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## LEARNING TO INCORPORATE AL-FARABI'S THOUGHTS INTO THE EDUCATIONAL PROCESS

### Abstract

The article describes how political, social and cultural events that took place in the time of Al-Farabi influenced the formation of the scientist's worldview. The eastern thinker Al-Farabi, who attached great importance to the entire system of Science, also studied the natural and chemical sciences at a high level.

In his treatise "on the necessity of the art of Chemistry", Al-Farabi noted that "in this art there are two types of error: the first is rejection and distortion, the second is the ability to recognize and recognize and exaggerate. They're both wrong." According to the scientist, the people who described this art tried to give it a secret meaning, so that it could only be understood by sages of equal rank.

Al-Farabi studied chemistry, medicine, geography, botany, mineralogy, etc. It is known that his treatises on natural science and his contributions to this area are numerous, and the scientist's legacy on them, in turn, requires introduction into modern education.

Nevertheless, in order to attract the younger generation to science, the masterpieces of science, to educate them spiritually, patriotically, to include the works and heritage of our ancestor al-Farabi in the curriculum and use it as a textbook should be left.

**Keywords:** alchemy, the art of chemistry, chemistry curriculum, chemical society, teaching chemistry

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## ӘЛ-ФАРАБИДІҢ ОЙЛАРЫН БІЛІМ БЕРУ ҮДЕРІСІНЕ ЕНГІЗЕ ОҚИТУ

*Аңдатпа*

Мақалада Әл-Фарабидің жаратылыстану бағытындағы химия, физика, медицина, ботаника, т.б. жаратылыстану ғылымдары бойынша жазған трактаттары қарастырылған. Бұл салаға қосқан жаңалықтары қыруар екендігі белгілі. Ортағасырдағы ойшылдың ғалым ретіндегі қалдырған мұраларының құндылықтық әлеуетінің ХХІ ғасырда да жоғалмай келе жатқан өзектілігін ашып көрсетуге негіз болады. Барлық ғылым жүйесіне үлкен мән берген Шығыс ойшылы Әл-Фараби жаратылыстану-химия ғылымдарын да жоғары деңгейде зерттеді.

“Алхимия өнерінің қажеттігі туралы” атты трактатында өз тұсындағы алхимиялық білімдерді талдап, алхимияның жалған қабыршағынан ғылыми дәнін бөліп алып, оны белгілі бір зерттеу пәні бар жаратылыстану ғылымының бір саласында қарастырды.

Әл-Фарабидің жаратылыстану бағыттағы химия, медицина, география, ботаника, минерология т.б. жаратылыстану ғылымдары бойынша жазған трактаттары да, бұл салаға қосқан жаңалықтары да қыруар екендігі белгілі, ғұламаның олар бойынша мұрасы да өз кезегінде заманауи білім беруде ендіруді қажет ететіндігі сөзсіз.

Осыған қарамастан, жас ұрпақты ілім-білімге, ғылымның жауһарларына қызықтырып, оларға, рухани, патриоттық білім-тәрбие беру мақсатында әл-Фараби бабамыздың еңбектерін, мұрасын оқу бағдарламаларына енгізіп, оқу құралы ретінде пайдалану сияқты игілікті ғылыми-әдістемелік зерттеулер мен шаралардың жоққа тән екендігін айта кеткен жөн.

*Түйін сөздер:* алхимия, химия өнері, химиялық қоғам, химияны оқыту, химия бойынша оқу бағдарламасы

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## ОБУЧЕНИЕ ВКЛЮЧЕНИЮ МЫСЛЕЙ АЛЬ-ФАРАБИ В ОБРАЗОВАТЕЛЬНЫЙ ПРОЦЕСС

*Аннотация*

В статье рассказывается о том, как политическая, социальная и культурная деятельность, происходившая во времена Аль-Фараби, повлияла на формирование мировоззрения ученого. Восточный мыслитель Аль-Фараби, придавший большое значение всей системе наук, на высоком уровне изучал естественно-химические науки.

В своем Трактате «о необходимости химического искусства» Аль-Фараби отмечает, что " в этом искусстве различают два вида ошибок: первый – отрицание и искажение, второй-

способность распознавать и признавать, преувеличивать. Они оба ошибаются". По словам гуллы, люди, описывающие это искусство, стремились придать ему тайный смысл, чтобы он был понятен только мудрецам равного ранга.

