valuable than knowing how to think with information in novel situations, inquiry is a helpful method to scientifically address matters encountered in professional, social and personal life.

Doing research is intrinsic to going into higher education. In this nature of things, fostering research skills must be a corporate part of any program that guarantees high-grade academic training.

However, this is actually a complicated problem as research papers fall into category of complex human performances; involving so many skills that few students are able to do well on them without extensive instruction and practice (Van Gelder, 2005: 42). This paper conceptualizes a teaching experience of giving Foreign Language (FL) students (Far Eastern Federal University, Russia) grounding for research competence building.

1.1. Theoretical Framework for Incorporating Methodology of Inquiry in Language Arts CLASSROOM

Since the learner is the active agent in constructing meaning, knowledge and worldview, his mind must be "instrumental and essential in interpreting events, objects and perspectives on the real world" (Jonassen, 1991: 29). This circumstance determines the concern with teaching the methods of thinking for making careful observations, discovering relevant data and ideas, generalizing from data, analyzing, hypothesizing, making inferences, interpreting, posing problems, anticipating consequences,

learning autonomously with a thirst for knowledge, to name a few.

The fundamental rationale of the paper has been John Dewey's philosophical propositions for the importance of inquiry-based teaching as a way of nurturing essential skills of lifelong learning for coping with the complexities of modern life and preserving values of the world (Dewey, 1938: 111).

Another foundational idea underlying innovative format of FL classroom is appraising the potentiality of student-generated questions (Marzano, 2014; Rosenshine, Meister, and Chapman, 1996; Tishman, Perkins, Jay, 1995) as a "high-yield strategy" (Marzano, 2009: 30) – classroom techniques that have research supporting their utility at enhancing student achievement".

1.2. Rationale

The new Competency-Based Education university curriculum is aimed at developing research competence recognized as a generic capacity applicable in every learning and professional area and viewed as a subset of higher order thinking skills and dispositions which students need to function productively in today's global society.

On the panel of proposed improvements high priority is being given today to developmental approach that sees thinking and learning as merging in instructional theory (Resnick & Klopfer, 1989). Hence, teaching methods of thinking ought to be inclusive, i.e. infused into content learning.

There are a lot of inquiry programs designed to help students find out about science phenomena (Burgh & Nichols, 2012) while in FL education new conceptualizations based on cognitive theory often pose a

challenge (Wingate & Tribble, 2012). Though teaching for research competence is asserted a part of a FL curriculum, very little actual time is spent by FL students doing inquiry activities. Teachers do extensive efforts to train students in FL functional literacy skills but miss the actual educational task to cultivate in students the skills of disciplined inquiry. As many graduate students lack skills of intelligent inquiry, the content of their research papers keeps below level - they can exercise at most superficial understanding of the subject matter and specious reasoning. Moreover, some of them do not have confidence or general knowledge of how to start exploration.

These problems are widespread and stem from the fact that up to the present day many instructional faculties choose to focus on teaching content and shy away from teaching generic skills. Foreign language instruction implements mostly the model of specific language skills training that serves to display patterns of weak thinking and low-order questions. When focusing on the lowest rung of the Bloom's taxonomy pyramid - memorizing, recalling, describing - engaged in are two-dimensional and casual classroom activities not associated with guiding exploration. Thus, students are unprepared for research writing because they are not taught methodology of thinking.

The traditional forms of FL practices or ventures to bring students into inquiry-based tasks without explicit teaching core skills fall short of a goal to nurture the disciplined mind. Also, teaching research competence intermittently comes to no good. On the other hand, teachers need and deserve a great deal of assistance in putting inquiry teaching into practice (Anderson, 1998).

So, recognizing the need for higher levels of skills, another course of action was adopted which resulted in raising the stakes and experimenting with an alternative format of FL classroom called Content-Based Guided Inquiry Learning (CBGIL).

