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The problems in the content integration of disciplines in training system of future teachers of technology

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Abstract. In the article considers the actual problems in the preparing of future teacher of technology the concept of «interdisciplinary connections» was analyzed. The problem of shaping the content of training courses in training graduating teachers of technology. Analyzed the ways of solving the problems of designing of the course content of physics in terms of the educational process based on the principles of educational integration.

Keywords: *integration, content of discipline, competence, technology teacher, physics*

Introduction. The processes of globalization, which gradually transform the world into a single space, and these processes find their own reflection in the Ukrainian educational system. The value of higher education in personal and social development of a human is growing, and its social, educational, training and research roles remain indispensable. It is necessary for society to have experts capable for self-improvement, self-development, which were able to use the acquired knowledge in the solution of professional tasks creatively and easily adapt to social and economic changes.

Pedagogical Universities carry out the order of the society in the preparation of future teachers based on modern achievements of science in teaching and practice. High quality of training involves the formation of not only basic knowledge of future teachers, but also those that are able to provide their professional mobility. Ukraine's accession to the educational and scientific space of Europe, coordination of national high education system in the context of European standards requires further development of theoretical bases and improvement of professional training of teachers.

Overview of the publications. Physics, as an academic discipline occupies a special place in the training of future teachers of technology. Many scientists have studied various aspects of teaching physics in high and secondary educational institutions: the formation of methodological knowledge bases; the problems of continuous education in physics; differentiation of education; theoretical foundations of teaching physics. Psychological and educational problems have been studied such as: the formation of the individual; integrated training and education of students; theory of teaching and the organization of educational process; training teachers to the profession in terms of educational integration.

The problem of formation of professionally significant qualities of future teachers became engaged in the end of XIX century. The key role of a teacher in current and future productive changes in education and society, was noted in the report of the International Commission on Education for the XXI century "Education: a hidden treasure" [3, p. 26-27]. In particular, states the need to recognize the importance of a teacher in the community and review the status of teachers in different countries. This will allow society to develop relationships and partnerships with families, enterprises, associations, cultural figures and others for a change learning opportunities at school and in the economic, social and cultural activities. Therefore, the need to update knowledge and skills is important for teachers, and

they need to get that opportunity within various forms of educational process. Modernization of national education and its entry into the European educational space put forward new requirements for training future teachers.

The need for integration of educational content in training of future specialists are considered in mono-graph and dissertation M.R. Artsyshevska, M.I. Berulava, S.U. Goncharenko. The principles of integrated knowledge and integrated education were highlighted in theses R.M. Bilyk, N.V. Vasilenko, V.O. Ignatova.

Kovalchuk V. believes that the current teacher primarily bound to be highly skilled and visionary professional, conscientious and loyal patriot of Ukraine, subtle psychologist, who owns the information and pedagogical technologies [2, p. 15].

Zelenko N. in his study considers the methodical preparation of the future teacher of technology and business students to study agricultural technologies and concludes that it is essential to select the right training material, which is aimed at fostering methodical preparation of students to teaching agricultural technology [1]. In her opinion, the most important criteria for selection of educational material are: the relevance of this knowledge in methodical training; integrating the essence of educational material on teaching methods of agricultural production technologies; developmental nature of cognitive activity.

Authors of «Concept of Technological Culture of Young People in Secondary School» (P.G. Atutov Y.L. Hotuntsev, A.A. Kozhin, V.P. Ovechkin, V.D. Symonenko,) define technology as a branch of knowledge, methods and tools used for optimal conversion and use of matter (material), energy and information and the plan for the benefit of man, society and the environment. The study of means and methods of transformation aimed ultimately at developing personality, its transformative thinking.

The purpose of the article is to study the impact of integration processes, to improve the quality of training students of pedagogical universities in the educational sphere «Technology».