Аль-Фараби изучал химию, медицину, географию, ботанику, минералогию и др. Известно, что его трактаты по естествознанию и его вклады в эту область многочисленны, а наследие ученого по ним, в свою очередь, требует внедрения в современное образование.

Тем не менее, для того, чтобы привлечь подрастающее поколение к науке, шедеврам науки, воспитать их, духовно, патриотически, включить труды и наследие нашего предка аль-Фараби в учебную программу и использовать ее в качестве учебника следует оставить.

**Ключевые слова:** алхимия, искусство химии, учебная программа по химии, химическое общество, преподавание химии

**Introduction.** It is written that the political, social and cultural events that took place in the time of Al-Farabi influenced the formation of the worldview of the scientist. The eastern thinker Al-Farabi, who attached great importance to the entire system of Science, also studied natural and chemical sciences at a high level.

In his treatise "on the necessity of the art of Chemistry", Al-Farabi notes that "in this art, two types of error are distinguished: the first – rejection and distortion, the second-the possibilities of recognition, recognition and exaggeration. They are both wrong." According to the scholar, the people describing this art, tried to give it a secret meaning in order to be understandable only to sages of equal rank.

**Responsibilities:**

-In the system of higher education in Kazakhstan, in particular, in the preparation of a future chemical specialist, the content of education is supplemented by new chemical disciplines and elective disciplines on the teachings of Al-Farabi in natural sciences, chemistry, medicine, botany, Mineralogy, etc;

-to provide effective methods of using Al-Farabi's heritage in the educational process in the field of Natural Science (Chemistry, Biology).

**Relevance of the study:** it is known that the eastern thinker Al-Farabi studied the natural sciences at a high level and made a great contribution to this field. It is the basis for revealing the relevance of the value potential of the legacy of the thinker of the Middle Ages as a scientist, which is not lost even in the XXI century. In the process of Higher Education, the high demand for the profession of Legal lawyer, Economist, which was established at the end of the twentieth and beginning of the XXI centuries, has now gradually shifted to the demand for specialists who "master the language" of information and communication technologies. And, whatever the direction of the heritage of Al-Farabi in question, when introducing them into education, we will aim to bring modern educational technologies to the use of digital technologies. Because the problems solved by chemistry, biochemistry, geochemistry, environmental chemistry are put on the agenda with relevance in human life over time.

**Expected results:** the scientific and methodological foundations, methods of introducing Al-Farabi's natural science heritage into the modern education system should be developed and implemented. Although modern education is based on creativity and creativity, its sources should begin with the teachings of Al-Farabi in natural science, chemistry, medicine, botany, Mineralogy, etc.

**Research methodology.** If we look at the early data, various political, social and cultural events that took place in the time of Abu Nasir Al-Farabi greatly contributed to the formation of the scientist's worldview. The eastern thinker Al-Farabi, who attached great importance to the entire system of Science, also studied natural and chemical sciences at a high level. We looked at some data to find out what contribution Abu Nasir Al-Farabi, recognized as the second teacher of the world, made to such a complex field as chemistry.

The natural-scientific socio-philosophical views of Abu Nasir Al-Farabi were formed and developed in the era when Central Asia was conquered by Arab feudal lords and forcibly incorporated into the state of the Arab Caliphate, which conquered a huge territory from India to the Atlantic Ocean [1].

Al-Farabi pays great attention to the Natural Sciences in the system of science. Based on the fact that the basis for recognizing the diversity of the whole world is based on knowledge of numbers and quantities, Al-Farabi emphasizes arithmetic and geometry among these sections, as well as the art of correct logical thinking. In his opinion, these sciences "permeate all sciences" because they work with concepts and relationships that are abstracted from the real disciplines and the real relationships and relationships between these disciplines.

