ISSN: 2578-7365

Research Article

Journal of Chemistry: Education Research and Practice

Development the Professional Competence of Students on the Continuous Natural Scientific Education in the Uzbekistan

Muzafar Sharipov

Faculty of Natural Sciences, Department of General and Inorganic Chemistry, Bukhara State University, Bukhara city, Uzbekistan

***Corresponding author**

Muzafar Sharipov, Faculty of Natural Sciences, Department of General and Inorganic Chemistry, Bukhara State University, Bukhara city, Uzbekistan

Submitted: 26 July 2021; **Accepted:** 05 Aug 2021; **Published:** 11 Oct 2021

Citation: *Muzafar Sharipov (2021) Development The Professional Competence of Students on the Continuous Natural Scientific Education in the Uzbekistan. J Chem Edu Res Prac 5: 104-111.*

Abstract

The article summarizes the experience of teaching natural science disciplines for various areas of training of students in pre-university educational institutions. The purpose of the disciplines "Chemistry", "Physics" and "Biology" is to form a holistic natural science worldview among students, which determines both the scope of tasks and the list of general cultural and general professional competencies being formed. The study revealed that in lyceums that implement continuing education in the "college-university" and "lyceum–university" systems, it is advisable to study general subjects of the natural science cycle at two levels: basic and advanced degrees. The study showed that in the course of general education natural science disciplines, it is advisable to allocate professionally significant information in a separate block (module).

Introduction

The strengthening of integration processes in the global education system, the transition to a market economy made it necessary to modernize the nationalы education system based on the competence approach [1]. The ongoing transformations require improvement of teaching and subjects of the natural science cycle. The competency-based approach in education, as opposed to the concept of "assimilation of knowledge" (and in fact the sum of information), involves the development of skills by students that allow them to act in new, uncertain, problematic situations for which appropriate tools cannot be developed in advance. They need to be found in the process of resolving such situations and achieve the required results.

The competence-based approach is an enhancement of the applied, practical nature of all school education (including subject-based learning). This direction arose from simple questions about what results of school education a student can use outside of school [2]. The key idea of this direction is that in order to ensure the "long-term effect" of school education, everything that is studied should be included in the process of use, use. This is especially true for theoretical knowledge, which should cease to be amere baggage and become a practical means of explaining phenomena and solving practical situations and problems.

The main value is not mastering the amount of information, but mastering the skills of students that would allow them to determine their goals, make decisions and act in typical and non-standard situations. The question of traditional teaching - "What to teach?" - becomes less relevant. The competence-based approach focuses on the activity-based content of education, which requires a different formulation of the question, namely, "What methods of activity should we teach?" [3]. In this case, the main content of training is actions, operations that relate not so much to the object of effort, but to the problem that needs to be solved. Not the usual "should know", "should be able to", but "can".

In educational programs, the activity content of pre-university education is reflected in the emphasis on the ways of activity, skills that need to be formed, on the experience of activity that should be accumulated and understood by students, and on educational achievements that students should demonstrate.

The most important feature of the competence approach is the ability of the student to self-study in the future, and this is impossible without obtaining deep knowledge [4]. However, the role of knowledge is changing. Knowledge is completely subordinated to skills. The content of training includes only the knowledge that is necessary for the formation of skills. All other knowledge is considered as reference, it is stored in reference books, encyclopedias, and the Internet, and not in the minds of students. At the same time, the student should be able to quickly and accurately use all these sources of information to solve certain problems.

Sources

The main concept for the competence approach is the concept of

"competence", which is new for Russian pedagogy, i.e. readiness to act in a situation of uncertainty. It is possible to identify key competencies that are universal and applicable in various life situations [5]. This is a kind of key to success. There are not so few core competencies, but they all consist of four elementary core competencies:

- Information competence – readiness to work with information;
- Communicative competence – readiness to communicate with other people, is formed on the basis of information;
- Cooperative competence – willingness to cooperate with other people, is formed on the basis of the previous two;
- Problem competence – readiness to solve problems, is formed on the basis трèх of the previous trs.

The strategy for modernizing education in Uzbekistan assumes that the updated content of general education will be based on "key competencies":"The main result of the activity of an educational institution should not be a system of knowledge, skills and abilities in itself, but a set of key competencies declared by the state in intellectual, socio-political, communication, information and other spheres" [6].