Materials and methods. Based on statistical studies, we have found that modern technology is very attractive sphere of knowledge for youth and the importance of appropriate teacher training technologies in this respect [6]. Effective training of future teachers for teaching students of modern technology cannot be beyond economical educational environment, which is regarded as objectively necessary condition in formation of pedagogical appropriateness teacher training technology.

State Standard for basic and secondary education provides introduction into educational field «Techno-logy», which main goal is the formation and development of design, technology, information and communication competencies to realize the creative potential of students and their socialization in society [4].

Education sector consists of informational-communication and technological components. The implementation of information and communication component is aimed at forming the subject of information and communication competence and key competencies.

The main condition for implementing technological component is the technology and information activities conducted by the emergence of creative concept to its implementation in the finished product.

The goals of learning technologies are: formation of the holistic picture about development of material production, the role of technology, design and technology in the development of society; familiarization of students with the working environment, traditional, modern and promising technologies of materials processing, decorative arts; forming ability to develop native culture heritage with the use of decorative arts; acquiring of the experience of the proceedings technology, the value of partnership and attitudes to traditions by students; development students' technological skills; awareness of students about the importance of the role of technology as practical implementation of scientific knowledge; implementation abilities and interests of students in the field of technology; creating conditions for self-development of entrepreneurship and professional development for each student; mastering the ability to assess the results of their subject-transform activities and levels of key and subject competencies formation.

Thus, based on the educational sphere «Technology» is the subject-transforming human activities in the material world, which is aimed at creating of a learning environment for the opening and development of students' abilities in personality-oriented sphere of design and manufacturing and in the process of familiarization with different materials, information and other resources according to the needs of creative ideas of students.

The concept of «Technology» is introduced in the name of the new discipline, has a completely different meaning than before (an idea about how to obtain and transform raw materials, etc.). The modern use of the term «Technology» covers both material, social and spiritual aspects of human activities and they are closely interrelated.

For implementation of the complex approach in a choice of method of activity for implementation of the exact method, and not the former technocratic solutions need a different ideology, different view of the order of things. Therefore, not rejecting in principle of the framework, which was based on the principle Polytechnic old system of labor training, educational sphere «Technology» makes a number of fundamental innovations:

1. Education sector «Technology» synthesizes knowledge of mathematics, physics, chemistry, biology and other sciences which is considered through the prism of the industry development, energetics, communications, agriculture, transport and other spheres of human activity.
2. One of the objectives of education is the formation of personality, creative thinking, active and adaptable. However, this task is transferred to the students. They

must understand the responsibility for their own preparation for a future life, self-determination and for success in it.

3. In the process of understanding, analysis and interpretation of knowledge into productive sectors of that passively receives information but individual person that can individually plans and carry out his activities toward the highest personal achievement that meets his potential.
- 4 The fundamental approach to the training system: not narrow objective and integrative-oriented, creative design. Thus, the inclusion of students in the design process, design and modeling, the project followed by the evaluation of the result of the binding factor is interaction between teachers and students.

The analysis of psychological and educational literature we can say about the existence of multiple points of view on the issue of professionally important qualities of teachers of technology.

Professional and creative activity of the teacher of technology – deliberate, conscious, personally meaningful activities aimed at productive and creative solving of professional problems. Readiness of the future teachers of technology to professional and creative activity – it is an integrative formation of personality, characterized by a high level of mastery of psychological and pedagogical special knowledge, relevant skills and important qualities which is necessary for effective implementation of the basic functions of professional, quite high creative level.

After the emergence in the 1970s of a new interdisciplinary scientific direction – synergetic, which explores the patterns and principles of self-organizing complex of macrosystems, there were opportunities to integrate educational processes that was based on the synthesizing trends. This approach provides opportunities for new forms of organization of educational process of training students' in educational sphere «Technology».

Recession from the subject differentiation of scientific knowledge that forms the reproductive thinking and transition to integrate knowledge, involves the development of models of educational process and content of training courses based on the integration of natural-mathematical disciplines and professional disciplines that contribute to the formation of a student's holistic view of world as a single process, increase of intellectual capacity, holistic vision of problem situations and creative approach to solving them.