2. Inquiry Driven Classroom

Embedded into the FL curriculum the micro-course is supported by topical readings with real-life problematics. But even though carefully selected, this may be ineffective without facilitating reflection on underlying meanings and interpretations. So, in addition to the development of the four basic language skills, the mini-course cultivates the culture of disciplined inquiry supposed to get students to think more carefully about what they are reading, writing or talking about. In point of fact, CBGIL is a course in which research is not viewed as a complex form to be mastered but as a means of deepening intellectual and emotional involvement with a subject. My specific concern was to provide an elementary basis to help students cope with future research paper they will have to write in their formal university classes, while at the same time master useful life skills of investigating the world. The course blends two kinds of courses normally separated in the FL curriculum: the content-based course in which language is taught indirectly through the medium of a specific subject matter (Brinton, Snow, & Wesche, 1989) and a thinking-based class (Beyer, 1983; Costa, 2008; Perkins, 1995). Such an approach combines the

strengths of both kinds of courses: language, content, and thought-centered methodology.

2.1. Content-based Guided Inquiry Learning: Components

The basic essentials of the mini-course on guided disciplined inquiry (Table 1) include: specific topical content, integrating macro-skills, expository instruction, team work, guided-inquiry activities, modeling questions, student-initiated questions to promote investigation inquiry, metacognitive awareness, reporting, individual responsibility. These components may be esteemed as tools to develop research skills and specific topical content.

Table 1. Critical components of the Content-based guided inquiry learning

Team work	Individual responsibility	Specific topical content
Modeling activity	Questions to promote inquiry investigation	Reporting
Integrating skills	Guided-inquiry activities	Metacognitive awareness

Integrating skills. The course leads to specific outcomes pertaining the development of language skills (listening, speaking, reading, and writing) and process skills (scientific methods of information processing and complex reasoning, metacognitive knowledge, habits of mind, as well as social skills of effective communication and collaboration) within content- and task-based activities. Linguistic forms and functions are considered as partial aspects of what is to be learnt, and language is organized around experiences that are immediate to students. In turn, cognitive operations of organizing, developing and expressing, creating and exchanging ideas, lead students to gain better linguistic competence. Such an approach where language acts as a medium of fostering intellectual thinking requires taking an extra step towards the formation and development of reading, writing and speaking skills of a very high order.

Specific topical content. In the content-based research approaches form is always practiced within a specific content. This helps students see the relevance of an inquiry skill (e.g. analysis) that will soon be extended to their research papers. The course promotes active learning through exploiting intellectually-challenging texts that engage students in doing mini-research. The teacher provides the specific texts as cases, situations or examples that students will investigate as they are guided to make conceptual discoveries. Investigation into an issue acts as not only a byproduct of the course but an integral concern of learners as well.

Modeling activity. Basic thinking abilities must be taught directly and explicitly (Chaffee, 1992; Perkins & Salomon, 1988). Hence, expository teaching is an effective way of organizing methodology of inquiry learning. The utilization of abstract structures for thinking is preceded by the modeling procedure. The teacher presents a new speculative instrument in an organized fashion checking to make sure the student is subsuming the new information. The research evidence suggests that most students will not learn thinking skills without explicit attention to helping them do so.

Group work. Cooperative methods are rooted in Piagetian and Vygotskian traditions that emphasize the value of social interactions for promoting cognitive

development. The central task of research – thinking critically about the text – is enacted in the helpful and stimulating environment of a classroom where they build a base of common experience which assists them in the process of sharing and communicating. If students are encouraged to work in teams, they are not left on their own as they are trying to understand and think beneath the surface. Instead, articulating their observations, ideas and questions they have the chance to elicit background knowledge, see other points of view, refine their ideas in discussions, support each other's understanding.

Reporting. A written report is submitted by each team at the end of the inquiry session. They may contain the team answers to the questions they were addressed during the session, a summary of the important concepts, statements, reasoning that they developed from the activity. The report gives students the opportunity to assess their performance and reflect what they have learned.

Individual responsibility. Students need to work to develop their own inquiry skills. For this reason it is essential that they be held individually responsible for their learning. To assure individual responsibility the instructor provides evaluation both of individuals and of the team. It encourages all students in a team to participate since the instructor's points may differ for different team members.

Metacognition, the process of planning, assessing, and monitoring one's own thinking in order to develop understanding. Actually, if the students do the steps but do not understand why they did them hands-on activities are just like rote learning. It must be kept in mind that the final outcome of thought-focused instruction is development of students' self-awareness of their own thinking, which means enabling them to monitor their act of learning, and thinking and involving them in a conscious development of skillful thinking (Niedringhaus, 2010).

