

METHODOLOGICAL BASES OF COMPUTER SCIENCE AND ENGLISH TEACHERS' TRAINING: PROBLEMS OF INTERSUBJECT CONNECTIONS IMPLEMENTATION

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Purpose. The ways of inter-subject communication realization in the computer science and English teachers' training have been explored. **Methodology.** The main methods are analysis, systematization and generalization. **Finding.** The paper has researched the methodological basis of training of computer science and English teachers in the «Secondary school» field of knowledge. Integration of computer science and foreign languages for the purpose of training specialists in these two fields for the mid-level of the educational system is an urgent task of modern higher education. In the development of inter-subject relations, considered as independent didactic principle, there are two main interrelated trends which are integration and coordination of knowledge. Ability to implement the acquired skills in various fields is been developed due to interdisciplinary communication in the field of computer science, linguistics, as well as methods of teaching and pedagogy. Interdisciplinary communication involves finding the mutual consistency of educational content. Realization of intersubject communications contributes to the achievement of results in a harmonious intellectual and emotional development of students' activity. The main value of interdisciplinary connections is that they provide an opportunity to create a unified system of knowledge acquired in different subjects, as well as to acquire new knowledge on the basis of these relations. Developing the concept of computer science and English teachers' training involves integration at the level of training and inter-subject communication areas. The paper has conducted a comprehensive analysis of competencies and skills necessary for specialists of the complex profile. Interdisciplinary bilateral relations in the aspect of content and teaching methods have been studied. The basic teaching methods and base sections of the curriculum in computer science, linguistics and pedagogy have been observed. It has been suggested that the trend of integration must be penetrated not only into the structure of subject knowledge, but also cover a wide range of methods and forms of educational work. **Originality.** The complex of professional competencies that are necessary for future professionals has been described. The problem of inter-subject connection implementation between the majors of Computer Science and language training has been outlined. The questions related to the use of integration and coordination components of inter-subject connections of Computer Science and English have been studied. **Practical value.** Submissions may be used in the process of curriculum development, systems training and methodological support for the «Computer science and English» specialty. **Conclusions.** The necessity of intersubject integration introduction to training has been proved. The importance of systematic approach to the educational process of future Computer Science and English teachers has been emphasized.

Key words: Computer Science and English teacher, intersubject integration, implementation of intersubject connections, professional competence.

МЕТОДИЧНІ ОСНОВИ ПІДГОТОВКИ ВЧИТЕЛІВ ІНФОРМАТИКИ ТА АНГЛІЙСЬКОЇ МОВИ: ПРОБЛЕМИ РЕАЛІЗАЦІЇ МІЖПРЕДМЕТНИХ ЗВ'ЯЗКІВ

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Досліджено методичні основи підготовки вчителів інформатики та англійської мови у галузі знань «Середня освіта». Розглянуто комплекс професійних компетенцій, які повинні мати майбутні фахівці. Визначено принципи побудови навчального плану спеціальності та його змістового наповнення на засадах міжпредметної інтеграції та координації. Окреслено проблему реалізації міжпредметних зв'язків між дисциплінами інформаційно-комп'ютерної та лінгвістичної підготовки. Досліджено питання, пов'язані з використанням інтеграційної та координаційної складових міжпредметних зв'язків інформатики та англійської мови. Обґрунтовано необхідність впровадження міждисциплінарної інтеграції з метою підготовки фахівців. Підкреслено важливість системного підходу до організації навчального процесу майбутніх вчителів інформатики та англійської мови.

Ключові слова: вчитель інформатики та англійської мови, міждисциплінарна інтеграція, реалізація міжпредметних зв'язків, професійні компетенції.

PROBLEM STATEMENT. At the initial stage of school computer science development it has been a popular point of view that Computer Science refers to the objects that need to be taught to former engineers and programmers. It took some time to understand that teaching at school must be mastered, that is, an expert should be familiar not only with the substantive side of the course, but also with the methods of teaching. After that the first generation of computer science teachers, enthusiasts, who were far from mathematics, physics and programming, and often combined these areas of

activity, was replaced by graduates in the specialty in which Computer Science meant the second major. The practice of such specialist's methodical training in universities evolved spontaneously. The construction of the course content of Computer Science techniques originated, as a rule, from some of the following positions:

- existing school course concepts compilation, then the detailed developing of own concepts;
- informed choice of the existing concepts and the use of appropriate materials for teachers;
- full description of the advantages and disad-

vantages of existing concepts and providing future teachers with the opportunity to find the best way in the real world that will confront them in practice later.