In the Middle Ages, alchemy was widespread, but it differed from magic and astrology with a certain scientific material. As you know, scientific chemistry was subsequently crystallized from Alchemy. But alchemy included fundamentally wrong conclusions, as well as reliable scientific facts. Alchemy in the medieval East - primarily its prominent representatives Jabir (Geber) and AR-Razi – made significant progress in revealing the nature of some chemical processes and compounds. But misconceptions about the possibilities of chemical cognition led its development in a harsh direction. As the main goal, Alchemists intended to obtain a "philosopher's stone", which could be used to turn cheap metals into gold and silver. They also tried to get precious stones, "the elixir of life, which heals various diseases and ensures longevity", etc [2].

According to Al-Farabi, alchemy, a science with a certain object of study and the magical art of converting cheap metals into precious metals, should be considered as a component of Natural Science. Natural sciences, or physics, chemistry is a science about nature, about its basic principles and parts, considering natural bodies and elements inherent in the relationship and interaction with the bodies of nature [3].

"According to the Farabi Division, semi-science consists of eight parts. These are: Prognostics, that is, the science of foresight, medicine, the science of nigromantia of physics, navigation, that is, the science of navigation, alchemy and mirrors, which provide for the transformation of things into another form," Abu Nasir Al - Farabi said in his book. Here he puts the science of language above, and then comes grammar, logic, poetics" [4][5].

In the works of Al-Farabi, Natural Sciences consist of 8 parts.

- Study of the origins of all simple and complex bodies in nature, in general;
- Study of simple bodies and their parts and elements that make up complex bodies;
- Study of the existence of natural bodies, their origin and destruction;
- Study of the properties of components of complex bodies, interaction accents;
- Study of the nature and method of connecting complex bodies, different parts;
- The study of what has dissimilar particles, but combines complex bodies in a homogeneous way, such as minerals;
- Study of plants, their general properties, varieties and characteristic features of each of them;
- The study of animals, their common properties, species, the study of the mental strength and characteristic features of each of them [6, pp. 89-90][7].

**Research results.** Discussion of the results of the study: on the basis of the treatises “on the need for The Art of Chemistry”, “origin of Sciences”, on the basis of the relationship of modern teachings of chemistry with medicine, botany, Mineralogy, preparation of methodological guidelines for integrated teaching. Al-Farabi's book "on the origin of Sciences" expresses philosophical thoughts and intelligent opinions about things. Al-Farabi proposed his theory of knowledge. According to him, Man is the product of the evolution of nature, things exist independently, man is the owner of cognition, things affect the human senses, give rise to intuition in man [8].

Al-Farabi divided the surrounding objects, bodies into six: 1-celestial bodies; 2 –Sane animals-people; 3-crazy animals; 4-plants; 5-minerals; 6 – The Four ultimate bases-fire, air, soil, water. These four roots are the core of matter [9].

"The alchemy period. The main features of the period. Arab alchemy. Achievements of alchemy" during the lesson, we considered the history of the origin of chemistry and the contribution of Al-Farabi, in order to consolidate the lesson, the list of questions from students was taken from 4 groups, the results of which can be seen in the lower figures.

Figure 1 - % indicators of students who answered the question "Alchemy is a pseudoscience, the main goal of its naive adherents was to make gold for personal enrichment"

