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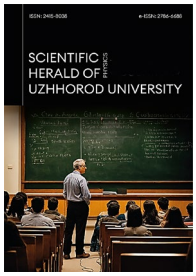

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Educational program for teaching chemistry with regional component in higher educational institutions

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Abstract

Relevance. The research explores the implementation of a regional component in chemistry education programs at higher education institutions in Kazakhstan. Its relevance stems from the need to improve and update university chemical education by incorporating regional specificities.

Purpose. The purpose of the scientific work is to investigate these problems and to propose specific ways of improving and updating the system of university chemical education based on the idea of regionalization.

Methodology. The methodology involved a three-stage experimental study conducted at Abai Kazakh National Pedagogical University, with 60 second-year bioorganic majors divided into experimental and control groups. The study utilized surveys, assessments of student skills, and implementation of a modeled program with problem tasks and independent research.

Results. Results showed that incorporating a regional component in chemistry education expanded students' knowledge about their region, increased motivation and interest, and fostered patriotism. The experimental group demonstrated significant improvement in research skills compared to the control group.

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Conclusions. The study concludes that regionalizing chemistry education can enhance learning effectiveness and material mastery. It recommends implementing regional components in chemistry programs to increase subject relevance and student engagement. The research also highlighted the importance of selecting appropriate teaching methods and organizational forms when incorporating regional material into curricula.

Keywords: natural sciences; territorial principle; method of teaching; experimental work; student survey.

Introduction

Many issues related to regionalization in teaching chemistry in higher educational institutions require the detailed consideration. Such problems include the identification of regional features of educational programs in chemistry; the development of principles and criteria for selecting the content of the regional component; the determination of the location of the regional component in the educational program; the analysis of the peculiarities of teaching methods in the course of chemistry based on regional principles. The purpose of the scientific work is to investigate the above-mentioned problems and to propose specific ways of improving and updating the system of university chemical education based on the idea of regionalization. Regionalization in teaching chemistry will increase the importance of the subject and attract the attention of students. The regional component of the chemistry university program, expanding and deepening the knowledge of students about the region, will allow them to instill a sense of patriotism and civic responsibility. With the help of the regional component in chemistry, it is possible to increase the effectiveness of training and the quality of mastering the material of the basic component of the educational program for chemistry.

The topic of regionalization of the educational system is quite extensive and multifaceted. Many works study the regional approaches to the development of education systems [1]. The regional component is the integration of the work of all participants of the educational environment and various aspects of regionalization of education. It is embodied in the essence of the work of all participants of the educational environment: management bodies, methodologists and heads of higher educational institutions, teachers, students and scientists. It is also presented in the types of activities: program, organizational and managerial, teaching, educational, methodological and scientific. Many studies underline the multifaceted role of the regional component in modern life of the country. Thus, it is noted that in a market economy, a new social order is being formed for specialists in various fields. It encourages the regional educational system to respond to ongoing changes, to adjust educational policy taking into account the local conditions, world experience and the life of market systems.

V.N. Averkin and A.M. Tsirulnikov [2], while analyzing the existing scientific concept of "regionalization", carry out a categorical synthesis of the regional sphere of education, reveal its integrative and variable characteristics, substantiate the modern principles of regionalization of education. The general course of regionalization of the structure of university education is reflected in the systems of natural science and chemical education. The educational program should reflect the goals and objectives of training, the content and principles of building a training course. The program should be based on concepts, sets of approaches and ideas the implementation of which is carried out during a certain educational time. With the variability of educational programs, a substantial number of issues arises. Some programs are characterized by imbalance, incompleteness and overload and by lack of a system. The stated goals are sometimes not achieved through the content of the programs [3-5].

