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DEVELOPMENT OF SCIENTIFIC COMPETENCE OF STUDENTS BY USING THE RESULTS OF RESEARCH ON HUMIC SUBSTANCES IN THE EDUCATIONAL PROCESS

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Abstract. This paper examines the use of humic compounds in research activities as a ways of shaping students' research skills.

A precondition for the analysis is to determine the research capabilities of undergraduate students, which will lead to the growth of an objective systematic phenomenon of learning. The research findings of this paper present objective knowledge as expressed in the conceptual framework of chemical education. To illustrate the meaning of scientific ability, we will investigate how undergraduate students in chemistry develop study abilities through diverse experiments. On the basis of the examination and abstraction, the relationship between undergraduate students' developments in scientific capability and their academic efforts is identified. In the procedure of higher learning, bachelor students' scientific engagement is organized, and study capabilities are developed by employing successful problem-oriented teaching approaches.

One of the most understudied difficulties in practice is the use of technology for establishing a competence-based strategy for student training. The formation of competencies that make up the integral structure of personal and professional characteristics for the successful performance of educational functions. One of the key objectives is to develop the academic skills for prospective professionals in higher education institutes. The primary lines of learning have changed as society has evolved, and in accordance with this, the best specialist with a higher education is required to improve his knowledge.

Key words: search and research activity, competence approach, formation, research competence, research activity, integration, humic, research skills

Introduction

When we talk about research competence, we rely on two main concepts underlying the disclosure of the definition of "research competence": the competence approach and competence. In the understanding of D. A. Ivanov, the competence approach is defined as an action, the approach is the result of education, and the result is not the amount of information received, but the ability of a person to act in various situations. In turn, competence is a set of practical skills that can be described as a person's ability to direct their knowledge and abilities.

Kazakhstan is now in the early stages of developing its scientific capacity. In this regard, the work outlines and thoroughly investigates specific elements of the the writer's strategy for developing scientific proficiency. A.V. Khutorskoy defines "competence" as a social requirement imposed in advance to education, expressed in a collection of interconnected conceptual directions, understanding, abilities, and background, and "competence" as mastery, mastery of the relevant competence,

carried out with the direct participation of the student (A.V. Khutorskoi, 2003: 58-64) [1]. S.G.Vorovshchikov emphasizes that it is better to distinguish the concepts of "competence" by potentially relevant, cognitive-personal, set-learned. Competence generates directions, tasks, roles, tasks that must be solved. Competence is the content of the competence that needs to be mastered. Competence in this case is understood as the successful implementation of activities for the implementation of a specific competence. (S.G.Vorovshchikov, 2007:81-103), (Ushakov A.A., 2008) [2,3].

Clarification and systematization of the term of academic ability has a great impact on improving the educational and investigative abilities of learners in the preparation of a future specialist. Although numerous investigations have already been undertaken on the development of learners' academic competence, this issue has not been studied in theory and practice. Currently, there is no clear understanding of the of the improvement of scientific skills.

A.V. Khutorsky defines research proficiency as the outcome of an individual's ability to think in a particular area of science, achieving the level of the scientific ability essential for comprehension of investigation techniques and approaches, roles, and importance positions that a person must acquire for the purpose conduct experiments. (A.V. Khutorskoi, 2003: 58-64) [1]. That is, research competence is a set of knowledge in a specific field, the presence of research skills (vision and problem solving based on the nomination and explanation of speculations, setting objectives and organizing, data collection and analysis, experimentation, and presentation of investigation outcomes), and the capacity to employ this information and abilities in a particular field of study.

The author believes that research competence is a quality determined in the assimilation of a new system of understanding according to previously acquired expertise, abilities, and knowledge.