Guided-inquiry activities are designed to improve performance in higher order thinking skills. They may take several forms, including analysis, problem solving, discovery and creative activities, both in the classroom and the community. The main point is to provide structured opportunities which stimulate and guide students to actively think for themselves reflecting on author's purpose, representing the point of view, role playing, discussing ideas, deconstructing textual information, drawing logical conclusions based on interpretation, developing principles, understanding performances, etc. Upon that the situation is structured into linking subtasks to ensure that the learners can cope with it with their existing resources.

To make skilful thinking a classroom reality we need a clear vision of investigation activity.

The scheme of inquiry cycle derived from a synthesis of research (Collins & Stevens, 1983; Gunawardena et al., 2006; Pascarella & Terenzini, 1991) has been applied in the course to assign the structure. Summarized, the phases are as follows.

1. *Observation / Identification of a problem.* Students are challenged to become mentally engaged in the concept to be learned.
2. *Exploration of ideas, concepts, statements, problems.* Students are led to think beneath the surface, at a

higher end of cognitive taxonomy to determine what the sender of the text message means. Operations that may occur in this phase might include identification of differences in understanding of terms, concepts, schemas and questions to clarify the extent of disagreement.

3. *Generating deep understanding.* Negotiation of meaning and/or co-construction of knowledge under the lens of critical examination. The construction of new knowledge process as students share and compare their observations and understandings with others.
4. *Meaning construction.* Modification of proposed synthesis or co-construction and phrasing of agreement, statement(s), and application of the newly constructed meaning. This phase encompasses summarizing agreement(s) and metacognitive statements that illustrate new knowledge construction and application.
5. *Evaluation* determines if the learner has attained understanding of concepts. At this stage the learner decides how he/she feels about the message, its personal significance or meaning.
6. *Raising a new issue.* This stage is based on the concepts students have learned, and connections to other related concepts that often lead to further inquiry and new understandings.

Though this sequence oversimplifies the process of doing inquiry which in any discipline is not strictly linear but messy, and at times idiosyncratic, it allows students to see inquiry investigation in a very basic and fundamental way. The logic of the scientific method is present in a structured fashion of CBGIL activities that model the stages of research process.

Inquiry-based learning is an approach to learning that involves a process of exploring the natural, empirical, and material world, which leads to asking many questions, making discoveries, and rigorously testing them in the search for new understanding (Foundations, 2001). It is high-quality research questions that guide inquiry and help to construct meaning in the light of the text deep understanding.

2.2. Higher-Order Questioning as a Basic Inquiry Technique

The major portion of the inquiry session is devoted to the students' asking questions. In the suggested mini-course higher-level questioning is positioned as the core component of inquiry process facilitating the search for authentic meaning throughout the whole process. The CBGIL esteems the ability to ask higher-level questions as a necessary instrumentality for students to increase inquiry competence; reading passages containing problems real and relevant to students, as a stimulus for jumpstarting student-generated questions. The course is designed to gradually introduce sequencing questions operating as a wellspring of inquiry, tools guiding inquiry, and in sequence, a technique crowning the investigation by creating a new issue.

To monitor wording of questions; the typology of question stems as a training instrument to improve students' questions may be suggested at the initial stage. In the instant case the students were invited to create a

toolkit of high-grade questions through their individual effort resorting to the practice of identification and matching questions and answers within investigating a specific concept. The students were given the opportunity to reflect what counts as friendship to themselves and others. As concepts cannot be established like facts

learners had to consider a range of possible meanings that prompt deep questions leading to contestable answer. Doing this, they are involved in active learning of cognitively complex language units and the language of reasoning (Table 2).

Table 2. Operation-centered activity: Identifying attributes of high-grade questions

Task: Study the message and high-grade questions that lead to contestable answers. Explore the concept with the questions provided. Find a match to these questions. Then organize the questions into the categories.	
<i>Someone is always quietly there to lend a helping hand.</i>	
What is the key point made by the author?	Books and friends should be few but good
What notion helps organize this representation?	Friendship isn't about whom you have known the longest... It's about who came, and never left your side...
Can you provide a definition for the notion presented?	Many people value friendship for what can be gotten out of it.
Can you make a distinction between friendship and good fellowship?	Hold a best friend with both your hands.
What would you compare it to?	There comes a point in your life when you realize who really matters, who never did, and who always will.
What details can you add to make this idea feel more complete?	A good friend
Can you propose an alternative?	Someone who helps you when you are in trouble is a real friend.
What conclusion can you draw?	A friend is the one who comes in when the whole world has gone out.
How would you justify the trend to weakening of solid friendly ties?	If all my friends were to jump off a bridge, I wouldn't jump with them, I would be at the bottom to catch them.
How would you assess the value of friendship?	Best friends are like diamonds, precious and rare. False friends are like leaves, found everywhere
What follows from the matter under discussion?	Only your real friends will tell you when your face is dirty.
How and where can we use this knowledge?	When you have a good friend on the uneven path of life, everything is easier.