One of the leading areas of modernization of the education system in Uzbekistan is the creation of a system of improved secondary vocational education [7]. At a joint meeting of the State Council and the Commission for Modernization and Development of the Republic's education system Uzbekistan On August 16, 2017, President Shavkat Mirziyoyev said that " one of the key principles for the development of vocational education is its continuity." And in this direction, one of the most important tasks is to create chains in the field of education, namely the school – lyceum – university or school – college- university chain, whose participants should work in direct contact with employers.

An indicator of the quality of training of a specialist, which determines his behavioral qualities in the labor market, is professional competence [8]. By professional competence, we mean an integral quality of the individual that characterizes the possession of key and professional competencies. It is competence that characterizes the professionalism of a specialist. A competent specialist is distinguished by independence, responsibility, the ability to create, the desire for constant updating of knowledge, mastering new information for successful solution of professional tasks, both in standard and problem situations.

At the same time, the competence of a future specialist should be formed in the course of training not only in special, but also in general education, including natural science disciplines. However, competence is inextricably linked with the experience of successful activity, which during training in a pre-university educational institution and further education at the university, the student cannot acquire in the proper amount [9]. Improving the level of professional competence depends on the individual abilities of the individual, the ability to use available opportunities and occurs at all stages of education.

Since natural science education, including those obtained in the framework of general education training, is aimed at developing intellectual potential, general culture, and technical skills, one of the most important tasks of its reform is to focus on continuous improvement of professional competence. For the successful formation of professionally significant qualities of an individual, it is necessary to determine the organizational and pedagogical conditions that will ensure the effectiveness of this process. This is the basis of the present study.

Background of the Study

In the context of this study, organizational and pedagogical conditions are understood as a combination of the content and structure of subject education, educational and methodological support and an innovative educational environment that ensure the successful solution of the set didactic tasks.

The formation of a competent specialist of a new generation is impossible without a holistic educational space: the continuity of general education with professional education at various levels and stages [10]. Continuity implies consistency between the goals, content, methods and forms of teaching in pre-university, post-university and post-university educational institutions. In our opinion, the problem of interrelation of education can be successfully solved through the implementation of the following types of continuity:

- motivational, contributing to the development of educational needs, cognitive interest;
- meaningful, consisting in the formationofstudents ' knowledge, practical and intellectual skills, as well as components of creative activity and an emotional and valuable attitude to the environment;
- organizational and technological - in the forms, methods and methods of organizing students ' educational activities at each stage of training.

Natural science education in the framework of general education training can be carried out through the system of continuing professional education according to the scheme: basic education (incomplete general secondary) → pre-university professional education (primary or secondary) → university education. In modern conditions, graduates of professional lyceums, colleges, and technical schools should possess not only the knowledge and skills necessary to ensure the competitiveness of their products, but also be competent in implementing and updating their knowledge [11]. In the current social environment, this is important for an individual's professional growth.

Competence is realized in the process of various types of activities (acquisition, transformation and use of knowledge), so the structure of competence includes a motivational component [12]. When implementing the competence approach in education, motivation is a subjective, conscious reason for the actions of a graduate of a pre-university professional educational institution. From the standpoint of axiology (the philosophical doctrine of values), we consider competence as an educational value. For students of professional educational institutions who have consciously chosen a specific field of professional activity, what is valuable is what allows them to prepare themselves for such activities to the greatest extent.

The study of chemistry, physics and biology in institutions of pre-University vocational education (vocational schools, colleges, technical schools) and universities, technical profile contributes to the development of the foundations of the future profession, develops thinking, allows us to more deeply understand the patterns of the world, to optimally solve chemistry problems of environmental education, to contribute to the implementation of labour and Patriotic education [13].

Values are personal meanings-they cannot be formed either by sending messages or by direct material influence. They are developed on the basis of personal experience, experiences, and cannot be accepted ready-made [14]. If the individual plans to increase professional competence "vertically", then studying this discipline at a higher level of knowledge will significantly increase the motivation to study this subject. At the same time, the student has a goal, to achieve which he takes the initiative.

As shown, new knowledge is transformed into cognitive value, which becomes determinative in the process of motivation, turns into a need and contributes to the acquisition of new knowledge and involvement in qualitatively new activities [15].

Social Context

As the educational level increases, personal values expand and include more and more social values in their circle and gradually turn the student into a socially active individual. For the student, the depth of relations becomes clearer: man-technology, man-nature, man-society, society-nature, science-nature, science-culture, culture-art, science – art, etc. As a result, students are more motivated to study the disciplines of the natural science cycle due to their awareness of the need to apply the acquired fundamental knowledge in their future professional and daily activities [16].