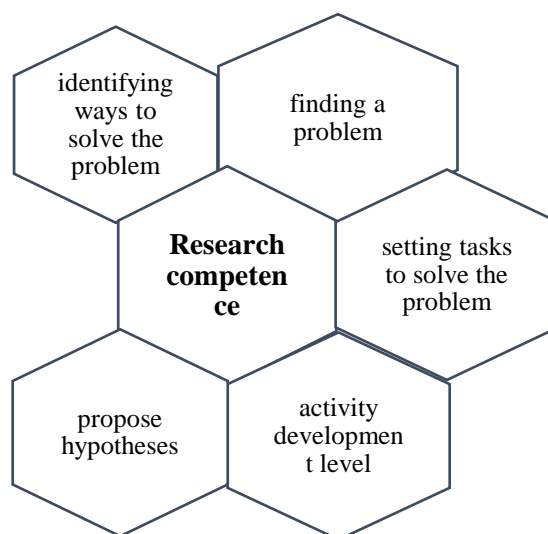


Figure 1 - Research proficiency refers to the degree of improvement in mental processes and academic procedures.

Materials and methods

The creation of a learner's competency framework for the use of methodological strategies based on scientific competencies in the course of study serves as the foundation for conducting research in chemistry. The purpose of implementing a competence-based approach in the chemistry instruction process is to form a system of students' competencies corresponding to this educational field.

The ability to effectively use learned researching expertise and abilities in practical settings is known as research competency. Research proficiency is demonstrated by philosophical education, proficiency with psychological and educational research methodologies, the capacity to analyze data from experiments quantitatively, make inferences, and represent research findings (O.A.Ostylovskaya, V.A.Shersheva, 2016: 85-90) [6]. Research ability is a pedagogic attribute. He demonstrates that an interpersonal didactic places a high priority on scientific effort, particularly on himself as a topic. The developed knowledge of research aids in accurately determining the goals and targets of the challenge under examination, selecting the required literature, choosing techniques for diagnosis, anticipating the likely outcome, and developing the phases of rehabilitative activity.

Conducting research is impossible without action. The activity component of research competence includes the ability to investigate, i.e. conduct a scientific search, develop the content, logic, research program, choose and apply a scientific method, set up an experiment and process its results, analyze from a scientific point of view, draw conclusions and present the work, present it. (E.N.Lekomtseva, 2009: 92-96), (A.Letina, 2020) [4,5].

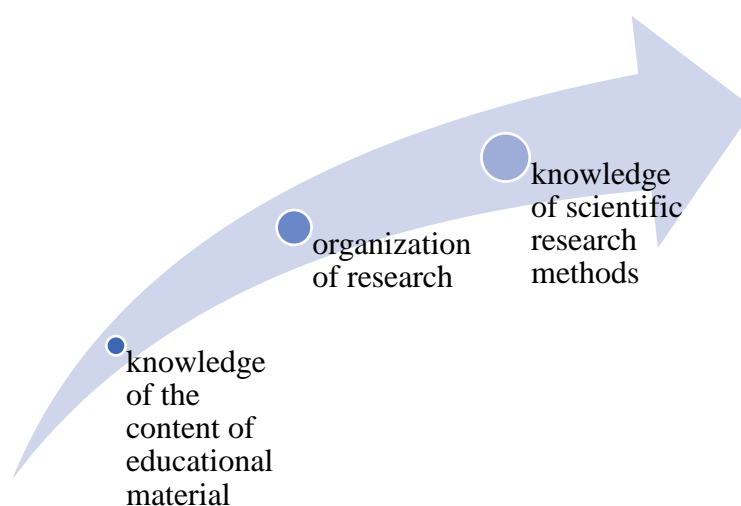


Figure 2 - The elements that make up the intellectual aspect of research competency

The research competence-based technique increases learners' pragmatic perspective, emphasizing the importance of gaining practical skills and the capacity to use information in action. As a result, the improvement of a student's abilities and growth after obtaining their degree constitutes the foundation of their academic educational ability.

It needs to be mentioned that the collection of competences developed by participants must concentrate on the philosophical aspect of the most common forms of learning.

Consequently, a certain reliance of understanding and abilities is developed in the process of learning, which is based on a competence-based approach, with acquired information being subordinated to vocational ability. As a result, this, reinforces to the notion that knowledge has personal value for the student. It cannot be "given", instead, they must actively engage in cognitively independent learning. Theoretically-based means of professional pedagogical activity of students of a wide range - from organizing research projects to understanding academic subject, and involve methodical mastery practice.