Table 2 presents cognitive processes – analysis, inference, evaluation, transfer - that help to organize substantive questions into a toolkit of major types of questions that drive inquiries in the search of new understandings.

- *Analysis* questions investigate the nature of something by eliciting its constituent elements.
- *Inference* questions require the student to recognize implied meaning.

- *Evaluation* questions help you to place a value on ideas and make judgments
- *Transfer* questions provoke a kind of breadth of thinking, asking students to take their knowledge to new places.

Students establish that all necessary attributes are present to qualify a question for a category.

It is advisable that they gradually complete the matrix in due course time.

Table 3. Creating a toolkit for high-grade questions

Analysis questions	What is the key point..?	What notion helps to organize ..?	Can you provide a definition...?	Can you make a distinction..?	What would you compare it to?
Inference questions	What details can you add..?	Can you propose an alternative?	What conclusion can you draw?		
Evaluative questions	How would you justify..?	How would you assess the value..?			
Transfer questions	What follows from..?	How and where can we use this knowledge?			

On completing the task students obtain a bank of substantive questions organized into the user-friendly toolkit. As the procedure of inquiry is framed around questions students learn that in order to obtain information, understand the real problem, account for the focus event, they must ask thoughtful questions. Provided sufficient systematicity and systematization, higher order questioning may become the students' initial method of doing research.

Although some teachers might find such an intensive focusing on interrogative strategy restrictive, I find this way of teaching for research competence more effective than the traditional approach due to the following reasons:

- Student-sourced questions shift the burden of thinking onto the learners.
- With the use of substantive questions students examine the data closely and explore a phenomenon until it becomes less mysterious.
- High grade questions have a potential application in a number of academic and cross-cultural contexts.

3. Conclusions

Herein before the author provides a vision of how a course that is targeted at inquiry competence development might be organized in the Language Arts classroom.

In response to the requirements of transforming foreign language education programs from rote to meaningful learning, Content-Based Guided Inquiry Learning (CBGIL) course is trying out new, more effective mode in FL teaching that reinforces the perspective of upgrading quality standards from two-dimensional low-level learning (recalling, literal comprehension, application) to the development of students' complex thinking, power of interrogation, and investigative frame of mind.

In reliance on its developmental purposes the Content-Based Guided Inquiry Learning can be considered quite a promising innovation that encourages the perspective of helping students to use FL to acquire questioning methodology as the central core skill for doing research. Nine components as the tools for developing language,

cultural and process skills are reflected (specific topical content, integrating skills, expository instruction, guided-inquiry activities, modeling questions, student-generated questions, meta-cognitive awareness, reporting, team work, individual responsibility). A structured approach organized around substantive student-sourced questions turns passive consumers of ready-to-use information into active investigators of existential problems. The experience of high intellectual quality enables FL students to move from fact and observation towards inference, interpretation and new meaning and message construction.

Exercising more frequent and effective use of higher-level questions in FL classroom makes students better learners and better inquirers – which, after all, is the goal of the “Content-Based Guided Inquiry Learning” course.

Further research needs to be done on whether FL students use the technique of high-grade questioning at their own motion when climbing the tree of knowledge, and how effectively they would ask high-grade questions with no outside help.

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Rebranding Ukrainian Generations and Generation Y through the Prism of Modern Views

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Abstract The article offers a short survey of the Ukrainian generations of 1900 through 2000. It details on the main features of the epoch and the environment in which generation Y was formed. The author specifies on the generation born in 1983 – 2003 and connects it with the peculiar features of the “millennials” entry into higher education.

Keywords: *generation Y, formation, Millennial Students, higher education*

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1. Introduction

Problem of generations has been among the main fields of interest for many renowned thinkers of the world, beginning with Socrates, who was one of the first to raise this issue and, in particular, severely criticized the young generation contemporary to him. For centuries youth used to be treated mostly critical and skeptical. These debates do not cease today.