Materials and Methods

The process of organizing the structure of chemistry education with a regional component involved researching the skills that students of the bioorganic specialty must acquire during their training. Accordingly, the organizational stage in scientific work consisted in the study of skills related to the identification of problems of scientific research, its direction and goals. On the entry stage, a survey and assessment of instrumental and technological skills was carried out. The latter include the ability to interact with technical devices and computer technologies. Based on this approach, the process of obtaining materials from various sources, their transfer and quality use was revealed. Methodological tools were used in the work to determine abstract and algorithmic thinking. They are necessary for realizing the intellectual development of a student, their self-reflection and self-control. In addition, during the scientific work, various types of actions were distinguished and evaluated. Based on this approach, the ability to act independently, implement interactive forms, and develop social skills was investigated. The initial stage in the scientific article was characterized by a pragmatically oriented character. This vector refers to the student's ability to provide an objective assessment of phenomena and categories; justify the quality of the obtained conclusions; apply the acquired knowledge in practice.

As for the organization and experimental testing of the researched model, it was conducted on the basis of Abai Kazakh National Pedagogical University. For this, 45 study hours were allocated, according to the university schedule. 2 groups (experimental (EG) and control (CG)) of 30 students each, who were studying at the 2nd year of the bioorganic major, were formed. Based on the use of the variable method, experimental work was implemented using digital methods and tools. In the experimental groups, the implementation of educational classes took place on the basis of a modeled program, which consisted of three stages and systems of problem tasks. At the third stage, students had to organize and conduct an independent study, and present the results to the group. The work was formed in mini-groups, and the ideas for implementation were formed at the previous stages. The entire process of such an experimental study was implemented on the basis of these planning tools. They provided an opportunity for discussion between students, in order to establish the vector of research work.

During the implementation of the organizational stage of work, deadlines for solving problems, methods of research, as well as differentiation of tasks between group members were established. The analytical stage of the research involved independent work by students on specific topics. This process was implemented in order to develop the skills of collecting various information. Students used an analytical approach when working with special literature, consulting with teachers, conducting interviews and analyzing the received materials. To ensure this process, each student has developed their own schedule to present data related to their topic and the results obtained in the research. During the scientific work, the consolidation of information was also applied. This was expressed in the work during the publication of materials by students on their wiki pages. This approach was necessary for the organization of collective work, namely the placement of the necessary information for public access and its correction. Consolidation of information was used to form a collective article on the topic of the problem. In this process, students applied their own creative abilities, directly in the process of choosing the most effective tool for presenting the results. After the completion of the experimental study, a post-experimental diagnosis was organized.

Results and Discussion

Nowadays, the unified rules, principles and requirements have not been formulated, according to which it would be possible to draw up an educational program in any subject, since the learning process and empirical material are constantly changing. Within the framework of the article, an attempt to identify principles, which help to select the material for the regional component of the chemistry educational program in higher educational institutions was made. Regional material provides opportunities teach chemistry based on the principles *"from simple to complex"*, *"from the unknown to the known"* [5]. *The principle of the scientific nature of the material* allows for discarding the dubious data, which have literally been abundant in the media lately. M. Skatkin [6] argues that the educational material should not contradict to the data of science. L.Ya. Zorina [7] came to the conclusion that the principle of scientific nature was the correspondence of educational material to the level of modern development of science; it is a selection of content, contributing to the formation of ideas about the methods of scientific cognition and demonstrating the most important laws of the process of scientific cognition.

The curriculum should be developed based on *the principle of sequence*. As a result of successful comprehension of the program, the student should develop a certain system of structural connections between the individual components, not a general chaotic picture. *The principle of consistency* contributes to the reform of education from classical learning to self-education. As a result, students' creative abilities are improved. *The principle of anticipatory* learning allows for including information that needs to be learned later in the program. This principle determines the better understanding of new material. The developing function of the educational program should be implemented at the expense of the material that requires the activity of students, which saturates the program with problematic situations and cognitive tasks. Here, interdisciplinary connections play an important role, the implementation of which in the program expands the possibilities of the learning process. *The principle of creativity* allows students to develop independence. At the same time, the diverse nature of the content of the regional material and the variety of forms of local history allow students to find the use of creative energy in accordance with their interests, inclinations and forces.