The way the learning procedure is organized, with the primary goal of training students to actively and independently assimilate both conceptual and practical information, is a characteristic of the competence-based method. Students must take more accountability for the outcomes of their autonomous thinking processes in order to further develop their autonomy. This creates conditions for students to comfortably complete the university's academic curriculum, increases the positive motivation of students, and creates the opportunity to conduct individual classes with students during classroom classes. The result of competence-based learning is the student's mastery of the experience of identifying a problem, mastering the skills of studying it, designing, working together, applying well-known and creating new technologies for obtaining a product of their activity, evaluating its quality and applicability.

Thus, the competence-based approach includes a set of principles for determining educational goals, manifested in the ability to learn, self-determination, self-realization and personal development of students; the educational material and structured learning formats designed to help participants acquire the fundamental teaching abilities, as well as methods for evaluating educational results. Changing the educational process is essential but not acceptable, for the advancement of learners' didactic competency. In order to prepare students for working life, it is critical to maintain the subject matter of educational fields of study, approaches, and techniques. Additionally, a trustworthy system for determining whether a new teacher is prepared to study must be developed and put into place. (Bondarevskaja E.V., Kulnevich S.V, 2004: 23-31) [11].

The main characteristics of a person with research competence include constant craving and the ability to self-improvement, cognitive activity and independence.

The competence-based approach contributes to the implementation in the result-oriented educational process of the content, techniques used to develop a social educator's research competency.

Requirements for the definition of research competencies of students :

- conduct independent research on the topic of the project;
- collect and analyze scientific information;
- systematize scientific information, literature;
- definition of the research plan and program;

- definition of the research results;
- be able to formalize the findings of research.

In this article, the substance of the work structure and research competence of chemists includes knowledge on the study of humic compounds.

The research methods in this paper are based on the research competence of students, which consists in the study of humic compounds through the established system of knowledge, their practical use and search possibilities.

This article analyzes the work done in obtaining humic compounds for the enhancement of students' academic proficiency.

During the procedure of collecting humic, abilities of learners such as analyzing, synthesizing, contrast, abstraction, determination, and accountancy of academic proficiency are evaluated.