The value attitude to natural science knowledge formed at this level of training provides a scientific worldview; social activity of the individual; determines the type of behavior and activity based on cultural, universal (moral, religious, ethical) and social (industrial, economic, legal, political) values, contributing to the formation of axiological competence of the individual. The result of such training is an increase in the professional competence of students. Based on the above, we will display the stages of professional competence formation:

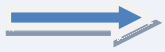
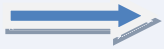
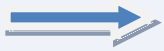
Value groups Personality-Based Formation Axiological information
orientations → Meanings → Motivation → Competencies → Competence

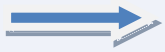
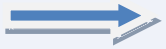
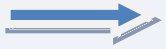
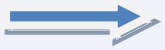
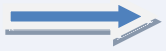
In this case, the acquired knowledge and skills in chemistry, physics, biology and other subjects of the natural science cycle are not the result of education, as in traditional training, but a means of solving problems in the future professional and daily activities of a specialist, in the continuation of education, and in the diversification of the profession.

Problem Statement

In the system of continuing education, pre-university training of graduates of an educational institution is of great importance for the implementation of meaningful continuity [17]. The selection of the content of general education disciplines in pre-university professional educational institutions is dictated by the goals of training a competitive, competent specialist.

Table 1: Model of an Activity-Based (Competence-Based) Training Session

1. Self-determination to work		Organization of positive self-determination of the student to the activity in the classroom: • Creating conditions for students ' need to participate in activities ("I want") • Content area selections ("I can")
2.Updating knowledge and fixing difficulties		• Updating knowledge, skills and abilities that are sufficient to build a new way of doing things • Training of appropriate mental operations • Creating a problem situation, fixing students ' difficulties in individual activities
3. Setting a learning task or problem situation		• Students ' correlation of their actions with the existing algorithm, method of activity for studying theoretical material, its structuring, and performing a practical task • Students ' identification and recording of the causes of difficulties • The teacher organizes students ' communication activities to investigate the problem situation that has arisen • Defining the purpose of the activity and forming the lesson topic

4. Building an exit project for their problem situation, difficulties		• Making and testing hypotheses • Organization of collective activity of students, during which a new method of action is built and justified • Fixing a new method of action in oral and written form
5. Primary consolidation of educational material		Students ' performance in the form of communicative interaction of standard tasks on new ways of action with a discussion of the steps of action and the results obtained
6.Independent work		Using an individual form of work: • Independent performance of tasks by students to apply a new method of action • Performing a self-test, step-by-step comparison with the sample • Evaluating your own independent work
7. Adding new knowledge to the system and repeating it		• Integrating new knowledge into the knowledge system • Working out previously studied algorithms
8. Activity reflection (lesson summary)		• Organization of students ' self-assessment of activities in the classroom • Fixing the degree of compliance with the set goal and the results of their activities

The study revealed that in pre-university educational institutions, in particular, in lyceums that implement continuing education in the "college – university or lyceum-university" system, it is advisable to study general subjects of the natural science cycle at two levels: basic and advanced [18]. The basic level provides the level of general secondary (full) education in a given subject area; thedeep level-practically provides the level of subject training in a university of the corresponding profile. This level is realized through the development of the program of the integrated course of secondary and higher professional educationdeveloped by us, and its development contributes to the better adaptation of lyceum graduates to the study of natural science disciplines at the university.

A certain consistency in the arrangement of educational material, connection and consistency in the presentation of each structural element of subject education, based on previously acquired knowledge, ensures the transition from previous knowledge to new, more generalized ones. Basic and advanced levels are studied on the basis of the didactic principle of content profileness, which implies the inclusion in working curricula of information related to the application of natural science knowledge in the future professional activity of a particular specialist [19].