Currently, universities train future teachers for whom Computer Science is the first major in combination with mathematics, physics, foreign languages, environmental protection or other courses. In such circumstances, the importance of the Computer Science teaching methods course has increased significantly in contrast to the situation when the Computer science is the second specialty, and is mainly taught by analogy and comparison to teaching technology of the first subject (mathematics or physics). First, it is necessary to refract the knowledge of students, received in the study of psychology, pedagogy, subject-cycle courses in technology of Computer Science' training. In this regard, there is an urgent need to improve the content of the Computer Science teacher methodical training.

The combination of computer science and a foreign language specialization is popular in Ukraine. Analysis of methodological training works allows us to conclude that there is the lack of integrative curriculum content justification of the computer science and English teaching theory and methodology, corresponding to the modern view of computer science as a fundamental scientific knowledge and general education area, as well as corresponding to the problem of higher education that is the formation of professional identity (the teacher). It determines the relevance of the study on the development of the computer science and English teaching methodical training content in high school.

The problem of intersubject relations is one of the most important in pedagogy, concerning modern processes of scientific and technological fields differentiation and integration.

Problems of computer science and English teachers' training in high school are the subject of research by many Ukrainian and foreign scholars. A comprehensive examination of the question is presented in the works by V. Bykov [1], L. Bilousova [2], I. Bogdanova [3], M. Hammond [4], R. Nikolov [5], P. Stephenson [6], P. Van Roy, J. Armstrong, M. Flat and B. Magnusson [7], M. Zhaldak [8].

So, R. Nikolov proposes an approach for acquainting Computer Science university students with various tools and methods of teaching Computer Science for:

- introducing one variant of school Computer Science curriculum;
- introducing some basic notions, principles and methods of Computer Science and a number of tools and specific approaches for their explanation and clarification;
- demonstrating a variety of computer applications in different fields;
- developing a sophisticated programming environment corresponding to the problem being solved and the specific users' needs;
- demonstrating some basic principles of educational software developing, passing through all the phases of the software life cycle;
- applying artificial intelligence methods and tools while developing and using educational software.

The students get self-confidence both as teachers in

Computer Science and English. So they can step towards new pedagogy in a rich computerized learning environment [5, p. 241].

I. Bogdanova traces trends and patterns of new inter-subject areas development and offers a upgrade vocational and educational training model as an integrated system consisting of four components: conceptual, structural and substantive, technological, organizational and didactic. The researcher examines several levels of integration: technology, intra- and intersubject. The first level lets you merge two technologies of training: modular and computer to create training modules as the integration of content, technology, and cognitive-operational. Intra-subject level provides the creation of the pedagogic integrated course. The basis of intersubject integration is the main teaching course within it forms a task, which is an instrument to achieve the theoretical and technical tools [3].

Modern science focuses on the theoretical concept of development and structural and organizational models of education for computer science and English future teachers. This issue contains the complex of pedagogical, psychological and methodological problems. In order to achieve the expected positive result, you must consistently develop radically other, more effective methods of teaching, taking into account the peculiarities of new information technologies and resources perception and development.

The purpose of this research is the study of scientifically based Computer Science and English methodological training system components found on comprehensive implementation of these subjects inter-subject connections.

EXPERIMENTAL PART AND RESULTS OBTAINED. Assigning of academic courses into a coherent unit is now the primary challenge facing the modern school, along with the humanization of education. The integration of Computer Science and foreign language schools is relevant. Ability to implement the skills acquired at different things develops intersubject communication in the informational, educational and socio-cultural areas.

Computer Science is a basic component of modern education, a general scientific subject. It plays an increasingly important role in society; it has become an important resource. The analysis of the mass professional trades content and forecast of its development suggest a growing role of training young people in computer science.

Teaching aspect of the problem is that the Computer Science and other general and specialized disciplines, presented in the curriculum, have the identical theoretical content, notions and positions. Therefore, the more effective it will unite the efforts of different educational disciplines in order to create the necessary relevant knowledge, the greater it will affect the learning process of Computer Science, where special knowledge of information, information processes and ways of working in the information environment has brought to the general scientific foundations created with other courses.

However, we believe that the time has come to consider a range of knowledge, skills, emerging studies in computer science not only in terms of technology but also in theory – in the process of construction of the world view

foundations, style of thinking, communication skills and others.