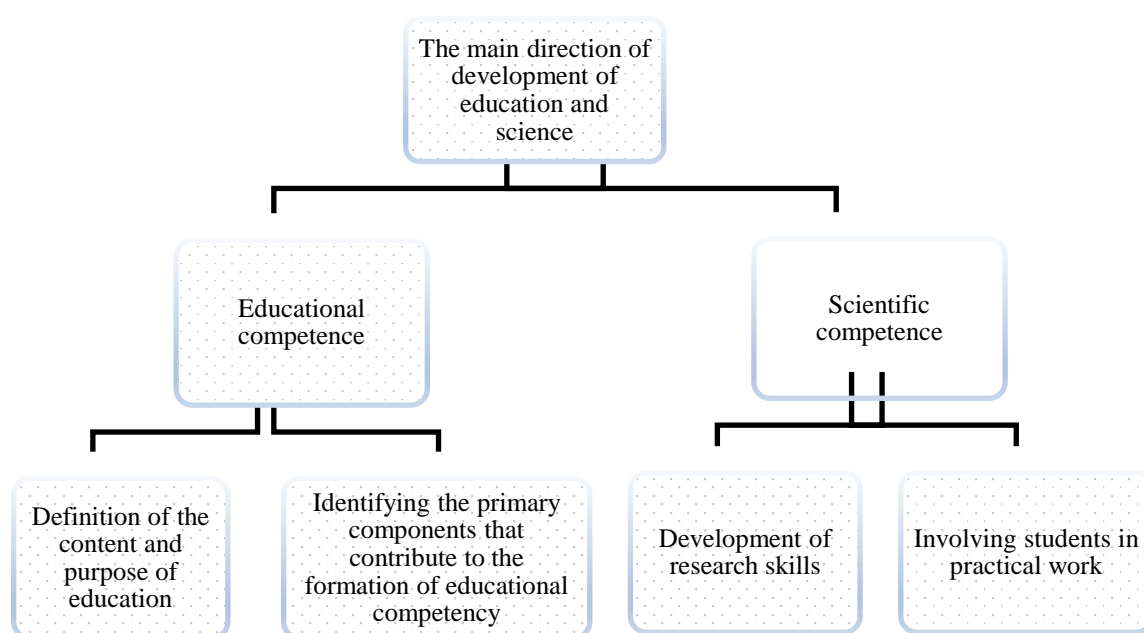


Figure 3 - The main direction of development of education and science

For the advancement of university students, this allows you to study not only ready-made knowledge, but also methods of mastering them.

The main objectives of the study:

1. reading the literature with scientific and methodological manuals for carrying out research work;
2. to ascertain the circumstances and methodological approaches that lead to the development of the pedagogical and intellectual abilities of chemical research works;
3. determination of the impact of the methods used in conducting a pedagogical experiment.

Table 1 - Development of students' research competence in the way of "obtaining humic acids"

Conducting research on the lesson's subject	Educational goals	Development of students' research competence
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The history of humic acid and the structure of humic acid and the classification of humic substances	- Study of the main training models; - disclosure and development of the concept of humins;	- able to understand the objectives of research activities in general; - ready to implement research activities (competence component formed)
Properties and ways to obtain humic acids	- skills in collecting, processing, analyzing information; - mastering and performing research and initial skills	- formation of independent research skills; - capable of educational cognitive activity;
Method of obtaining humic acid from azmineral silt sulfide swamp	- mastering the technique of research work	- ability to apply knowledge for practical purposes; - improving their skills in the framework of research activities
Method of obtaining humic acid from brown coal and shale	self-study of research work with the improvement of knowledge	- formulates the knowledge gained with other students in the research process; - be able to draw conclusions and apply the knowledge gained;

The content of the investigation's capacity method for development for learners:

- teaching methods and technologies
- organization of teaching methods
- components of learning tools
- evaluation components

Training of graduates in research works, identification of educational and personal skills with the help of various psychological questionnaires, organization of scientific activity. The gradual increase of research literacy is justified by ensuring the involvement of students in scientific activity.

The main goals of the work:

1. establishment of research literacy and organization of scientific activity;
2. to provide the facilities and methodological pathways for the acquisition of academic competency in the area of cognition;
3. to improve a methodology for the establishment of students' research literacy thanks to the organization of the work "ways of obtaining humic acid";
4. holding a lab experiment and defining the productivity of the developed methodology.

Results

The article presents a project for managing the procedure of learning, consisting of laboratory workshops that allow students to form research competencies in accordance with the program of study of the specialization 6B05301 Chemistry and 6B01507 - Chemistry.

At the research lesson, students master the methodology of scientific research, master the stages of scientific cognition, learn to formulate and solve research problems. During the research work, students' laboratory project was completed in the format of group and pair work.

This special chemical technology lesson is designed for 4 hours a week, for a total of 15 hours. During the lesson, the methodological manual "humic stains and methods of obtaining them" is used. For chemical technology lesson, three lectures (6 hours), five laboratory and practical classes (9 hours) are methodically provided. The program of chemical technology lesson (15 hours) is described (Table 1). (Sailaubai A.K., Myrzakhmetova N.O., Kishibaev K.O., Dzheldybayeva I. M., 2022:38) [7].

Table 2 - Methodological support for 1st laboratory Practical lesson (15 hours) has been developed.