The educational function of the program helps creating conditions for research, which contributes to the development of creative initiative and the formation of the positive personality traits of the student, such as activity and independence. *The motivational function* of the program can be considered as educational and developmental ones. Motivation is the first stage for the gaining knowledge [8]. This principle allows for not only training personal, but also general skills – hard work, patience and perseverance in achieving goals. Moreover, the authors should consider the principle according to which the selected material should use *cross-curricular connections*. The use of interdisciplinary connections is one of the most difficult methodological problems for a chemistry teacher in higher educational institution. In addition, the teacher needs to master the methodology of using cross-curricular connections, identify topics in which it is possible and advisable to rely on cross-curricular connections, master the technology of their implementation [9]. Cross-curricular connections make it possible to plan the study of the material, to save precious study time. Knowledge of chemistry and other subjects is concretized, deepened and generalized. Interdisciplinary connections are necessary and important, but the question of their qualitative implementation, as one of the aspects of the general problem of improving teaching methods remains open [10].

A chemistry course with a regional component can be a good way to solve the problem of integrating knowledge dispersed in different courses. One can talk about the emergence of a new subject – chemical local history, that is, a complex of scientific disciplines leading to a comprehensive knowledge of the region, broadening the horizons of students, as well as deepening and concretizing general chemical knowledge of the basic component of the program [11]. Lessons with interdisciplinary connections can be classified into three types. The fragmentary type implies the implementation of connections with other subjects and is carried out at separate stages of the lesson. The core type relies on knowledge from other subjects and constitutes a prerequisite of the lesson. Integrated lesson type synthesizes knowledge from different subjects throughout the lesson.

Each region has its own specific features, which must be reflected in educational plans for chemistry in universities. For example, the structure of production of the chemical industry in Kazakhstan consists of basic chemistry (64%), which includes the production of inorganic acids, alkalis and their salts, explosives. Varnishes, paints and agricultural chemicals (mineral fertilizers and pesticides) account for 21% of production. Petrochemicals are represented by one large enterprise and account for 10% of the total production of the chemical

industry. Consumer chemistry, represented by enterprises producing detergents and cleaning products, accounts for 5%. Zhambyl region is the only producer of phosphorus, phosphoric acid, phosphoric fertilizers and sodium triphosphate. Chromic anhydride, chromium oxide, chrome tanning agent and sodium bichromate are produced only by enterprises of the Aktobe region. The entire republican volume of carbides is produced by Karaganda region; over 90% of styrene polymers and about 70% of nitrogen fertilizers belong to Mangistau region. A significant volume of pesticides is produced by Almaty region including shampoos, hair sprays and detergents.

In this case, it is necessary to take into account the peculiarities of the economic and geographical position of the region; geological structure, relief, climate, inland waters, soils and minerals; features of flora and fauna, problems of the ecological situation and the chemical industry of the region; the history of the region associated with the development of chemistry, chemical science and education; features of the region's labour resources, famous chemists, the role of the region in the life of the country; the listed aspects characterizing the specifics of the region are considered from the point of view of chemistry with the active use of cross-curricular connections and the attraction of students' knowledge in related natural sciences and humanities. The formation of educational programs for each separate region has certain difficulties. The specificity of a particular region may not be clearly expressed, as a result of which, it will be difficult to select the necessary educational material, to set various educational tasks and select objects for laboratory work. Thus, the *zoning principle* will be fundamental in this situation. Chemical industries may be in a poor state of disrepair; scientific institutions can work on narrow specific, inaccessible or closed topics. Therefore, the study areas should be carefully selected for compiling the program. For example, industries intended for study should use advanced science-intensive, environmentally friendly technologies. The scientific work in higher educational institutions should meet the general pedagogical principles [12].

