Development of Cognitive Competences of Future Teachers on the Basis of Interdisciplinary Relationship

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ABSTRACT

The requirements of State educational standards developed in the disciplines at all stages of education provide not only deep knowledge and education for young people, but also the tasks of preparing young people who are the creators of tomorrow for the next stages of Education. This necessitates the effective use and improvement of training and educational work in its place of mechanisms of interaction with each other in educational disciplines of significant didactic importance at all stages of the current educational system. The process of integration of subjects at all stages of Education shows that the targeted use of the features of their interaction in the teaching of subjects, the pedagogical and methodological correct Organization of classes, guarantees the meaningful and high-quality teaching of each subject.

Each teacher will have to take a lesson in a situation where he understands well that the subjects he is teaching are interconnected with other subjects. Terms that are incomprehensible to students on the topic will have to explain the circumstances in the case when the teacher used cognitive competence. This article explains exactly how teachers use cognitive competencies and develop it in cases of interdependence of disciplines.

Keywords: interdisciplinary integration; general professional competences; students' professional training.

1.Introduction.

The formation of the necessary competencies of university students in terms of the quality of higher education should be considered in the concept of combining the content of training future specialists. Integration is the integration of disciplines into holistic education as a qualitatively new system of interdisciplinary interaction of subjects of the educational process.

The issues of combining the content of the training of future specialists and the formation of cognitive competencies of future teachers have acquired Special Research significance in connection with the transition of the higher education system to a competence-oriented basis. S. I. Do not pull and N. P. Puchkov defines integration as a didactic purposeful process and the result of the interconnection, interdependence and synthesis of knowledge of the Natural Sciences, which is manifested in the transformation of the elementary elements of integral Sciences.

M. N. According to berulaw, the Integrative communication of academic disciplines can be carried out at three main levels, which are based on:

- the ratio of the structural and procedural aspects of integration carried out in the educational process;
- its resolution through didactic tasks;

- some types of integrative interaction.

The first level of integration of educational content can be represented by academic disciplines that are of an integrative nature and have a specific subject of study. The second level of integration is carried out in the form of didactic synthesis: the unification of academic disciplines at this level is constantly carried out on the basis of one of them. Finally, the third level of educational content integration is the level of interdisciplinary communication, which currently has the greatest practical distribution.

The special relevance of the study of the problems of inter-subject interaction is due to the development of a competence-based approach in the system of higher professional education. General cultural and professional competencies presented in the standards of the Federal state educational standard cannot be formed by students within the framework of mastering one academic discipline, they require the organization of methodological cooperation at the interdisciplinary level.

The first classifications of interdisciplinary communications were based on temporary criteria: previous (initial), companion and promising (subsequent). Later, Inter-element analysis began to develop the content of knowledge as a way to establish inter-element relationships. Along with chronological contacts, information was also identified: real, conceptual, theoretical. Any state of communication should include all three characteristics and types of interdisciplinary relations, it is necessary to single out complexes of knowledge and skills, the constructive basis of which is the leading scientific ideas and generalized methods of activity associated with them. V. N. Maksimova proposes to classify interdisciplinary connections as follows:

- information and interdisciplinary relations;
- interdisciplinary philosophical relations;
- ideological ties;
- operational-activity interdisciplinary relations.

The interdisciplinary aspect of the formation of professional foreign language communication skills among university students, despite the wide coverage of this topic in pedagogical and linguodidactic research, still remains relevant. Knowledge of a business, professionally oriented foreign language forms an important component of constructive communication between specialists, and readiness for its implementation at a functional level is one of the means to increase the effectiveness of the performance of professional tasks.

Based on these positions, it is logical that the main component of the formation of communication skills in a foreign language is the integrity and consistency of the methodological interaction of the subjects of the educational process at the university as a component of integral and professional competencies. Didactic concretization of interdisciplinary strategies and tactics in the process of preparing students for constructive foreign professional communication requires clarification of the component of educational and methodological support, the basis for its formation is, first of all, the development of the student's cognitive interest in professional activity. The most effective and stimulating material for learning:

- taking into account the general educational and research experience of students of the relevant educational direction;
- carrying out relevant scientific and technical information;
- provide knowledge on the profile of the specialty;
- Reflects the problems of national and regional development of the Real sector.

2.Methodsand Results

The pedagogical conditions and features of the formation of the communicative competence of future specialists as a component of professional and integral competencies were determined as a result of our research analysis, which was carried out on the basis of a survey of students and teachers of the humanitarian and preventive departments of universities. We were primarily

interested in the opinion of teachers about the interdisciplinary interaction of teachers of the Department.