Table 2: Model of Implementation of the Competence Approach in The Teacher's Pedagogical Activity

The competence-based approach in educational activities is aimed at the formation of students subject competencies.	Competenceый based approach
The formation of competencies is realized through the organization of students ' activities (the activity approach is implemented on the basis of maximum inclusion of classes, practical works, excursions in the educational process).	Formation of competentions
Student's activity is most effective if there is interest, motivation, and development of independent cognitive activity (educational and cognitive competence) among students.	Student activity
Student's interest can be aroused through a problem situation (question, task), research task, or experiment.	Interest in student activities
Solving problem situations contributes to the development of skills in research and experimental activities (research competence is based on "skill", as a person's readiness for certain actions based on existing experience)	Problem situation of research and experimental activities

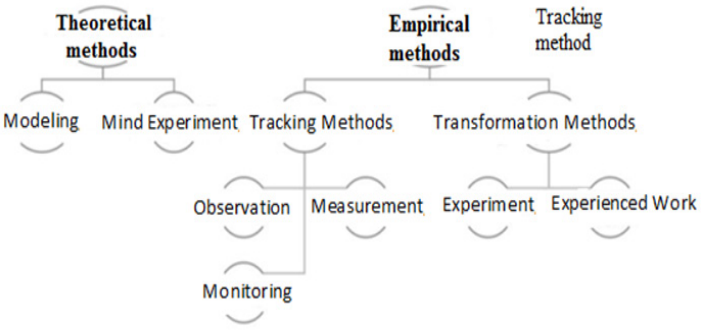
This principle is important for the implementation of not only meaningful, but also motivational continuity. When implementing the principle of meaningful profileness in training, an individual learns the system of professional knowledge that he needs, since without this he will not be able to competently implement his future activities, which significantly increases the motivation to study subjects of the natural science cycle. It should be noted that already in an educational professional institution of pre-university training, through chemistry, physics as subjects studied, professionally significant personal qualities of a future technical specialist are formed [20].

Continuity in the study of chemistry and physics is ensured by both meaningful integration of the corresponding course with subjects of general education and professional training, and meaningful differentiation by the nature of future professional activity of specialists in a particular profession in secondary and, accordingly, in a higher professional educational institution [21]. Such an integrative-differentiative approach to the implementation of continuous general education natural science training in the "college – university" and "lyceum-university" systems is implemented through block-modular course construction, which is actively introduced into teaching practice in secondary professional and higher educational institutions in connection with the transition to competence-based learning.

Results and Discussion

Our research has shown that in the course of general education natural science disciplines, it is advisable to allocate professionally significant information in a separate block (module). For example, a chemistry courses at technical colleges, both basic and advanced, may contain the module "Chemistry in the profession..." or " Chemistry of elements and their compounds used...".

This makes it possible to update students ' knowledge on the properties of materials that are important for a particular area of professional training, which increases the level of cognitive and motivational components of competence. This approach to updating the content of education is essentially modular and competency-based, as it contributes to the formation of professional competence of future specialists in a specific field of professional activity. This structuring of the chemistry course allows an individual to independently study this science in accordance with their interests and needs, and build their own picture of the world [22].



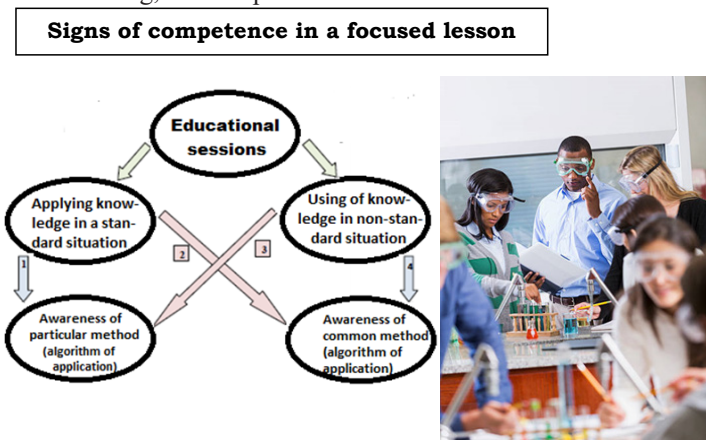
Scheme 1: Model of Scientific Knowledge in Teaching the Basics of Chemistry

An important role in the implementation of continuous general education training of students is played by organizational and technological continuity, formed by the components of interaction between the subjects of training (the teacher and the student): methods of teaching, means of teaching, forms of organization of the subject educational process [23].

Continuity in the continuous educational process implies a set of organizational and methodological measures necessary for the most successful continuation of the education of graduates of pre-university educational institutions at the university. In our opinion, the main ways of organizing the educational process in lyceums, colleges, and technical schools are as follows.

Use of University Forms of Education

It is advisable to build classes for the primary assimilation of the material according to the type of lecture, thereby forming students ' elementary skills of reducing and compressing information. Written recording of educational information teaches you to focus on the main thing, avoid repetition.