When compiling the educational program for chemistry with regional component, two main approaches are possible: compact and fractional. The first approach creates a unified multidimensional training course. This approach has a number of undeniable advantages in the modern educational environment. Development of the content of education through the transition to a block-modular construction of courses, rational use of study time. The indisputable advantages of the compact course include the possibility of free selection and submission of regional material, full reflection of the specifics of region. It stipulates the formation of a holistic view of the region chemistry; the possibility of intensive use of cross-curricular connections; implementation of a variety of teaching methods; application of a wide range of organizational forms of training [13-15]. When considering a compact version of the distribution of educational material, it is necessary to pay attention to a number of its disadvantages: significant time costs; localization of the course at the end of the educational module; distance of study time from theoretical material. Indeed, for the implementation of such a course, it is important to allocate a certain number of teaching hours with the usual chronic lack of time in higher educational institutions. In this case, it is not about the “interspersed” regional material, but about the allocation of a whole block of classes.

In addition, the study of the region chemistry should be based on the knowledge of students. Thus, it is logical to place the regional component at the end of the training module. However, such placement reduces the effectiveness of students' assimilation of regional material. In addition, the sufficiently long distance of applied material from the theoretical base, reduces the effectiveness of students' understanding of the theoretical aspects of the studied regional material and requires the repetition of the fundamental base. For students to understand the essence of the discoveries of chemical scientists who lived and worked in the region, it is necessary to recall and repeat many concepts, phenomena, laws and reaction equations. Without this, the efficiency of information perception is decreased and the learning goals are not achieved [16].

The second approach is the fractional one, which implies the distribution and localization of regional knowledge and problems through individual educational topics at different stages of training. This approach has obvious advantages. With uniformed supply of regional material; less time spent; increasing motivation when studying the region; full implementation of the principle of communication learned in the classroom. The fractional version provides close relationship between the theoretical material of the basic chemistry program just studied by students and applied regional material. Thus, two tasks can be solved at once: the studied theory is effectively consolidated, and the regional material is perceived with awareness. In addition, with the fractional approach, a uniformed and dosed supply of local material is carried out throughout the entire module. For example, at the beginning of the module, students study “General principles of the structure of organic compounds. The electronic nature of the chemical bond”. After the presentation of the topic, a lesson with the regional component is held, dedicated to the history of chemical science in the region, to the continuity of the development of chemical ideas and knowledge. The course of regional chemistry does not seem artificial to students with such an approach, but it is naturally woven into the basic educational program [17; 18].

The disadvantages of the fractional variant of the distribution of the regional component include the limitations of organizational forms of training; temporary restrictions; content restrictions, and the course loses its independence. Indeed, a fractional approach restricts the types of students’ activities. The implementation of trips and workshops seems problematic and difficult due to program and time constraints. In addition, it is impossible to reflect all the diversity of regional specifics. This lack of freedom can lead to a generic, truncated and artificial course. The fragmentation of the program of the regional component also leads to this. There is no holistic perception by students of the specifics of their region. In this case, the regional component loses its independence and the system of knowledge about its native land. To overcome the disadvantages of two approaches and find

reasonable compromises, the following actions are possible. It covers the creation of integrated course; increasing the share of students' independent design, search and research work; additional repetition and generalization of the main theoretical material; conducting the summary lessons at the end of the module [19-21].

It seems effective to create an integrated course based on subject modules and interdisciplinary connections. Thus, the problem of lack of study time is partially solved. Independent work of students allows the solving of several interrelated tasks: to ameliorate the understanding of the material being studied, to carry out the educational role of teaching, to save educational time. The learning process is a living organism that functions dynamically, and the basic laws of this process are determined by the main fundamental elements – teaching methods [22].