Intersubject communication is a finding the mutual consistency of educational content on teaching academic subjects, due to the individuality of each subject. Implementation of intersubject connections contributes to achieving greater results in the overall development of students in the harmonious development of all areas of their intellectual and emotional activity. The main importance of intersubject connections is that they make it possible to link a single system of knowledge obtained in different subjects, as well as to acquire new knowledge on the basis of these relations.

Structure of inter-subject connections is as follows:

- knowledge and skills from the first domain;
- knowledge and skills from the second domain;
- the integration of knowledge and skills in the process of learning.

Intersubject ties in education reflect a comprehensive approach to education and training and let highlight the main elements of the curriculum. They form specific knowledge of students, revealing the epistemological problem, without which a system of mastering the fundamentals of science is impossible.

Inter-subject links involve students in cognitive manipulation techniques with general scientific nature (abstraction, simulation, synthesis, analogy, etc.).

The organization of educational process on the basis of intersubject connections can affect individual classes (usually generalized), topics for solving inter-subject problems, several topics of various subjects, a series of subjects or to establish the relationship between course cycles.

To improve the quality of education and optimizing the learning process through the implementation of content and courses activity integration it is necessary to solve the following problems:

- coordination of possible topics or issues with teachers of different courses for their joint study;
- a list of intersubject connections between academic courses;
- changes in the content and hourly planning;
- research of students interests during the studying of the subject, the increasing of their activity in the cognitive activity;
- replenishment of teaching experience with different technologies, techniques, forms and methods of learning.

To develop the concept of computer science and English teachers' training, which requires integration at the level of training and inter-subject communication, it is necessary to analyze the competencies required for specialists of this profile.

The system of the computer science and English future teachers competence is presented on Fig. 1.

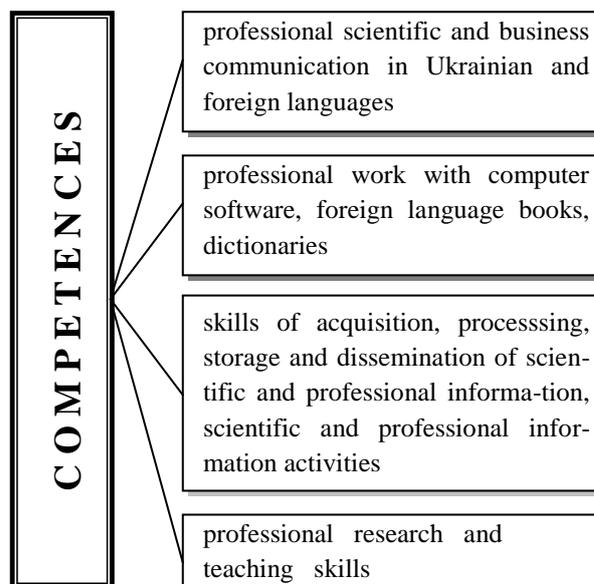


Figure 1 – Competence system of the future computer science and English teachers

Competence system involves the formation of a complex of skills and abilities, which includes information and computer technologies, linguistic and pedagogical components.

Future teacher of Computer Science should have:

- knowledge of the regulatory framework of international agreements in the field of higher education;
- knowledge of the academic mobility regulatory support system;
- knowledge about the features of the higher education system of the European educational space.

Future Computer Science teacher also should have a working knowledge of:

- web browsers;
- information on how to download and manage various types of files;
- machine translation systems and electronic dictionaries;
- interactive programs;
- creation and deployment of web-sites;
- information in a foreign language.

The main professional qualities that an English teacher should possess include:

- knowledge of the English language at a level that is not lower than advanced;
- fluency in spoken language and excellent pronunciation;
- possession of traditional and communicative teaching methods;
- experience with modern teaching tutorial of foreign publishers;
- knowledge and experience in teaching business English programs;
- spoken vocabulary of business English at different areas of business;
- ability to select additional individual materials for lessons.

Based on generalizations and systematization of skills for computer science and English teacher we try to create a system of skills that specialist in these two

profiles must have.