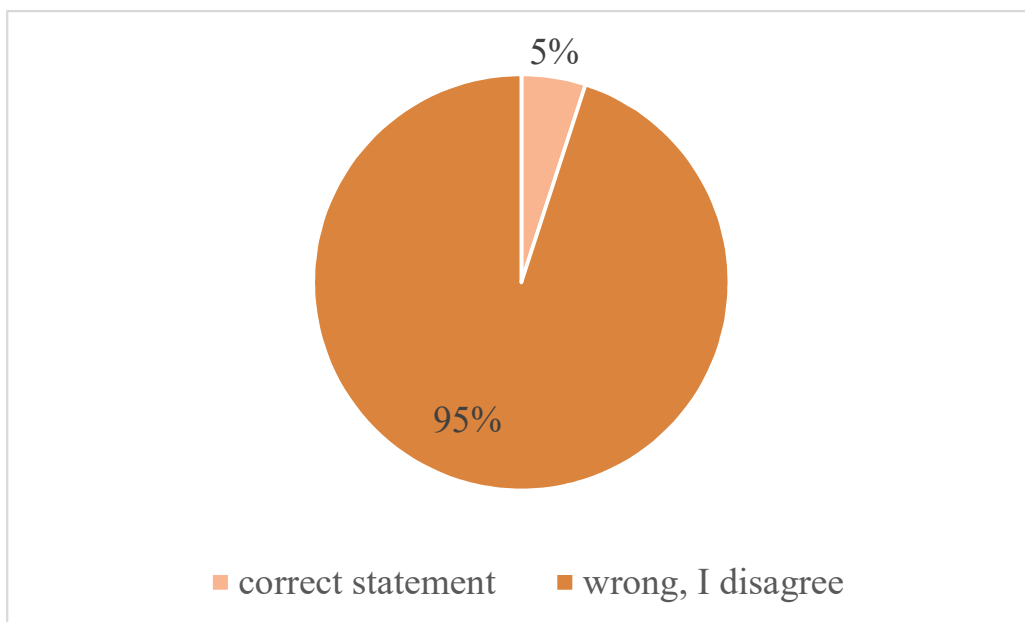


Figure -2. "What was the main purpose of the study of Alchemy? % indicators of students who answered the question"

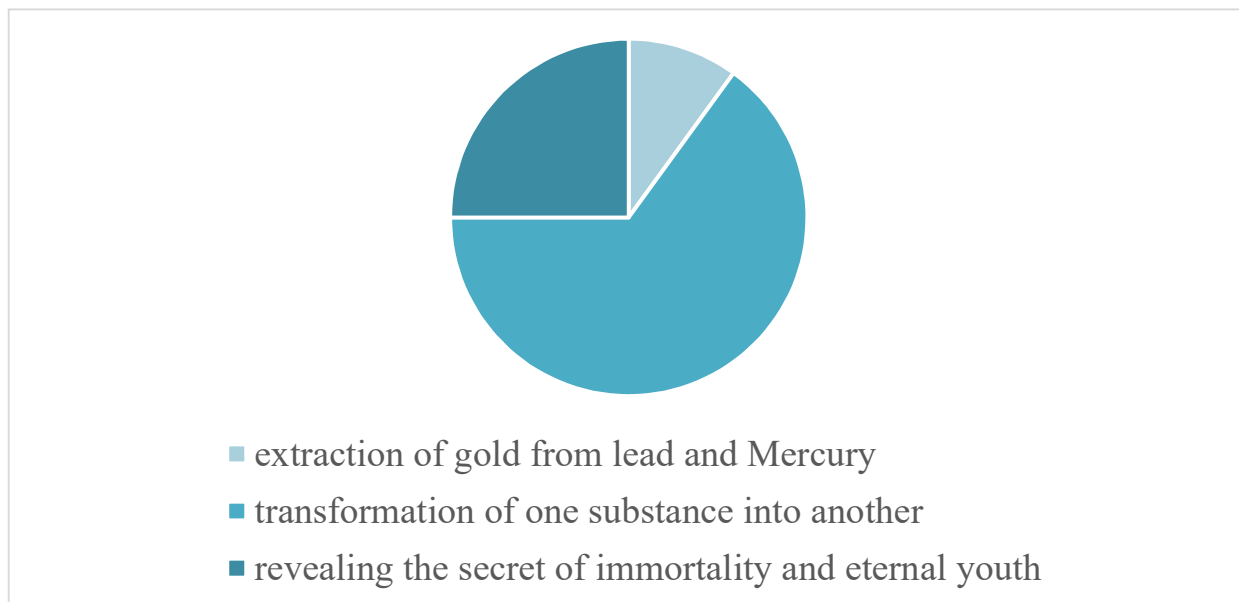


Figure - 3. % indicators of students who answered the question " Arab Alchemists made undoubted practical successes - they isolated antimony, arsenic and, apparently, phosphorus, obtained acetic acid and solutions of strong mineral acids"