In pedagogical theory, many approaches have been developed to consider the concept of teaching methods. The task of the research is to consider the main teaching methods and their features in relation to the chemistry course with a regional component and various forms of its distribution in the educational environment of the university. When implementing an educational program for chemistry with the regional component, one cannot rely only on traditional methods. Recently, new teaching methods have been developed and substantiated, and old teaching methods in turn have been modernized. Person-oriented learning implies the transferring of training to a subjective basis with an attitude towards self-development of the individual [23-25]. This problem can be solved by such modern methods as differentiated teaching and collective peer learning. The introduction of such methods into practice assumes that the training will result in transformation of the individual image of the world, which should shape the student's mind.

When implementing person-oriented methods, the following conditions must be taken into account: structuring the educational material into semantic blocks; setting educational goals; creation of special educational and cognitive motives; problem setting. *The method of problem learning* is not a new phenomenon in the practice of teaching chemistry [26]. The method of problem learning can be integrated into exploratory learning with a compact and fractional distribution of educational material. A distinguishing feature of this method is the independent activity of students, which must be gradually developed and improved. The course of chemistry with regional component determines the following types of problem tasks. It presumes tasks for the establishment of numerous cause and effect relationships (for example, to identify the period of maximal atmosphere pollution in the region and to explain the reasons of this phenomenon). It also covers the assignments requiring the ability to handle complex judgments (for example, discuss the potential for moving all chemical and petrochemical enterprises outside the region).

When selecting material for the problematic tasks, one can be guided by the following criteria. The problem must be interesting for a particular group of students. It is necessary to take into account the level of preparedness of students. The problem should have several solutions; the problem must be urgent and serious enough to justify the efforts of the whole group over a period. It is necessary to consider the availability of information and interdisciplinary connections. In the practice of teaching a course of regional chemistry, *the method of educational and game activities* can also be used [27]. The game can serve as a means for reality modeling; it is increasing the motivation of learning and organization of educational activities. Games can be applied at different stages of learning. They can also take a small fragment of a lesson, a whole lesson or several lessons. Games can be divided into role-playing (business games) and educational (crosswords, puzzles) ones. The role-playing should be well prepared: the main roles of the participants, the material of the game, reference books are outlined. Regional material can be used quite successfully in such games. Therefore, the fragment of the lesson could be devoted to the “meeting with the regional Akim”. Thus, it is possible to implement the zoning principle: “ecological zoning of the region. Industrial zones of the city. The influence of transport on the ecological situation of the region. Activities of regional environmental organizations. Environmental programs of the government of the Republic of Kazakhstan” [28; 29].

The method of communicative-dialogue activity requires good preparation, quick reaction, the ability to conduct a heuristic conversation from the teacher, and a certain culture of discussion from the group is needed as well. The regional chemistry course has a great potential for the implementation of this method in all variants of the distribution of regional material in the educational process. Each topic studied has many problems and questions that can be applied to conduct educational discussion. For example, a teacher asks students a simple question. Is chemistry harmful or beneficial? During the discussion, the teacher suggests to imagine a picture of the future of the region without the product of modern chemistry and all industries where its achievements are used. The method “by contradiction” can achieve more tangible results in this case than a direct story about the breadth of the application of chemistry. Checking and evaluating the level of students' understanding of the content is a mandatory stage of educational training. The control of the perception of knowledge fulfills not only the ascertaining or checking function. In this case, there is a process of feedback, a process of identifying, for example, the effectiveness of the regional component, the justification for the use of one or another variant of the distribution of material in the educational process or organizational forms and methods of teaching. In other words, control of knowledge assimilation is a criterion for the quality of education.

However, it is important to note that verification has the function of control, education and development. Indeed, in the process of oral or written responses, practical work and research work, the student thinks logically, develops imagination, attention, memory; other cognitive processes are also activated. In addition, any teacher knows what a powerful instrument of education is the assessment of the student's performance. Conceptual integration is essentially a compression tool [30; 31]. Therefore, it was decided to analyze the attitude of university teachers to regional component in teaching chemistry. A poll was conducted among the teachers of chemistry at Abai Kazakh National Pedagogical University. The results of a poll are demonstrated in Figure 1.