US scientists – economist and sociologist Neil Howe and historian and writer William Strauss in the early nineties developed a theory of generations and tried to find out what the very concept of a “generation” is, what is the most objective and appropriate way to classify different generations, and what the essence of the phenomenon of conflict of generations is. The research of the aforementioned scholars was based mainly on the US experience and data. On analyzing the situation of the period from 1584 to 1991 they made the forecast up to 2069 and described five generations of the XXth century. They employed the American data, the data and experience of some other countries, and the data from the life of the former Soviet Union.

Conflict of generations in Ukraine as part of Tsarist Russia before 1917 and that of the country as one of the republics of the USSR from 1917 to 1991, and in the period starting in 1991 when Ukraine became an independent and sovereign state are three different conflicts.

The G.I. Generation, or as it is called “the Greatest Generation”, “generation of winners” are the people who were born in the years 1900-1923 and their formation and socialization took place before 1933. The significant events of the period: two revolutions of 1905 and 1917, the first world war, civil war, brutal totalitarian regime

with its transformational processes: forced collectivization, repression, starvation told on the formation of this generation in Ukraine. Fear, insecurity, ideological offishness, vain expectations of a better future are among the main characteristic features of the majority of the representatives of that generation. Such inherently Ukrainian traits as diligence, great performance, patience and being law-abiding contributed to the rapid development of the recovery of national economy, industrialization, the rise of culture. However, the Ukrainian “G.I. generation” fully felt all the “charms” of the inhuman socialist system – poverty, repressions, ethnic oppressions, “Executed Renaissance” in the cultural and spiritual realm up to the artificial famine of 1932-1933, which claimed millions lives and that actually was a genocide of the people of Ukraine by the ruling elite of the Soviet Union.

In the years 1923-1943 the “silent generation” (also known as the “Lucky Few”) was being born. The period of its formation lasted until 1953. N. Howe and W. Strauss believe that this human grading is characterized by tolerance and respect for the law. In Ukraine, the representatives of this generation were under the influence of famine and repressions of the thirties, terrible realities of the Second World War, and the difficulties of the post-war reconstruction. The famine of 1947-1948 also had its effect.

Strict observance of laws based on fear, forced commitment to the dominant ideology, attempts to achieve the highest possible social status were the features of this generation.

The generation which was born in the years 1943-1963 and accordingly formed until 1973, is called “the turbulent generation” or “the generation of baby-boomers”. This is due to the significant baby boom during this period. The people of this generation lived in the environment of intense work, the Cold War, the threat of nuclear

apocalypse. Among the positive factors of the period one can mention the so-called 'Khrushchev thaw', the achievements of the USSR in space exploration, some tendency to improve housing. This generation is marked by the spirit of collectivism, that was strongly encouraged by the current authoritarian regime, by the attempts to achieve career growth, and certain social optimism.

In the years 1960-1983 generation "X" or "the Unknown Generation" was born. Its formation was until 1993. The growth of national consciousness, desire for national independence (which came in 1991), Gorbachev's perestroika, the spread of dangerous diseases with the AIDS among them, alcoholism, and drug-addiction of a significant part of the youth were the characteristic features of the Ukrainian life in that period.

There took place a gradual shift from the prevailing doctrine of collectivism to the realization by many people of the idea that they are self-contained and free subjects of social and political life. People got more informed and intelligent, felt the necessity of better education, especially of life-long education.

2. Discussion and Results

The generation which is now the biggest concern is the people born in 1983-2003. The ideas of different authors as to the characteristics of this generation both on the global as well as on the local scales are quite diverse, and sometimes, controversial. And this is one of the reasons why this generation has so many names. It is called "the millennium generation", "generation-next", "net-generation", "generation Y", etc. The term "generation Y" is the one that is the most widely exploited and we use it here.

What were those factors that significantly influenced the formation of generation Y in Ukraine? First of all, it's Ukraine's independence as a result of the collapse of the Soviet Union. Global informatization, painful transition from the administrative command economic system to a market economy, the fact that public life got partially free from being excessively politically and ideologically set and public relations became more liberal and humane, the introduction of paid forms of education are also among the important factors.