Scheme 2: Signs of Competence in a Focused Lesson

Various forms of control over the assimilation of educational material can be used: colloquium, dispute [24]. Experience shows that university students who are introduced to the basics of discussion in college are more confident in answering seminars, tests, and exams. For the same reason, it is necessary to include elements of research work in the educational process: essays, reports, reports. However, taking into account the age characteristics of students at the initial stage of training in pre-university educational institutions, combined lessons are most effective: lecture and seminar classes, interview seminars, etc. The acquisition of basic technical skills, as well as the development of creative potential, is facilitated by conducting practical and laboratory work, which is given great attention at the university.

Use of Interactive Teaching Methods

These methods are focused on broad interaction of students not only with the teacher, but also with each other and on the dominance of students' activity in the learning process. The construction of the educational process in college based on the reproductive method of teaching leads to the fact that college graduates take a long time to adapt, experience significant difficulties during their studies at the university. Therefore, we suggest the following lesson structure (Table 3).

Table 3: Structure of an Interactive Lesson

Lesson stage	% of the time	Methodological goal	Sample methods
Stage 1 Motivation	5 %	Focus your attention and arouse interest in studying this topic	• ”Blitz Question“ • " Microphone“ • "Brainstorming session "
Stage 2 Announcement of topics and tasks	5%	Provide students with an understanding of their activities, what they should achieve as a result of the lesson	Through the epigraph, word, title
stage 3 Getting the necessary information	5%	Instructing students to complete a task	• Presentation of a homework assignment • Getting to know the handout • Mini-lecture
stage 4 Interactive task	60%	Practical assimilation of the material	• ”Aquarium" • “Press” • “Carousel” • Stimulation • The debate • Workshop • “Snowball” • "Microphone” • " Project protection” • Working in small groups
stage 5 Summing up	25%	Discussion to consolidate	• the "Big Circle" material “ • Unexpected offer” • “Snowball” • “Creative task” • “Project” • “Press”

This is due to the fact that students initially assimilate the empirical knowledge and skills offered to them in a ready-made form and only then proceed to their generalization and application in various specific situations. For the development of creative activity of an individual, which is necessary for the implementation of successful cognitive activity, both in college and in higher education, the educational process in pre-university educational institutions should be carried out using interactive methods within the framework of personal-oriented developmental learning technologies [25].

This approach assumes the need to ensure maximum activity of the student himself (involvement in project activities, performing situational tasks, participating in conferences, discussions, games, etc.) in the process of competence formation. This increases the level of professional competence and self-confidence as the basis for personal growth.

Involvement of University Teachers

In the educational process, it is stated that the organization of classes in fundamental and specialized disciplines by specialists of higher educational institutions contributes not only to improving the level of general education training and career guidance, but also ensures the effectiveness of adaptation of applicants to the conditions of higher education [26].

It should be noted, however, that currently there is practically no educational and methodological literature containing practice-oriented situational tasks that allow you to form at this level of knowledge and assess competence.

As the study showed, the effectiveness of improving professional competence in teaching" non-core " disciplines of the natural science cycle in the system of continuing education is promoted by the following organizational and pedagogical conditions.

- Continuity of the educational process, ensuring consistency between the goals, content, methods, forms and means of teaching at all levels.
- Updating the content of education based on the principle of content-based profileness in teaching subjects of the natural science cycle in pre-university professional educational institutions, thanks to which an individual forms a system of professional knowledge and a value attitude to the process of cognition.
- Modular-competence approach to structuring the content of natural science education in accordance with the characteristics of the future profession of a specialist.
- Use of university forms of organization of the educational process, as well as methods that increase the level of independent activity, develop independence, cognitive interest yin students.
- Sufficient material and technical base of the educational institution, ensuring the organization of training on a competence basis.

The Resolution of the President of Republic of Uzbekistan «On measures to improve the quality of continuing education and the effectiveness of science in the areas of "chemistry "and" biology "» solves some of the above problems for natural sciences [27].

Conclusion

In conclusion, it should be noted that the organizational and pedagogical conditions discussed above for improving professional competence in the process of continuous natural science education are not the only ones, but, as practice shows, they are optimally combined and give a positive effect when studying chemistry not only in the "college – university" system but also in lyceums very effectively.

The results obtained taking into account characteristics of the study subjects can be applied to other objects of natural-science cycle (chemistry, physics, biology, etc.) and mathematics in modelling continuous education systems have integrated various levels of education, for example, "School-Lyceum– University " or "school – College – University".