The generalized result of the survey among teachers showed the following. Almost all respondent teachers believe that the leading motivation of students to learn a special foreign language is the possibility / need to use the acquired knowledge for further professional and career growth. Basic skills and abilities necessary for a specialist: possession of professional terminology; knowledge of the culture of a business partner and the basics of negotiations; presentation experience (self). Profiles and teachers of humanitarian departments the teaching of professionally oriented foreign languages determines the feasibility of combining interdisciplinary scientific and methodological potential, and they agree that the involvement of teachers of preventive departments in the participation of students in the activities of language education is an important aspect of the joint activities of departments. Teaching professionally oriented foreign language communication is, first of all, the need for an interdisciplinary combination of scientific and methodological potential. An important aspect of the joint activities of the departments is the involvement of teachers of preventive departments to participate as consultants in the activities of language education of students. Effective forms of interaction are lectures in a foreign language, joint holding of practical or laboratory work in profile subjects with the introduction of discussions in a foreign language, conducting scientific work on language education by students in profile subjects, etc. In the Coordination of the methodological interaction of teachers of humanitarian and professional training cycles, as well as the joint development of requirements for the discussion of the content of work programs and the results of mastering the course, work modeling, seminars, presentations, etc.are important. for teachers of humanitarian departments, the recommendations of teachers of specialized departments on research activities are always valuable and are important for senior students in the preparation of courses and theses. For the organization of communicative and developing research activities of students, it is necessary to jointly develop design topics, evaluate its results from the point of view of communicative and special training, as well as register grant materials.

Competence (lat.competo –I achieve, I deserve, I deserve) - means knowledge, experience in one area or another. There has long been a focus on the personal social qualities of teachers, and from the demand of each time, the requirements for the educator have improved and become more complex.

Interdisciplinarity today acts as one of the main trends in the development of science, the basis through which innovative technologies (nano-, bio-, cognitive, social, informational) are progressing, as the most promising approach to solving complex socio-economic and environmental problems. The interdisciplinarity of university education can rightfully be considered as an indicator of its scientific and fundamental nature, on the one hand, and practical orientation, on the other.

Emphasizing the importance of interdisciplinary education, A. L. Andreev, T. S. Akhromeeva, G. G. Malinetsky, S. A. Posashkov note the relevance of stimulating the development of creative, self-developing innovative environments for scientific breakthrough. Thus, A. L. Andreev points out that the module of creativity is not individual individuals, but the creative intellectual environments covering them, where ideas are formed, creative teams are crystallized and experience is disseminated. The medium that supplies creative elements to science can be higher education based on a strong science–education–production relationship. It is here that the competencies of future specialists are formed, as well as the building up of supra-disciplinary knowledge.

Understanding the importance of the interaction of academic disciplines is not new either for education in general or for higher education in particular. Interdisciplinary or interdisciplinary connections have been realized both in secondary school and in institutions of higher education for many years. Nevertheless, the problem of fragmentation of

education received by graduates is discussed quite often.

The interrelation of academic disciplines, their interaction can be carried out at different levels. The first of them is characterized by the fact that theoretical positions and methods can be supplemented, used, transferred from one discipline to another. At the same time, it is possible to clearly identify which academic subjects interact. Each of them retains its own methodology and theoretical assumptions without their significant modification, knowledge and methods are supplemented to a greater extent cumulatively, used to solve problems specific to this discipline. Such interdisciplinary interaction practically does not provide a holistic vision of an object or problem that goes beyond the discipline. The so-called over-subject knowledge and skills are developing insignificantly. The interaction of disciplines can be called rather multidisciplinary. It is it that is represented mainly in the content of education in secondary school through interdisciplinary connections. On the basis of multidisciplinary interaction, the principle of professional orientation is mainly implemented in the institution of higher education.

A higher level of interdisciplinary interaction involves the synthesis of various theoretical positions and methodologies that are involved in scientific research from other disciplines. It is in this case that we can talk about interdisciplinary integration or interdisciplinarity in education. Interdisciplinarity, according to E. N. Knyazeva, means cooperation of various scientific fields, circulation of general concepts for the study of a certain phenomenon. Interdisciplinary integration often involves the synthesis of theoretical knowledge and technology. In this case, the humanities, natural sciences and mathematics disciplines are not opposed, but mutually enrich each other. For example, one of the central places in interdisciplinary research is occupied by synergetics, which studies the processes of self-organization and dynamic chaos in complex systems of very different nature, opening the way to understanding the patterns of development of such systems and their management.