<i>Type of practice</i>	<i>Practice content (number of hours)</i>	<i>Key competencies</i>
Lecture 1	History of the discovery of humic acid (1 hour)	Competence to search for different databases, work in a team, learn
Lecture 2	Structure of humic acid and classification of humic substances (1 hour)	Formative, competencies
Lecture 3	Humic acid composition and functions (1 hour)	Systematizing nodal competencies
Lecture 4	Humic acids and their properties (1 hour)	Competence to independently engage in improving knowledge, the ability to get useful from practice
Laboratory work 1	Analysis of Humate extraction methods (2 hours)	Competence to independently engage in improving knowledge
Laboratory work 2	Method of obtaining humic acid from azmineral silt sulfide swamp (3 hours)	Competence to form the relationship between research skills and knowledge
Laboratory work 3	Method of obtaining humic acid from brown coal (2 hours)	improving their skills in the framework of research activities
Laboratory work 4	Technique of extracting humic acid from shale (3 hours)	Formation of the competence component
Lecture 2	Final lecture (1 hour)	Formation, systematization, and research essential capabilities

The review of ways to obtain humic acids create opportunity to determine the learners' understanding and abilities regarding academic competency, as well as their involvement with application in practice. Students' academic skills and assignments include their readiness to take initiative in tackling a variety of educational assignments, including organizing the study, gathering data, analyzing it, adjusting the preliminary and final outcomes of the research, and collaborating with and applying what they have learned in real-world situations.

The competence of students in conducting research on "ways to obtain humic acids" specialties 6B01507-Chemistry and experimental 6B05301-Chemistry.

Here is an example of practice: *a method for obtaining humic acid from brown coal.*

Work plan: Getting to know the work; Preparation of raw materials (coal, solutions); Determination of humidity, ash content and mineral impurities in the composition of coal; Methods for determining the yield of humic acids: leaching of humic acids from coal; Precipitation of humic acids. Disinfection of the formed sediment; Discussion of the results; Processing the findings of the research.

Necessary equipment for work: Desiccator; Beaker; volume 300-500ml; Pipettes; Glass funnels, Buchner funnel; Chemical flasks, Bunsen flask; Measuring flasks, 100, 250, 1000ml; Porcelain crucibles, saucers; Ash-free filters; Vacuum pump; Analytical scales.

Equipment requiring preparation for the method of obtaining humic acid from brown coal:

- 5 g brown coal (ground)
- 4% NaOH solution
- 5% HCl solution

Progress of the work:

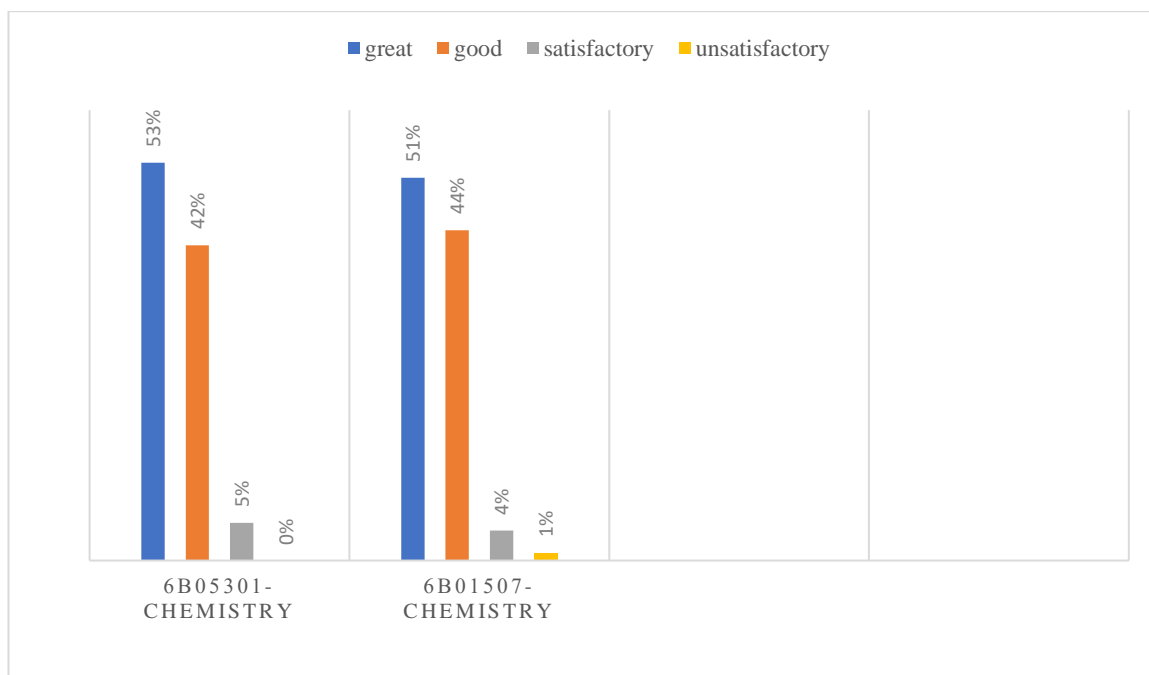
Measure out 5 g of brown coal and put it in a 500 ml glass.