The system of skills of Computer Science and English future teacher, in our opinion, contains:

- psychological and educational assessment of students to determine the route of their education and training;
- design of elective courses in computer science and English using the latest achievements in Science;
- implementing basic and elective courses in computer science and English in accordance with assigned teaching load classes (groups) as in the curriculum and their own lesson plans, class schedule;
- training with the use of modern technology, especially considering the age of the person;
- help in students' professional self-determination in order to prepare them for the conscious choice of profession;
- translating of official and business documentation, socio-political, non-fiction and fiction on a professional level;
- providing consecutive interpretation or interpretation with a sheet, observing the grammatical, syntactic and stylistic rules;
- participating in the preparation of dictionaries and encyclopedias, periodicals issue;
- developing, implementing and maintaining of linguistic profile software products (automatic translation programs, electronic dictionaries, language trainers, language testing programs, etc.);
- programming in different languages: C, C#, JAVA, Perl, PHP, JSP, EJB;
- software and hardware design, hardware and software install for information and automated systems;
- collecting local area network (wired, wireless via Wi-Fi, Bluetooth, GPRS).

In addition, the specialist must have pedagogical competence. Under the pedagogical competence it refers to an integrated professional-personal characteristic that defines the willingness and ability to carry out teaching duties in accordance with the norms, standards, requirements. Pedagogical competence suggests rational using of the totally civilized experience in education and training, and, therefore, sufficiently holding methods and forms of appropriate educational activities and relationships.

Baseline of professional-pedagogical competence is a humane attitude. Professional-pedagogical competence includes the ability to take educational reality in the work systematically. This property enables a holistic, structured vision of the pedagogical processes logic, understanding patterns and trends of the educational system development, makes it easier to design appropriate activities.

Based on the analysis of competences and the complex system of computer science and English teacher skills and abilities, it may be possible to assume that the educational program should include three main blocks, presented in Fig. 2.

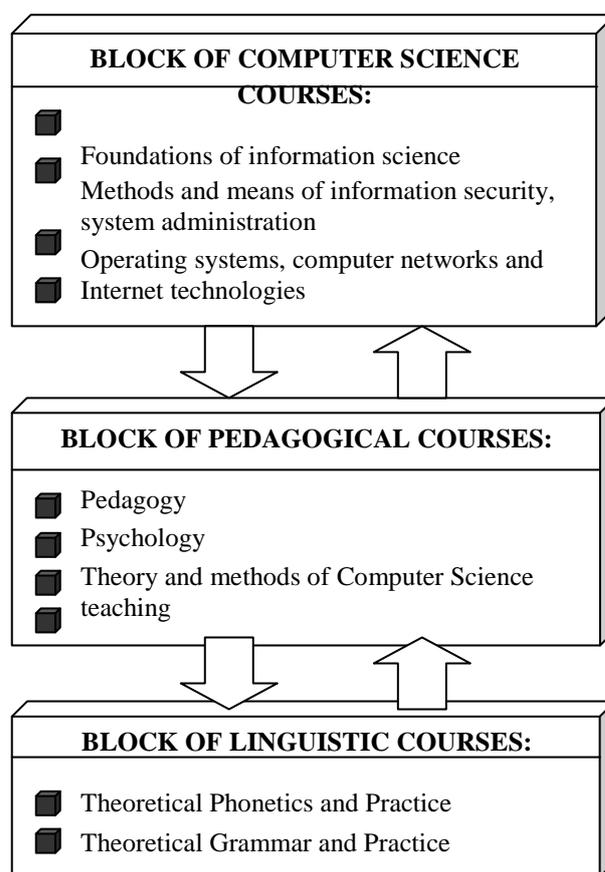


Figure 2 – Courses blocks of training programs for computer science and English teachers

It is necessary to study the bilateral nature of intersubject connections, referring to the content and teaching methods. Thus, the most important methods of studying and stationary main sections of the program in computer science, with the basic concepts of different subjects through which emerging theory, scientific facts to consider are to establish links between them. The trend of integration should penetrate not only the structure of subject knowledge, but also cover a variety of methods, forms of educational work.

Intersubject connections are relations between the structural elements of subjects content expressed in concepts, laws, theories, scientific facts. Taking into account that laws and theories are formed through the concept or express the relationship between them, it is believed that interdisciplinary communication is a connection between concepts in different subjects. In the development of the idea of interdisciplinary connections formed as independent didactic principle, there are two main interrelated trends – integration and coordination of subjects' knowledge.

The variety of content lines makes Computer Science not only complex, but also interdisciplinary subject. In fact, every course in one degree or another is connected with it in any kind of interdisciplinary communication.

Integrating role of computer science course, in our point of view, is shown in:

- presence of diverse intersubject connections with other computer science courses;
- leading role of computer science course in the information culture formation;
- general educational value of computer science in the

formation of the operating style of thinking.