There are two views on the significance of the influence of the previous generation on the attitudes and values of the next one. According to the first view the parents are trying to raise their children in the context of the values that are common and important to them. On the other hand, the parents want to create the environment for their children which would be dramatically different from the one into which they had been born and in which they themselves were raised. They want the lives of their children to be qualitatively different from their own lives. The psychology formed by the parents according to their philosophical principles and commitment to the values that they could not use in their lives is the peculiar feature of the Ukrainian generation Y. And we can't but mention the influence of the environment and those global and local events against the background of which this generation grew and matured.

The main characteristic feature of the influence of "generation X" on "generation Y" in Ukraine is that

parents try to provide their children with the University education and, preferably – liberal education. The competition for being enrolled for economic, legal, educational, and medical profile specialties is rather severe. And those Universities that take students for technical, natural and mathematical, agricultural specialties experience serious problems with competitive admission.

Our studies show that secondary education in Ukraine witnesses the reduction of interest and quality of knowledge in mathematics, physics, chemistry, and biology.

A characteristic feature of a large part of the Ukrainian "millennials" is their excessive demands on their own sustenance: "I want a lot and immediately". In the routine of everyday life, they put personal needs and interests above the public ones. But as the practice of the last period shows, in the force majeure situations, a significant portion of the Igrsks dramatically change the orientation from self-centered to patriotic, often sacrificing their health and their lives defending the independence and interests of their homeland. It was these 18-22-year-old students and young people who became the generators and participants' of the "Dignity revolution" of 2014 in Ukraine. Many of those who are fighting terrorists in eastern Ukraine, and dying for freedom, independence and integrity of the state are the young people born in the 80-90s of the previous century.

Even though the background, which was the formation of "Generation X" and "Generation Y" is largely the same, the distinctive feature of the period of socialization of "Generation Y" is the rapid development of information technology, the wide spread of the Internet, and the use of various gadgets. The Igrsks are characterized by a significantly decreased interest in books, communicating in real life. It is not by chance that contemporary 20-30 year old people are often called "the net-generation". The Ukrainians of this age are often marked by the insufficient knowledge of real life; they are often naive and even infantile, with the males' positions being inferior.

The period of the formation of the generation Y's in Ukraine there were rapid changes in economics, politics, and culture. The socialist economy was being superseded by the market economy. The laws related to making money became more liberal. There appeared cooperatives, private enterprises and other forms of manufacturing and service. Trade barriers were removed. What was once called profiteering and used to be severely persecuted became a legal way of making money. There opened the opportunities to travel abroad for private commerce and selling the Ukrainian goods, and to privately import foreign goods which were in short supply in Ukraine for sale. A significant portion of the parents of 'generation Y' became the so-called "shuttle vendors". A large sector of the economy went to private ownership and the new owners dictated new and largely unfamiliar job terms and conditions to the jobseekers, with the increasing share of the representatives of 'generation Y' among the latter.

The dominance of the social policy of collectivism suffered crashes. Young people are increasingly unwilling to work in a team for the common good and are more and more often looking for opportunities to work individually, "for oneself", or at least in a group of their peers of similar mentality and world view.

Unlike the previous generation the Ukrainian Igrek-generation increasingly preferred an individualistic lifestyle.

Lifestyle of the previous generations which was based on the principle “to live for the sake of work”, was being substituted by the formula “to work for the sake of living, and living should be as comfortable as possible”. This transformation became possible as a result of the elimination of ‘the iron curtain’, the convergence with the developed European and North American countries, and the processes of totalitarian globalization.

As for the practical work, the motivation for it in the Igreks is quite different than that of their parents. They seek a meaningful work which should be creative, interesting for them, and promising in terms of career. Even the payment is not the main incentive. The Igreks are not attracted by traditional jobs. They prefer working with the latest technology and modern means of communication.

Work, public activities, social values, and interests (“first think of your motherland and only then think of yourself”) were the main priorities for the parents of the generation of the “millennials”, but for the “millennials” themselves, the thing which is of primary importance is their personal life. The Ukrainian Igreks start their family life later than their predecessors. Family values and relationships are more significant for them.