Pour the pre-prepared 4% NaOH solution. The resulting solution is placed in a magnetic mixer for 1 hour. After 1 hour, we take the solution, place the filter paper in the Buchner funnel and leave it for 24 hours to filter.

The next day, after 24 hours, we measure the filtered extract through a measuring flask. We measure the volume of the measured extract.

Pour the solution (HCl) over the measured extract, install the Buchner funnel filter paper and leave for 24 hours for filtration.

The next day, we take filter paper and dry it. Dried humic acid is filtered through an electronic scale. The finished product consisted of black scales with a characteristic odor. In the work done, we will calculate the yield of humic acids from the therapeutic swamp using this method (J.K.Kairbekov, J.T.Eşova, A.J.Kairbekov, 2006)[12].



As a consequence of the investigation, the degree of advancement in the assimilation of the supplied laboratory works' material was taken into consideration. helped facilitate the development of an analytical skills.

As a result, to help learners strengthen their learning and scientific abilities, we provide:

- dynamic training methods are widely used;
- scientific collaboration is encouraged;
- students are involved in experimental projects.
- integrate disciplines;
- utilize learners' current abilities;
- integration of knowledge with practice.

Discussion

Several research papers were included, which included high-quality research papers on scientific research experience. Based on this research work, substantive and synthesized research papers were created. The results of the experiment showed that students studying in the specialties 6B01507-chemistry and 6B05301- chemistry have fully mastered the research work in conducting the experiment. Statistical analyses of the questionnaires received and the results of laboratory work after their implementation were carried out. Each student was asked to make an application for laboratory work at the beginning and at the finish of the educational process, as well as each group of students to present the output of products obtained during laboratory work. The study of the knowledge and skills of chemistry students showed that 75% of students could solve the problems of solution preparation and chemical analysis at an average and high level. Before concluding the training program, future chemists will have a thorough understanding of research techniques and academic procedures.

Conclusion

Consequently, considering the existence of these abilities, baccalaureates ought to possess a number of research skills: having the capacity to formulate learning goals and objectives; the willingness to set up the sequence of analytical tasks; the competence to select techniques and tools that align with the goals of scientific work; the potential to investigate, contrast, and support their position on a particular topic of studies in science; the skill to assign the primary tasks of work; the desire to identify the advancement of study findings and a willingness to boost; the competence to gauge the effectiveness of the completed investigation accomplished outcomes; the ability of learners to prepare their academic and scientific works; the ability to style, arrange, and manage research projects. It was able to establish a conceptual understanding of the acquired knowledge about the way to obtain humic acid in order to help students enhance their investigative competencies. The work carried out in the laboratory, equipped with modern equipment, contributed to the training of students at a high level based on the curriculum. Laboratory work carried out for the improvement of learners' scientific competencies helps to develop students' activity, formulate explanations to arguments.

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РАЗВИТИЕ НАУЧНОЙ КОМПЕТЕНТНОСТИ СТУДЕНТОВ ПУТЕМ ИСПОЛЬЗОВАНИЯ РЕЗУЛЬТАТОВ ИССЛЕДОВАНИЙ ГУМИНОВЫХ ВЕЩЕСТВ В ОБРАЗОВАТЕЛЬНОМ ПРОЦЕССЕ

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Аннотация. В статье анализируется использование деятельности по изучению гуминовых соединений как средства формирования исследовательской компетентности студентов.