The next higher level of interdisciplinary interaction (transdisciplinarity) implies going beyond specific disciplines, characterized by the transfer of cognitive schemes from one disciplinary area to another, the development and implementation of joint research projects. With such a level of interaction of academic disciplines, we can talk about a holistic vision of the object of study, the formation of a holistic vision of the problem. The questions "Which academic disciplines interact?" or "What integrates with what?" are already meaningless here. In this case, research and training will be based not on a disciplinary principle, but on a problematic one (i.e. the solution of a complex scientific-applied or social problem is put at the forefront), attempts will be made to consider the problem in all its complexity and complexity.

These levels of interdisciplinary interaction are naturally presented in different ways in modern science and higher education. But it is interdisciplinary integration in higher education that will become a prerequisite for innovative breakthroughs in science and technology.

These trends in the development of science, education, the magnitude of the consequences of human changes in the natural and social environment have determined the objective need for a universal interdisciplinary core in the structure of professional competencies of a modern specialist. Since 2010, the Belarusian State University at the Department of Pedagogy and Problems of Education Development has been conducting scientific work on the problems of interdisciplinary integration.

As an important result, we will present a well-founded model of a modern specialist. It includes two levels of competencies. The first level – general professional competencies – is represented by universal interdisciplinary competencies. Their formation among students corresponds to the principles of scientific and fundamental training of a specialist, serves as the basis for the implementation of interdisciplinary educational, research and

project activities, as well as the development of professional competencies of the second level - in the field of a specific profession.

Five groups of universal interdisciplinary competencies are identified as general professional: informational; general scientific; competencies in the field of high humanitarian technologies and personal growth; design and research; competencies related to life in a globalizing world and in the field of sustainable development.

These five groups represent the most important tools with which a graduate can participate in the innovative development of the country in the fields of science, human development, economics and environmental activities. Thus, in the scientific sphere, information, general scientific, design and research groups of competencies will be in demand first of all; competencies in the field of high humanitarian technologies and personal growth will be used for the development of human resources and society as a whole; competencies related to life in a globalizing world and in the field of sustainable development will be directed to solving the tasks of preserving a favorable habitat, ensuring sustainable socio-economic development and a decent standard of living for future generations.

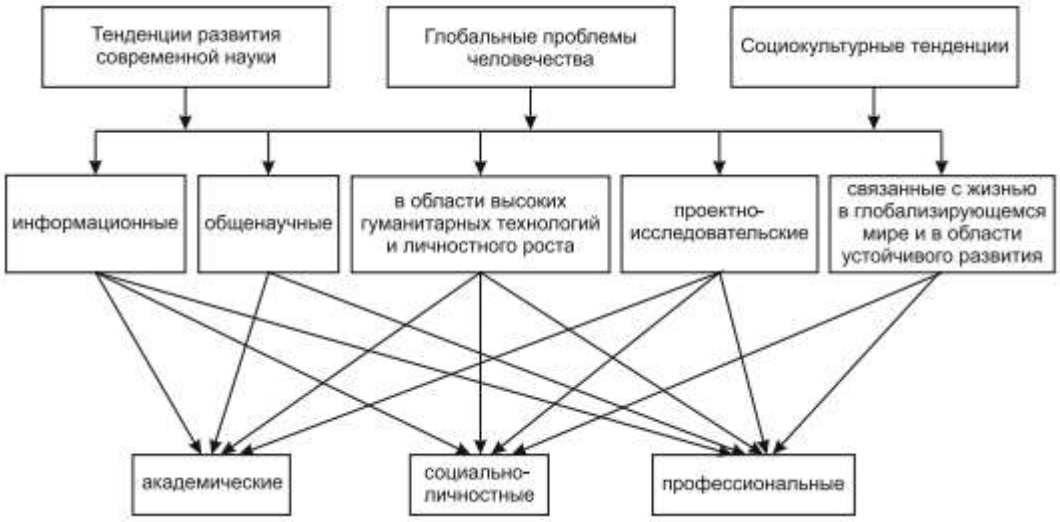
Let us briefly present the essence of these groups of competencies. Informational presupposes knowledge of information technologies (IT) at user levels (search, information processing, use of network technologies for communication and presentation of results); confident use of IT in the field of professional activity, as well as computer capabilities in solving interdisciplinary tasks, which, as a rule, involve computer modeling, visualization, evaluation and interpretation of information.