Sometimes the Ukrainian “millennials” are considered insufficiently socially responsible and binding, and even lazy. But the studies show that it is not so. 10 to 20 percent of university graduates of an educational qualification of “specialist” (“expert”) and “master” receive diplomas with honors, that demonstrates a high level of knowledge and competence. The “millennials” who are employed are maximalists, they seek self-actualization at work, getting adequate remuneration for their work, and prefer flexible working hours, looking for the most appropriate means and methods of performing the production tasks. Unlike their parents, who appreciate their office and reluctantly change the jobs even if they are not satisfied with the latter, the “millennials” are more flexible in this respect and they easier change jobs if they do not meet their demands and needs.

The “millennials” views on life and human relationships are more liberal and democratic than those of their parents. The majority of the young people prefer civil marriage, they are entering sexual relations in a much younger age than their parents, the Igreks are more comfortable with gay marriage, though the last is not that usual in Ukraine.

A modern Ukrainian student of the millennium generation is gadgets-friendly and for them the Internet has become a reference, a manual, and an Encyclopaedia.

As of now the share of a student’s independent work has been dramatically increased in the training process. The role of the teacher and the time of their direct involvement in students’ education has significantly reduced of late. The teacher’s function is that of a tutor, facilitator, advisor, consultant who is planning and developing training objectives for the student, providing the necessary techniques for their implementation, and who performs control functions without a direct participation in the students’ learning activities.

A Ukrainian student of nowadays becomes more demanding to the teacher’s or instructor’s professional and personal qualities. A student is impressed by the teacher who is a bright knowledgeable, and erudite personality, who can interest students and build relationships with them on the subject-to-subject basis. The latter is particularly important in view of the fact that the Ukrainian system of education, which has long been an integral part of the Soviet educational system, was dominated by the subject-object format of relations between teacher and student. The rudiments of this form of relationship are often a cause of confusion and conflict between the participants of the educational process.

As the result of the globalization processes, the Ukrainian Igreks pay more and more attention to learning foreign languages as a means of mobility, opportunity to build a career not only in Ukraine, but also abroad. The admission to the schools of philology in the Universities is very competitive as it means new perspectives and new chances. But the number of those whose ambitions are realized from the very first try is not that high. Moreover, many of the “millennials” do not persist in keeping trying.

It should be noted that when we talk about this or that distinguishing feature of “generation Y”, we mean those most frequently displayed features and qualities which are characteristic for the majority of their representatives. In fact, the dominant life principles, worldview, social behavior, life trends of different layers of the Igreks are dramatically different. They depend on many factors – economic, social, political, and geographical. For example, the young people of the Western Ukraine stand out as devoutly religious. Young people from central Ukraine and the western parts of the country clearly show their adherence to national traditions and more often display their national dedication. Urban Igreks have more opportunities for education, better job placements, the organization of leisure, and so on.

The most common features, characteristics and trends of different generations are in many respects similar or even common to the whole of human civilization of a certain age. The first four generations of Ukraine of the XXth century were largely dependent on external factors and circumstances. The dependence on other countries, revolutions, wars, social and technological upheavals, domination of the totalitarian and authoritarian regimes left a significant imprint on the consciousness, social, psychological, and spiritual characteristics of these generations. Psychological rigidity, depression, fear, poverty, isolation from world civilization processes, and the low level of national consciousness are the most common characteristics of the Ukrainian generations of 1900-1980.

3. Conclusions

It is natural that “generation Y” couldn’t but inherit from their predecessors – the previous four generations – certain features and properties, especially – from their parents who represented “generation X”. But the impact of globalization and localization processes, scientific and technological progress, a significant change in socio-economic conditions, the creating of their own statehood

left a significant imprint on the formation, ideology and worldview of the “millennium” generation.

Thus, the current “Y-generation” resembles the previous one only in some features. The gap in mentality, worldview, information awareness between the Igeks and their parents’ generation is much bigger than between/among all the previous generations.

The characteristic features of a significant part of the Ukrainian “net-generation” are the absence of ideological and political engagement, freedom and critical thinking, prevailing of the individualistic interests over the collectivist ones, wide information and informative literacy, the desire to master a foreign language, find interesting, creative and well-paid work, and organize their education in some developed country where higher education is the most versatile and flexible higher education system for international students in the world and then, by chance, to seek employment and residence there. They have the capacity for greatness, indeed.

Time will show what “generation Y” will pass to “generation Z”, which is born and formed now, and what this unknown generations will appear to be.

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