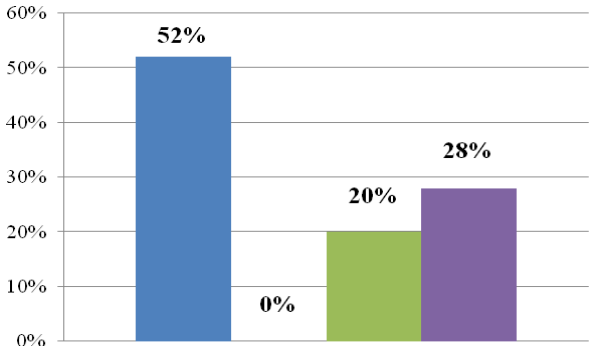

Figure 1. The assessment of using programs for teaching chemistry with regional component and without regional component

Note: 52% – positive attitude to regional component in teaching chemistry; 0% – negative attitude to regional component in teaching chemistry; 20% – programs with regional components and programs without regional component in teaching chemistry have the same level; 28% – difficult to answer the question.

Thus, the conducted analysis allows for establishing that the educational program in chemistry with a regional component in higher educational institutions is an important link of educational training, which provides for the achievement of educational goals. The principles and criteria for the selection of educational material identified in the research process are reasonable and make it possible to implement a chemistry program with regional component in accordance with the stated objectives. Different ways of distributing regional material in the curriculum (compact, fractional) have their own characteristics in relation to the applied methods and organizational forms of educational training. When determining an effective option, it is crucial to pay attention to the features of the object and the subject of study. When choosing a particular teaching method in the implementation of the regional component, the preference should be given to methods with a high degree of student independence. The educational program for chemistry with the regional component in a higher educational institution performs educational and developmental functions, which allow for arguing the universality of the course.

The processing of the results obtained during the post-experimental diagnostic research was based on the mathematical method. It should be noted that the effectiveness of the emergence and improvement of research skills in both groups differed significantly. In particular, the students who were part of the experimental group are characterized by better results, in contrast to the participants of the control groups, in which there was no drastic improvement in the tested skills (Table 1).

Table 1. Indicators of pre- and post-experimental diagnostics

Parameters of research skills assessment after the course of chemistry with regional component	**Cross-section**	**EG**		**CG**	
		Average %	**Differences in development rates, %**	**Average %**	**Differences in development rates, %**
Skills of critical evaluation of data	Pre	2.7%	+2.3	2.7%	+0.6
	Post	5%		3.3%	
Skills of finding, storing, evaluating and using information	Pre	2.3%	+2	2.3%	+1.3
	Post	4.3%		3.6%	
Summarizing skills based on research data	Pre	2.1%	+2	2.3%	+0.3
	Post	4%		2.6%	
Skills in using digital tools in the process of generating ideas	Pre	2.3%		2.7%	
	Post	4%	+1.7	3%	+0.3
Skills of argumentation and persuasion of others	Pre	1.7%%	+2.6	2.1%	+1.2
	Post	4.3%		3.3%	
Skills to distinguish methods of implementation of the obtained data	Pre	2.1%	+2.5	2.3%	+1.3
	Post	4.6%		3.6%	
Average	Pre	2.2%	+2.1	2.4%	+0.8
	Post	4.3%		3.2%	

It was found that by introducing an educational program of chemistry with regional component, expanding and deepening the knowledge of students about their native land. This allows for developing the motivation of students and their interest, for implementing educational tasks and for shaping a sense of patriotism and civic responsibility. The system of realization of cross-curricular connections is considered; the ways of integrating knowledge are proposed and the ways of introduction into the university practice of a complex subject – chemical study of region are outlined, which presupposes the scientific approach. Therefore, by introducing the program of the regional component in chemistry, it is possible to increase the effectiveness of training and the quality of material mastering. In addition, the work proved that the program of the regional component in chemistry made it possible to expand and deepen the knowledge of students about their hometown; to foster a sense of patriotism and civic responsibility. The introduction of the program of the regional component in chemistry makes it possible to increase the importance of the subject and attract the attention of students in higher educational institutions.