In our study, we examine the integration of disciplines content of mathematical and natural cycles of professional training of future teachers of technology. In different years, the block of natural sciences and mathematics were called differently. At the beginning of the formation of public higher education standards of physical and mathematical sciences unit called cycle of basic training, and physical and mathematical training and from the rest, in the new educational and professional program for bachelors technological education [5] they form a series of mathematical disciplines, natural science training. This block of disciplines that we call the cycle of natural and mathematical training includes subjects such as: age physiology and hygiene; basics of ecology; chemistry; general electrical engineering; higher mathematics; general physics; information technology in education.

Into the cycle of professional training courses according to the modern educational and professional program, we include a series of scientific-subject professional disciplines for preparation. They are: basics of engineering and technology; economics and organization of production; standardization, quality management and certification; material science; technology of construction materials production; processing of construction materials; mechanical engineering; working machines; energy machines; information machines and computer systems.

Integration of the content of natural and mathematical sciences in the training of future teachers provides learning technologies, development of abilities and skills in a particular system, promote mental activation process, the implementation of the transfer of theoretical knowledge to professional practice. The interdependence of disciplines is primarily a reflection of objectively existing link between the individual sciences, and the sciences – with technology and practical activities of people. The need for interaction between modules of subjects and didactic principles is dictated to prepare students for practice.

The value of interdisciplinary connections especially intensified in recent years due to the trend towards integration of science and practice, the emergence of integration jobs. This requires future teachers mastering scientific, general technical and special knowledge and skills, application of complex knowledge in practice. In this regard, significantly increased the practical orientation of polytechnic knowledge, the possibility of using fundamental knowledge was also increased.

In pedagogical literature are more than 30 definitions of category "interdisciplinary links" there are a variety of approaches to teaching evaluation and classification. These definitions usually reflect certain properties of communications (methodological, didactic, etc.) and their functions (ideological, educational, developmental, psychological, etc.).

Interdisciplinary communication can be considered as independent didactic principle. There are every reasons to believe that interdisciplinary links one of the principles of didactics. As the principle of learning, interdisciplinary relations interact with all other principles. That is why interdisciplinary links with their systematic and purposeful implementation reconstruct the whole process of training, which acts as a modern didactic principle.

Interdisciplinary relationships are reflected in the academic disciplines of teaching relationships that objectively are in the nature of modern science and learned so interdisciplinary links should be considered as equivalent of inter-scientific didactic ties.

To the leading didactic integration tasks, we include:

- The selection of integration, i.e. those branches of scientific knowledge that can be most effectively integrated together to provide a complete training of students;
- Determination of the scope and content of integrated courses with the level of prior training and deep knowledge of students in each of integrated disciplines;
- To create optimal conditions for training of the integrated course considering putting them in various innovative teaching methods.

A careful study program of the school course, for a typical curriculum educational sphere "Technology", you can set the relative (percentage) number of common themes,

overlapping with the themes of other disciplines – biology (7%), chemistry (11%), mathematics (11%), physics (16%), social sciences (9%), natural sciences (8%), geography (6%), drawing (7%), computer science (13%), visual arts (9%). We also determined the total amount of educational material and disciplines of physics and mathematics to the natural cycles of professional training of technology teachers [6].

You can see that the greatest potential for integration has the discipline «General Physics», which along with general scientific disciplines cycle creates the fundamental framework for future teachers of «Technology» also it forms the scientific worldview and competence.

Educational material of the course «General Physics» in pedagogical universities should reflect not only current but also future requirements to future specialists. It must be prognostic and logically associated with the material cycle vocational courses «Electrical engineering and electronics», «Theoretical Mechanics» and other subjects for the given direction and profile.