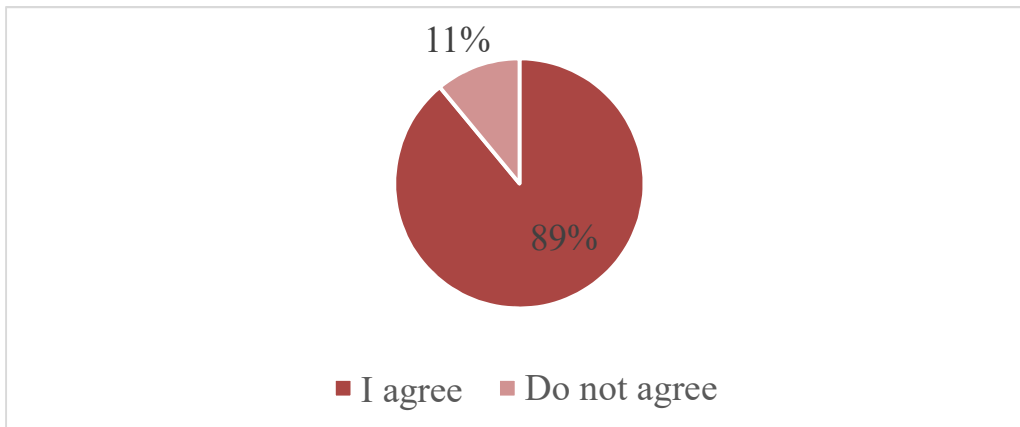
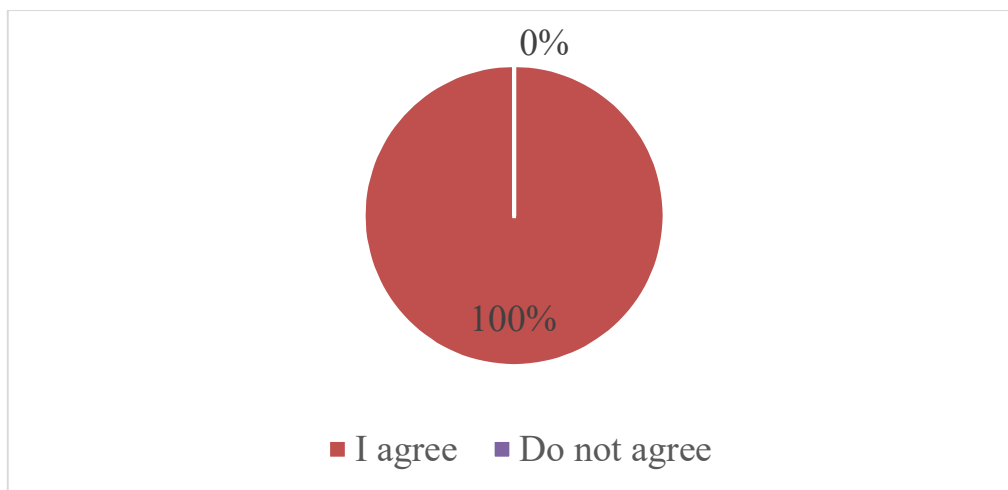
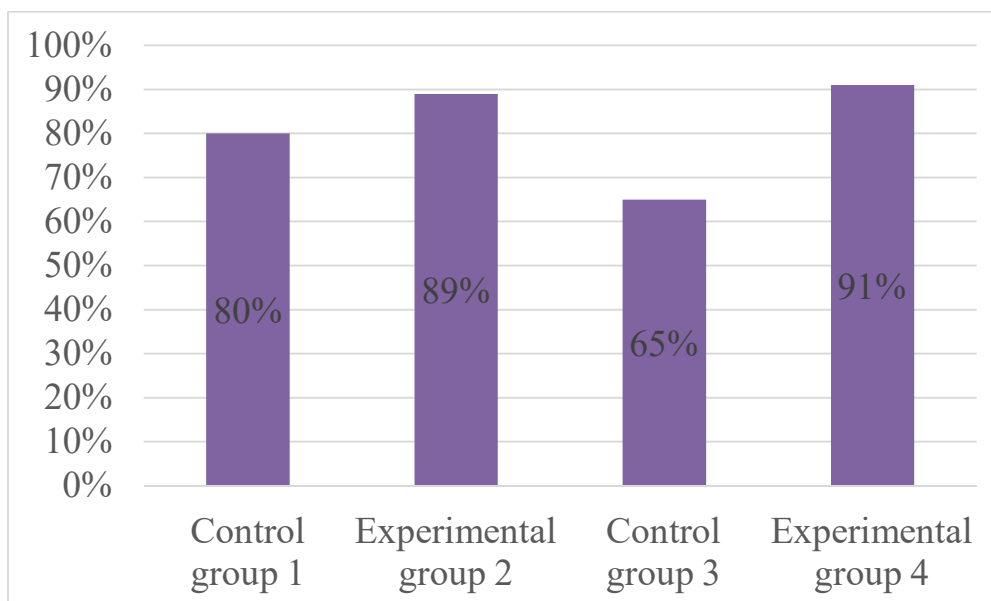