Предпосылками исследования является определение исследовательской компетентности студентов бакалавров, что приводит к развитию объективных системных явлений образования. В данной работе представлены результаты исследования, которые являются непредвзятыми знаниями, воплощенными в системе химического знания. Однако, чтобы более полно объяснить понятие исследовательской компетентности, давайте рассмотрим процесс формирования исследовательских навыков у студентов бакалавриата по химии через выполнение различных исследовательских действий. На основе анализа и обобщения результатов выявляется взаимосвязь между развитием научных способностей студентов бакалавриата и их академическими усилиями. В процессе обучения в высших учебных заведениях организуется научная деятельность студентов бакалавриата, а также развиваются способности к обучению с использованием успешных проблемно-ориентированных подходов к обучению.

Технология внедрения компетентного подхода к подготовке обучающихся является одной из недостаточно изученных проблем на практике. Формирование компетенций, составляющих интегральную структуру личностных и профессиональных характеристик для успешного выполнения образовательных функций. Одной из важных целей является формирование исследовательских компетенций будущих специалистов в высших учебных заведениях. С развитием общества изменились и основные направления образования, и в соответствии с этим требуется лучший специалист с высшим образованием, совершенствующий свои знания.

Ключевые слова: поисково-исследовательская деятельность, компетентностный подход, формирование, исследовательская компетентность, исследовательская деятельность, интеграция, гумин, исследовательские навыки

БІЛІМ БЕРУ ПРОЦЕСІНДЕ ГУМИНДІ ЗАТТАРДЫ ЗЕРТТЕУ НӘТИЖЕЛЕРІН ПАЙДАЛАНУ АРҚЫЛЫ СТУДЕНТТЕРДІҢ ҒЫЛЫМИ ҚҰЗЫРЕТТІЛІГІН ДАМУ

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Аңдатпа. Мақалада студенттердің зерттеу құзыреттілігін қалыптастыру құралы ретінде гуминді қосылыстарды зерттеу қызметін қолдану талданады.

Зерттеудің алғышарттары-білім берудің объективті жүйелік құбылыстарының дамуына әкелетін бакалаврлар студенттерінің зерттеу құзыреттілігін анықтау. Бұл жұмыстағы зерттеу нәтижелері химиялық білім ұғымдар жүйесінде көрінетін объективті білім болып табылады. Зерттеу құзыреттілігінің анықтамасын түсіндіру үшін біз әртүрлі зерттеу әрекеттерін орындау арқылы химия пәнінен бакалавриат студенттерінің зерттеу дағдыларын қалыптастыруды қарастырамыз. Талдау және жалпылау негізінде бакалавриат студенттерінің зерттеу қызметі арқылы зерттеу құзыреттілігін қалыптастыру арасындағы байланыс анықталды. Жоғары білім беру процесінде бакалаврлар студенттерінің ғылыми қызметі жоспарланады, ал зерттеу құзыреттілігі оқытудың тиімді проблемалық әдістерімен қалыптасады.

Білім алушыларды дайындаудың құзыреттілік тәсілін енгізу технологиясы тәжірибеде жеткіліксіз зерттелген мәселелердің бірі болып табылады. Білім беру функцияларын табысты орындау үшін тұлғалық және кәсіби сипаттамалардың интегралды құрылымын құрайтын құзыреттерді қалыптастыру. Жоғары білім беру орындарында болашақ мамандардың зерттеу құзыреттілігін қалыптастыру маңызды мақсаттардың бірі болып табылады. Қоғамның дамуымен білім берудің негізгі бағыттары да өзгерді және соған сәйкес өз білімін жетілдіріп отыратын жоғары білімді үздік маман талап етеді.

Тірек сөздер: іздестіру-зерттеу қызметі, құзыреттілік тәсіл, қалыптастыру, зерттеу құзыреттілігі, зерттеу қызметі, интеграция, гумин, зерттеу дағдылары

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