Interdisciplinary connections in higher educational institutions is a concrete expression of the integration processes, which is taking place in a certain time in science and in society. They play an important role in improving of the quality of practical, scientific and theoretical training of students. Implementation of interdisciplinary connections helps to shape the students a holistic view of natural phenomena, the relationship between them and therefore making a significant academic attainment. The knowledge and skills that students have acquired in the study of physics make possible to solve problems both in training and in future scientific and professional activities.

Physics is a scientific foundation of the engineering. Therefore, physics as a discipline plays a leading role in the formation of professional knowledge of teachers of technology. Content of physics as a discipline represents a great opportunity to familiarize future teachers to physical principles of major industries, with many technology processes and spheres of work.

In modern conditions we can indicate the following industries which are use the laws of physics as its scientific basis such as: as energetics, mechanical engineering; testing and measuring equipment; handling equipment for regulating and directing production processes (automation, radio electronics, cybernetics); transport (road, air, rail, water, gas oil and petrol wires); communications (internet, telephone, telegraph, radio, television).

To physics are relevant individual spheres of technology (mechanical, thermal and electrical methods of processing metals, metal forming and using various kinds of radiation, friction sliding, rolling and tranquility, mechanical work, safe handling of electrical devices, prevent harmful effects on the human body electric current and electromagnetic radiation, control of serviceability grid, reflection and refraction, dispersion of light, electric field, electric current leaders, foundations electronics, etc.).

According to the above we can identify such problems of physics the constructed on the principles of integration of natural and mathematical disciplines and cycles of professional training of teachers of technology: development of knowledge about physical principles of modern production equipment and technology; forming the ability to apply knowledge in physics for solving various physical and

technical problems; develop skills of handling widespread in modern technology gauging devices, control devices, power sources, methods of conversion and use; the formation of certain personality traits (positive attitude towards work, professional orientation, creativity, curiosity, research and design skills).

Conclusions. Integrity of Pedagogical Integration of unity provides internal and external relationships actions of teachers in all disciplines aimed at building professional-valuable orientations of the future teacher and his professional and personal qualities. The analysis of integration processes in the physical preparation of future teachers of technology allows to make the following conclusions:

- Forming an integral concept of teacher education based technologies may establish interdisciplinary connections with general physics course;
- Since the goals of individual educational processes in the system must be adequate to the system as a whole, the organization needed a foster educational process in pedagogical university, in which physical and special training of future specialists will form a special position and professional future of teachers, armed with a set of diverse knowledge and skills necessary to perform their professional functions;
- The lack of integration with physics teachers leads to the fact that one and the same theme is duplicated in the

classes of interpreted from related disciplines. That is why the creation of integrative sections of different departments to establish specific interdisciplinary connections in the vocational and educational training of students;

- Partial approach of the educational process should be replaced by an integrated comprehensive training, focused on the formation of a holistic understanding of the pedagogical process by students;
- Because developed to our day's profiogram and qualifying characteristics do not fully reflect the structure of vocational teacher complexity of its functions under market conditions, there is a need for guidance set intermediate and final goals of the integrated training at a single integrated model of future teachers.

Based on the above we can conclude that quality of training of future teachers of technology that meet modern requirements of society regarding teacher training, is possible for the conditions of the graduates of pedagogical universities integrated knowledge and skills. Ensuring the above named requirements may make based on the integration content of subjects of natural-mathematical cycle subjects and professional training of future professionals who will ensure the formation of an integrated system of basic and specialized knowledge in the future.

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Касперский А.В., Шишкин Г.А., Проблемы интеграции содержания учебных дисциплин в системе подготовки будущих учителей технологий

Аннотация. В статье рассматриваются актуальные проблемы подготовки современного учителя технологий, анализируются понятия «междисциплинарных связей». Исследуется проблема формирования содержания учебных дисциплин в системе подготовки будущих учителей технологий. Анализируются пути решения проблем конструирования содержания курса физики в условиях организации учебного процесса основанного на принципах педагогической интеграции.

Ключевые слова: интеграция, содержание дисциплин, компетентность, учитель технологий, физика