Figure - 4. % indicators of students who answered the question "since the Middle Ages, only the creators of fiction or cheap fiction were interested in alchemy"



As a result of the 4th group, according to the pedagogical experiment conducted according to the plan, the level of knowledge of students increased from 89 to 91%..



The matter of their transformation into one another is formed by different kinds. Bodies appear, undergo changes, disappear, and the four cardinal bases do not change forever. As a result of their transformation into each other, new foundations of life are born and mature.

Farabi knew that precious stones and minerals are formed mainly from water solutions. He is also a man who has learned alchemy. The main goal of this science was to find a "philosopher's stone" that would turn "bad" metals into gold, or to create a "core of life" that would give Man eternal life. Farabi wrote a special treatise called "on the need for the art of alchemy", in which he tried to reveal what is right and what is negative in the art of alchemy. It can be said that this is a unique discovery that Farabi made in alchemy.

According to A. Kobesov, Al-Farabi paid great attention to theoretical issues of Medicine, Biological Sciences, about which he wrote works "about human organs", "about animal organs", "about temperaments", etc [10].

Full use of interdisciplinary connections of the corresponding theoretical content of chemistry and Animal Science in the subject of Biology in pedagogical educational institutions,

In the near future, we will consider in detail (as an example 1-2), based on the teachings of Al-Farabi, integrated into the teaching content.

Table 1- Organization of training

Forms of Organization of training	Кіріктіретін химиялық білім	Integrated chemical education	Integrated medical education	Integrated mineralogical education	Information technology capability
Lecture, laboratory classes	The composition of air: oxygen, oxidation processes. Based on the treatise "on the origin of Sciences"	Respiratory system of vertebrates Based on the treatise "on animal organisms"	First aid. Oxygen.	Chemical composition of Mineralogy	Computer-Mathematical Modeling of the composition of air, the mechanism of respiration, chemism, transfer of the composition of air by diagram
Lecture, laboratory classes	Determination of the environment of solutions, solutions	Urinary system of vertebrates	Preparation of solutions	Composition of solutions	Virtual modeling of a solution-defined environment

Training tools include information Learning Technologies, Electronic textbook publications, a virtual laboratory, the internet, tasks to test your knowledge, Control and test tasks. In order to properly organize the formation of appropriate professional skills on the basis of integrated training of students with the help of informatization of disciplines related to the problem we are studying, we had to solve the following tasks:

- determining the level of students' assimilation of information requirements;
- Identification of optimal ways of intensifying independence on the basis of informatization of education, through interdisciplinary integration between teaching chemistry in the discipline TP (elective subject) with medicine, botany, mineralogy;
- An integrated program of teaching chemistry in the discipline TP in connection with medicine, botany, mineralogy, providing a methodological system aimed at constantly improving students' knowledge, increasing their cognitive activity on the basis of electronic educational publications.

**Conclusion.** The works of Farabi, studying the creative, historical, scientific heritage created by him for his era, are of particular importance in the professional training of future chemistry teachers.

As many works of Al-Farabi, all of them are published and presented to the public in large copies as long as possible, and a wide range of readers, including school teachers and students, find

the opportunity to get acquainted with these works, it will be the best thing. In addition, it would be a light if Al-Farabi's short treatise "on the need for the art of alchemy" was included in the preface to the textbooks of students who are just starting to get acquainted with chemistry. In particular, if every student in the country begins to study Chemistry by familiarizing himself with the work of Abu Nasr Al-Farabi, he will certainly be interested and motivated in this subject. Also, Al-Farabi would have answered without hesitation when he said what works he wrote..

The great ideas of our great scientist, the second teacher of the world – Al-Farabi-about the relationship between theory and practice can play a huge role in the history of science, including in the history of chemistry.

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