General scientific competencies presuppose knowledge of the basics of modern natural science (in the most important aspects: the universe, matter, life, mind), synergetics, systems theory as scientific directions that give universal mechanisms for the functioning of complex systems of any nature, as well as the principles of their management. It is important to possess a mathematical apparatus (at least within the framework of professional activity), focus on compliance with scientific ethics (prevention of plagiarism, intellectual honesty).

Competencies in the field of high humanitarian technologies and personal growth are based on knowledge about the processes of cognition, learning, communication, information processing by a person and are detailed in psychology, pedagogy, sociology, political science, history, philosophy and economics. They are manifested in the implementation by the graduate of an effective influence on a person and a group; successful planning; effective training, including self-study; management of the behavior of a person and a team. Technologies of personal growth emphasize the choice of educational trajectories and means of self-development, knowledge of their personal characteristics and the choice of behavioral strategies. They assume the presence of goal-setting, planning, reflection, initiative, will to achieve goals.

Design and research competencies presuppose knowledge of the scientific method as such and represent the basis for the implementation of a scientific approach to solving problems. Their formation means that graduates are able to generate hypotheses, analyze and generalize information, understand the limits of applicability of the methods used, and have critical thinking. The ability to plan and implement the idea from the idea to the final product, risk assessment when making decisions, and presentation of results are important. Competencies related to life in a globalizing world and the need to promote sustainable development presuppose knowledge of factors threatening the survival of mankind, the causes of their occurrence and possible ways to overcome them; essential features of the implementation of sustainable development at the regional and international levels. These competencies require the ability to preserve national identity in combination with the acceptance of other cultures, the ability to communicate with representatives of different countries. It is important that students have a sense of responsibility to

future generations when using technologies and taking into account their possible consequences when introducing innovations.



The analysis of the content and interrelations of the presented competencies allowed us to conclude the following. Firstly, universal interdisciplinary competencies include socio-personal and academic competencies from the educational standards of the specialties. Secondly, the five groups of competencies identified by us have a greater impact on professional and allow us to integrate academic and socio-personal competencies with each other. Thirdly, the model we propose is built taking into account the trends characteristic of the development of the interrelationship of the competencies of modern science and public relations, in this regard, these trends are reflected in the groups of interdisciplinary competencies more clearly. Fourth, the advantage of the proposed model lies in the fact that it will make it possible to more clearly define the value of disciplines that are not directly related to a narrow specialization, but nevertheless have a significant impact on the professionalism of the graduate. Thus, it can be recommended to focus students' attention on the fact that as a result of studying a non-core discipline, universal interdisciplinary competencies necessary for all specialists are formed, which are in demand for solving topical scientific and practical problems. The proposed model will also help to unite the socio-humanitarian and natural science disciplines with a common idea, to more clearly establish the relationship within the so-called block of general scientific knowledge, as well as with the block of professional knowledge.

As a result of the experimental work carried out, the methodology of interdisciplinary integration has been substantiated and tested, which contributes to the formation of general professional competencies among students studying at the first and second stages of higher education. The preliminary results of the experiments are described in the papers.

The essence of the methodology is a combination of the so-called horizontal and vertical integration, which makes it possible to realize not only the professional orientation and the connection of individual disciplines, but also interdisciplinary integration. Horizontal integration involves joint study within one discipline of problems that fall within the subject field of several disciplines, finding common content and using methods to ensure a holistic vision of the problem. Horizontal integration involves combining two or three disciplines in the process of solving, for example, practice-oriented tasks of a professional orientation. At this level, interdisciplinary integration contributes to a more complete realization of the professionalizing function of learning. Integration is realized by including interdisciplinary tasks in the content of disciplines.

Horizontal interdisciplinary integration is complemented by vertical integration aimed

at cultivating students' systemic thinking, holistic vision of scientific and socio-professional problems, as well as the formation of a scientific worldview. Vertical integration involves "stringing" or "threading" the content of academic disciplines with global ideological problems, "red threads", which include: problems of sustainable development (its social, economic, cultural, educational contexts), greenhouse gases and energy resources in general, self-organization in complex systems (synergetics), the evolution of life, modern cosmology, effective management, etc. By themselves, these problems cover a wide range of sciences and applications, and they can serve as a basis for a future specialist on which he will build his educational and research activities.