The problem of choosing high-quality methods of organizing the educational process, training students in certain areas in modern universities is relevant in the scientific and pedagogical doctrine. Therefore, researchers

have different views on the issue of studying chemistry, in particular, taking into account the regional component. This indicates the presence of common and different approaches to the formation of educational programs of chemical specialties in universities.

In particular, N.I. Gumerova and A. Rompel [32], E.W. Kelley [33] focused on additional disciplines that must be introduced into the training of future chemists. Such activities are aimed at forming the practical skills of future specialists regarding the role of chemical processes in the life of each person, as well as their professional activities. According to the researchers, the implementation of such an approach will have a positive effect on the motivation of students to study both general education and elective subjects. The combination of additional classes with the main ones will increase the level of competitiveness of candidates in the modern labor market.

The researchers claim that the development and implementation of special chemical educational disciplines will help students of higher education institutions to better understand the requirements of employers for their profession. In this context, it is necessary to take into account the regional peculiarities of the professional direction, as well as the labor market. Based on this, the researchers believe that thanks to the implementation of selective academic disciplines in universities, it will be possible to reorient educational activities on regional principles. The conclusions made in the work and in the cited article have common features. Thus, the description of the importance of the regional component in the process of training students of chemical specialties converges in both studies.

In contrast to previous researchers, A.S. Getie [34], R. Zhang and D. Zou [35] analyzed the regional component in the educational system from the point of view of learning a foreign language. They claim that the use of such an approach in linguistics is one of the priority vectors for the development of education as a whole. This is explained by the fact that the process of learning a foreign language involves not only mastering another language, but also the culture and mentality of another nation. As a result, this approach is the most popular among universities when organizing the educational process. Researchers claim that this involves the spread among students of the understanding of multiculturalism, which contributes to their educational and general cultural development. Special attention was paid to the study of the concept of “regional component”. The priority of its definition is due to the fact that there is still no single interpretation of it in scientific doctrine, since the content of this category depends on the sphere of social life in which it is used. Based on this, it is advisable to describe the regional component in educational programs in two forms. The first, as a result of the student's activity in the process of determining the structural aspects of education.

According to the researchers, the second form of the regional component is revealed as an element of the content of educational disciplines of the basic curriculum related to the study of information about a specific region. As part of their work, the scientists conducted a review of methodological developments, on the basis of which they came to the conclusion about the expediency of implementing such an approach in educational planning at the expense of quality material and data on regional features in a foreign language. They give the following examples, namely, the educational material should relate to the culture and traditions of a specific region, as well as its geographical and historical features. Based on the above, the regional component in the modern educational process, which is formed and developed in the conditions of global integration, must take into account the general theoretical principles of the educational material and its practical properties determined by the specifics of the region. The identified position is intertwined with the results presented in the framework of this scientific work. For example, the description of the essence of the regional component and its role in the educational activities of students coincide in the two studies.

B.T. Lau et al. [36] drew attention to the peculiarities of the introduction of a regional component into the process of studying chemistry by university students. In his opinion, this approach does not involve significant changes that deform the traditional system and approaches to education. He claims that in educational programs for the study of chemistry in the regions, the component occupies the place of both basic and additional education at the same time. Meanwhile, requirements are established for the person's possession of both educational and educational properties. According to the researcher, this approach contributes to the improvement of the quality of higher education, which acquires features that provide the ability to adapt the educational environment to environmental changes. In addition, the regional component plays an important role in the formation of professional competence of future specialists. This is explained by the fact that it affects students' in-depth study of branch disciplines, taking into account general and special material. The researcher claims that this has a positive effect on chemical educational disciplines as well, because they are updated and improved. This increases the popularity of such professional areas among applicants. Based on this, he emphasizes the priority of building future educational programs based on the regional component, with the aim of improving the quality of education at universities. The implementation of this method is characterized by certain features, as it requires modification of educational materials and information and technical means for the implementation of educational activities.