During the study, we found several types of intersubject connections of Computer Science with other subjects:

- computer science is the source of information for other interdisciplinary integrated courses;

- Computer Science category (information, algorithm, model) find their place in the system of other courses concepts;

- certain types of computer science concepts are studied in other subjects;

- other educational disciplines are interdisciplinary sources of information for science. For example, the linguistic concepts of text, a paragraph in the letter are based while the study of «Presentation of Information» and «Information Technology» topics (in the theme of «Text Processing»);

- during the study of Computer Science lines content variety objective content of other subjects are widely used, in particular, the study of the algorithm concept and the information technologies development (e.g., processing technology of textual or graphic information) is based on the didactic material from the linguistic;

- in the process of learning, means of information and communication technology (ICT) are now widely used.

Effective form of computer science and English teacher training are binary classes built on close interdisciplinary connections. In the modern interpretation of a binary lesson it must be built on the active use of computer technology. Binary classes are a form of implementation of interdisciplinary connections and integrate knowledge from several subjects. This is one of the non-traditional types of teaching. Binary classes in nature are a form of the project, namely, usually interdisciplinary, internal short or average duration of the project. Binary classes integrate knowledge from different fields to solve a problem, make it possible to apply this knowledge in practice.

Usually binary classes are held during the creative use of materials, and those classes contain interesting and practically important issues based on interpersonal interaction, which are available to students. The results of the work have practical value. This lesson is an important step in the formation of competencies of future teachers, developing their thinking. The purpose of binary lesson is to create conditions motivated the practical application of knowledge, skills and abilities, give a chance to see the results of their work.

To implement intersubject links of Computer Science and other courses that constitute the comprehensive training of students at universities a certain methodical basis is required. Direction of finding these methodological foundations has already been identified. In particular, one of them is identified by processing of relevant issue of integrated education methods. The latter have found some form of implementation, in particular in the form of educational activities designed to integrate content knowledge in different subjects. During these sessions not only the integration of knowledge of students, efforts of teachers of several subjects in creating of integrated knowledge, but also the combination of educational problems, mobilization of all inclinations of students, to disclose the value of learning occurred. Also there has been the first example of educational programs construction in which Computer Science is an integrated

component. Methodological study of the subjects content provides generalization and systematization of knowledge gained in the study of different subjects, giving grounds for formation of educational impact that understanding of the real world is reached by application to explain the most common laws and principles underlying in a lot of phenomena.

CONCLUSIONS. 1. Intersubject or multi-disciplinary approach to the construction of the learning process is widely used as one of the organization elements in higher education. Providing intersubject connections solves the problem of two profiles' specialist training. Establishing of inter-subject connections is an organizing element in the field of education and in the educational process.

2. This approach allows for a more focused training and significantly improves the efficiency of learning. In the field of educational process organization interdisciplinary connections enable to introduce the principles of problem-based learning broader.

3. The establishment of intersubject connections may contribute to the creation and development in strong motivation of students learning, the development of a conscious attitude to learning, the learning process, and a process of acquiring knowledge, skills and abilities. The student is thus transformed, from the object to the subject of the educational process, which is nowadays a prerequisite for successful learning

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МЕТОДИЧЕСКИЕ ОСНОВЫ ПОДГОТОВКИ УЧИТЕЛЕЙ ИНФОРМАТИКИ И АНГЛИЙСКОГО ЯЗЫКА: ПРОБЛЕМЫ РЕАЛИЗАЦИИ МЕЖПРЕДМЕТНЫХ СВЯЗЕЙ

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Исследованы методические основы подготовки учителей информатики и английского языка в области знаний «Среднее образование». Рассмотрен комплекс профессиональных компетенций, которые должны иметь будущие специалисты. Определены принципы построения учебного плана специальности и его содержательного наполнения на основе межпредметной интеграции и координации. Определены проблемы реализации межпредметных связей между дисциплинами информационно-компьютерной и лингвистической подготовки. Исследованы вопросы, связанные с использованием интеграционной и координационной составляющих межпредметных связей информатики и английского языка. Обоснована необходимость внедрения междисциплинарной интеграции с целью подготовки специалистов. Подчеркнута важность системного подхода к организации учебного процесса будущих учителей информатики и английского языка.

Ключевые слова: учитель информатики и английского языка, междисциплинарная интеграция, реализация межпредметных связей, профессиональные компетенции.

Стаття надійшла 05.04.2017.