Vertical integration is implemented on the basis of the diffuse principle of inclusion of interdisciplinary knowledge in the content of academic disciplines, which assumes that scientific principles that allow revealing the deep laws of a particular process or phenomenon permeate the content of all subjects. This means that in each specific task that is offered to students, there is an element of general scientific knowledge that is also significant for professional training. It assumes not only the solution of individual tasks by students, but also the implementation of scientific and applied research projects, the contribution to the development of which is made by all the disciplines studied. At the same time, the results of the projects, in turn, can be used in a whole range of educational and research areas of students' work. The final stage of vertical integration can be the joint implementation of an interdisciplinary project by students of different specialties.

The implementation of a comprehensive methodology of interdisciplinary integration includes several stages.

1st stage. Computer science as a factor of interdisciplinary integration.

The process of studying the disciplines "Fundamentals of Information Technology", "Information Technology" was based on the implementation by students of humanities of a complex of interdisciplinary tasks aimed at mastering the fundamental concepts of computer science, its methods and algorithms, which have found the most significant reflection in a number of sciences; familiarity with the main models of interdisciplinary areas – synergetics and the problems of sustainable development. This stage is important because it not only forms students' information literacy (including as a basis for further use of IT, elements of computer modeling, visualization, etc.), but also gives primary ideas about the essence of a number of concepts of synergetics, philosophy and other sciences, such as fractal, self-similarity, bifurcation tree, dynamic chaos, strong dependence on initial conditions, self-organization in complex systems, etc., In our opinion, it is also important to solve problems that allow applying the principles of sustainable development. Knowledge in the field of IT, synergetics and sustainable development issues allow students to implement interdisciplinary integration at a higher level in the process of further education.

Within the framework of a pedagogical experiment, the effectiveness of this stage has been proven. In 2014, the next stage of experimental work was completed. In total, from 2010 to 2014, the experimental group included 203 students of humanities. During the allotted time, the students of the experimental group not only mastered the necessary level of program material, but also mastered a wider range of general scientific knowledge, the ability to independently create models, conduct a computer experiment. They got acquainted with interdisciplinary concepts used in mathematics, computer science and social sciences and humanities. However, the students' answers also revealed unresolved problems. Thus, students prefer to use ready-made resources presented on the Internet, and very rarely transform or replenish content. Figuratively speaking, they perform the function of consuming and transmitting ready-made information, producing practically nothing on their own and not contributing to the development of the information environment. In this regard, their ability to effectively influence the target audience through IT remains poorly realized, which will

negatively affect the formation of competencies in the field of high humanitarian technologies in the future.

2nd stage. Generalized tasks using IT as a means of interdisciplinary integration.

At this stage, integration was carried out on the basis of using IT to collect, analyze information, visualize data, and model in the process of studying specialized disciplines in 2-4 courses. Students were involved in the solution of generalized interdisciplinary tasks, the implementation of interdisciplinary projects, term papers and theses of an interdisciplinary nature. An example of the implementation of the methodology for designing the interdisciplinary content of education in a higher education institution at this stage is described in the publication.

Stage 3. Joint work of students of different specialties on an interdisciplinary problem in the subject field of pedagogy.

The purpose of the stage was the development by undergraduates of scientific and applied tasks of an interdisciplinary (global) nature aimed at developing their skills in setting and solving interdisciplinary tasks. The peculiarity of integration in this case was the joint work of representatives of different specialties and profiles on a real and relevant interdisciplinary problem. Undergraduates, being graduates of the first stage of higher education, have professional competencies in solving problems in their subject area. To carry out an interdisciplinary project, they need to interact with representatives of another specialty in the subject field of pedagogy, namely: analyze possible ways to solve the problem, as well as formulate interdisciplinary tasks for students, develop methodological support for their successful solution. The tasks for the projects are formulated in such a way that they represent objective scientific or applied problems of an interdisciplinary nature. Undergraduates, interacting with each other, enrich the experience of their colleagues, which is necessary for a holistic view of the problem. At the same time, pedagogy acts as an environment in which interdisciplinary knowledge is combined and pedagogical skills for designing educational material are formed. In this case, undergraduates do not have insurmountable difficulties due to a lack of knowledge from a certain field. The topics of the projects and the requirements for them are presented in the works. In total, 139 undergraduates of natural sciences majors participated in the experiment in 2013-2014.

3. Conclusion

The most important results of this stage include: the development of a systematic vision of socio-professional problems; increased motivation to engage in scientific and pedagogical activities; the emergence of new scientific ideas or associations in the process of preparing and discussing projects, the desire to expand their scientific horizons; enriching the experience of interaction with specialists from other fields and public speaking; the formation of the ability to see interdisciplinary problems and formulate interdisciplinary tasks. Detailed results of the work are presented in the publication.

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