Thus, for the effective implementation of the regional component in educational programs of universities, it is necessary to analyze the current state of educational programs in chemistry and modify them in accordance with modern conditions and features of the region. The described conclusions correspond to the results obtained in the course of this study. This indicates that the formation of educational programs considering the regional component implies qualitative changes in the educational activities of students studying chemistry. Based on the works described above, it can be stated that the regional component is an important aspect of various educational directions and programs. This indicates that it can also be used during the training of chemistry students at universities to improve the quality of their knowledge.

Conclusions

Thus, practical research based on theoretical developments allows for confirming the correctness of conceptual provisions. The article substantiates that the regionalization of the educational process is a priority vector, on the basis of which the development of the educational environment and its structural elements is possible. In addition, the research results, the main goals and tasks of the regional component of the chemistry educational program of higher educational institutions were analyzed; the need for theoretical substantiation and practical development of the above-mentioned program was revealed. On the basis of the analysis of various literary sources, as well as pedagogical experience, general principles and criteria for the selection of educational material for the educational program in chemistry with a regional component were developed. On the basis of the experiment, the effectiveness of the proposed model of teaching chemistry with a regional component in a higher educational institution was proven.

In addition, the scientific paper considered compact and fractional options for the localization of the regional component in the chemistry education program of higher educational institutions, their positive and negative features. The peculiarities of the teaching methodology of the course are revealed, the forms of organization of training according to the regional component in the chemistry lessons at the higher educational institution are proposed, the peculiarities of knowledge testing and assessment of the level of assimilation of the course content are considered. A promising direction of further scientific research is the process of development, approval and implementation of a chemistry textbook with a regional component for higher educational institutions.

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Conflict of Interest

None.

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Освітня програма для викладання хімії з регіональним компонентом у вищих навчальних закладах

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Анотація

Актуальність. Дослідження присвячене впровадженню регіонального компонента в освітні програми з хімії у вищих навчальних закладах Казахстану. Його актуальність зумовлена необхідністю вдосконалення та оновлення університетської хімічної освіти з урахуванням регіональних особливостей.

Мета. Метою наукової роботи є дослідження цих проблем та пропозиція конкретних шляхів удосконалення та оновлення системи університетської хімічної освіти на основі ідеї регіоналізації.

Методологія. Методологія передбачала триетапне експериментальне дослідження, проведене в Казахському національному педагогічному університеті імені Абая, в якому взяли участь 60 студентів другого курсу біоорганічних спеціальностей, поділених на експериментальну та контрольну групи. Дослідження включало анкетування, оцінювання навичок студентів, реалізацію змодельованої програми з проблемними завданнями та самостійними дослідженнями.

Результати. Результати показали, що включення регіонального компоненту в хімічну освіту розширило знання учнів про свій регіон, підвищило мотивацію та зацікавленість, а також сприяло вихованню патріотизму. Експериментальна група продемонструвала значне покращення дослідницьких навичок порівняно з контрольною групою.

Висновки. У дослідженні зроблено висновок, що регіоналізація хімічної освіти може підвищити ефективність навчання та засвоєння матеріалу. Воно рекомендує впроваджувати регіональні компоненти в програми з хімії для підвищення актуальності предмета та залучення учнів. Дослідження також підкреслює важливість вибору відповідних методів навчання та організаційних форм при включенні регіонального матеріалу в навчальні програми.

Ключові слова: природничі науки; територіальний принцип; метод навчання; експериментальна робота; опитування учнів.