References

1. Myachin DA, Fedorova IV (2010) Competence-based approach in global education systems. Scientific notes of the St Petersburg branch of RTA 37: 154-167.
2. Dautova OB (2008) Step to yourself: New challenges of modern school education: Scientific and Methodological materials. S Petb: OOO "Knizhny Dom".
3. Serikov VV (2003) Competence model from idea to educational program. M Pedagogika 10: 8-14.
4. Elkonin BD (2002) The concept of competence from the perspective of developing learning. In monog Elkonin BD, Modern approaches to competence-based education, Krasnoyarsk.
5. IA Zimnyaya (2004) Key competencies as the effective-target basis of the competence approach in education. M: Research center of problems of quality of training.
6. Karimov IA (2010) The concept of further deepening of democratic reforms and the formation of civil society in the country. Tashkent 2010: 259-260.
7. Bazarova GG, Yuldasheva F Kh (2015) Development of the education system in the context of modernization. Eurasian Scientific Journal 12: 67-72.
8. Technical and vocational education and training in the XX-I century. Recommendations of UNESCO and the International Labor Organization. (2003) Moscow: Center for Studying the Problems of Professional Education 2003: 83.
9. Alieva NZ (2008) Postnonclassical natural science education: conceptual and Philosophical¬ foundations. Moscow: Academy of natural sciences 2008: 512.
10. Ruzmetova NV (2020) Development of socio-cultural competence as a condition for the formation of professional competence of students in Uzbekistan. Secondary vocational education 301: 62-65.
11. Zeer EF (2005) Competence-based approach to modernization of professional education. Zeer E, Symanyuk B, Higher education in Russia 4: 23-30.
12. The concept of modernization of Russian education for the period up to 2010. (2002) M 2002: 24.
13. Sharipov MS (2015) Dilution of the ability to solve computational problems in chemistry as a method of improving chemical competence. Mater Repub scientific and practical conf “Improving the professional competence of teachers working in the system ofыhigher and secondary special education”, Bukhara 2015: 20-23.
14. Bobienko OM (2005) Key competencies of the individual as an educational result of the professional education system: Dis. ... cand ped sciences Kazan 2005: 185.
15. Kagan MS (1997) Philosophical theories of value. Saint-Peterburg 1997: 204.
16. Konstantinovsky DL (2005) Improving sociological education: an analytical report. DL Konstantinovsky, AA Ovsyannikov, NE Pokrovsky, Moscow: "Logos" 2005: 84.
17. Krasilnikova NV (2010) Pre-university training of students as a means of developing a regional system of continuing educa-

tion. Abstract of the Thesis of disser. ... phyl doc ped sciences Saransk 2010: 19.
18. Dvulichanskaya NN (2007) Chemistry course program for secondary vocational education institutions (colleges) technical direction. under the scientific editorship of Prof Tupikina, Moscow: Dom pedagogiki Publ 2007: 51.
19. Simonov VM (2000) Didactic foundations¬вы of natural science education: dis. ... Doctor of Pedagogical Sciences: Chelyabinsk 2000: 403.
20. Pavlova AP (2004) Formation of professionally significant qualities of technical college students in the process of teaching physics: Dis. ... phyl doc ped Nauk: Tolyatti Publ 2004: 190.
21. Lyusev VN, Mishin AV (2012) Problem-based training as a method integrating educational and production activities. Proceedings of the Penza State Pedagogical University named after VG Belinsky 28: 856-859.
22. AM Novikov, DA Novikov (2009) Methodology of scientific research. Moscow: Librocom 2009: 76-105.
23. Usova AV (2005) Theory and practice of developing learning: a course of lectures. M Publishing house "Pedagogica" 2005: 128.
24. Mikhelkevich VN, Kravtsov PG (2001) Targeted functional-oriented training of specialists at a technical university. Samara: SamSTU Publ 2001: 112.
25. Bondarevskaya EV (2000) Theory and practice of personality-oriented education. Rostov-On-Don: Rostov Pedagogical University Press 2000: 352.
26. Sharipov MS, Djiryeva D (2021) Formation of chemical competence in the study of analytical chemistry in academic lyceums for the training of laboratory assistants // Collection. Of Thesis of the international scientific and theoretical conference: "Kuatbek Readings-1: Lessons of Independence". Republic of Kazakhstan 2021: 74-77.
27. The Resolution of the President of Republic of Uzbekistan «On measures to improve the quality of continuing education and the effectiveness of science in the areas of "chemistry "and" biology "». (2020) Tashkent 2020: 4805.