

UDC 378

**STEM – AN EFFECTIVE APPROACH TO THE EDUCATIONAL AND
RESEARCH WORK OF PHARMACIST STUDENTS**

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Abstract: The main tasks on the way to the implementation of STEM principles in the educational process in the preparation of future pharmacists are highlighted. The present requires the teacher to work for the future, to be ahead of his time, which involves improving professional skills, constant analysis of pedagogical activity and making adjustments in accordance with social demands throughout the entire professional activity

Keywords: STEM - education, competence, chemistry, integration, educational - research activity

One of the current trends in the innovative development of education is STEM - an oriented approach to learning. The main goal of STEM education is the implementation of state policy, taking into account the new requirements of the Law of Ukraine "On Education" [1] regarding strengthening the development of the scientific and technical direction in educational and methodological activities in all educational areas; creation of a scientific and methodical base for increasing the creative potential of youth and the professional competence of pedagogical workers.

The task of STEM education is to form the competitiveness of graduates in the modern labor market and their ability and readiness to: solve complex problems; critical thinking; creativity; cognitive flexibility; cooperation; management;

implementation of innovative activities. The goals of STEM education are aimed at the formation of five main competencies: 1. conceptual understanding - understanding of concepts, operations and relationships; 2. operational freedom – skills of flexible and accurate execution of operations; 3. strategic competence – the ability to formulate, present and solve problems; 4. adaptive understanding - logical thinking, reflection, explanation and argumentation; 5. productive consciousness - the tendency to consider the subject as reasonable, useful and valuable along with the belief in its effectiveness [2, p. 29]. That is why the topic of educational and research work of students - pharmacists from chemical disciplines "Determination of ions, especially calcium ions, in medicinal products" was selected. The purpose of educational and research work: to form the concept of qualitative and quantitative analysis, the main indicators of solutions, especially electrolytes (hydrogen index, ionic strength of the solution, dissociation constants, protolysis constants, and others), develop the ability to work on research. Tasks of educational and research work: teach how to work with various sources of information and determine ions using various methods of analysis; describe the impact of ions on the human body, express judgments about the impact of relevant ions on human health, promote the education of a responsible attitude to the task.

The greatest interest of educational and research work was presented by medicinal products with the presence of calcium ions. Preparations containing calcium ions are used to treat allergic diseases, reduce the increased permeability of blood vessels and have an anti-inflammatory effect, treat diseases associated with calcium deficiency..

Medicines containing calcium are used as a hemostatic agent, to improve the activity of the heart muscle, as antidotes for magnesium salt poisoning, to stimulate childbirth. Medicinal products containing calcium also include gypsum, which is used in surgery for plaster bandages; chalk, which is used in cases of increased acidity of gastric juice and for the preparation of tooth powder. One of the common pharmacopoeial drugs is calcium chloride. Calcium chloride reduces vascular permeability, has an anti-allergic and anti-inflammatory effect. It is used in the treatment of allergic diseases (hives), radiation sickness, rheumatism, bleeding, bone fractures, skin diseases, as well as in poisoning with magnesium salts, oxalic acid, hydrofluoric acid salts, lead, mercury,

phosgene. Therefore, this drug was taken to determine the content of calcium ions. The task of the research was to determine the authenticity of the drug and the degree of its purity. According to the pharmacopoeial articles that control the quality of medicinal products, the content of calcium chloride in the medicinal product should not be less than 98%. The presence of impurities, salts of iron, aluminum, barium, orthophosphates is also not allowed.

Magnesium salts and sulfates are permissible impurities and do not affect the quality of the medicinal preparation of calcium chloride [3, p. 250]. Determination of the authenticity of the calcium chloride drug is based on the reaction of the calcium ion with ammonium oxalate. Magnesium ions are quite often present in the solution of the drug together with calcium ions, so the reaction should be carried out with the participation of an ammonia buffer solution [4, p. 200].

For the quantitative determination of calcium chloride in the medicinal product, compleximetry with the indicator chrome dark blue was used. Triton B solution was titrated until the cherry-red color of the solution changed to blue-lilac. The results of the study indicated that the calcium content in the medicinal product (calcium chloride solution) was within the normal range [2, p. 29].

The next study of pharmacy students was devoted to the improvement of the method of compleximetry of the content of magnesium and calcium in the leaves of nettle dicotyledons using pyrocatechin violet and acid chrome dark blue indicators. The optimal conditions for the extraction of calcium and magnesium by the method of complexometry from the studied raw materials are not substantiated in the literature

As is known, mineral substances as components of the metabolism of medicinal plants supplement and enhance their therapeutic effect on the body [3, p.235]. Medicinal plants, in which macro- and microelements are in a bio-absorbable form, can be effective for normalizing the mineral balance [3, p.205].

Dicotyledonous nettle leaves are an official plant material included in the State Register of Medicinal Products of Ukraine [5, p.232].

The main use of raw materials and preparations based on it is as a hemostatic agent. This pharmacological effect is mainly attributed to fat-soluble vitamins of group K [6,

p. 359] contained in nettle leaves. However, it is also known that nettle contains a significant amount of calcium oxalate [6, p. 330]. Vitamin K in the liver contributes to the synthesis of specific proteins and enzymes of the blood coagulation system, and calcium in the plasma participates in the processes of their activation.

The hemostatic effect of nettle is based on the synergism of action, as a result of which it is widely used in practical medicine, despite the range of synthetic drugs presented.

In order to determine the completeness of the extraction of calcium and magnesium from the leaves of St. Nettle, the influence of the size of the raw material particles, the ratio of the raw material and the extractant, the optimal time and the extraction frequency were studied.

It was found that magnesium is best extracted when nettle leaves are crushed to less than 0.2 mm. At the same time, the largest amount of calcium in extraction is observed when using raw materials with a particle size of 0.5 to 2.0 mm. Purified water is the best extractant for calcium release. When using diluted hydrochloric acid, the output of magnesium from the medicinal rolin compound (Medicinal Plant Compounds) increases.

This is due to intensive destruction of chlorophylls in an acidic environment. At the same time, the output of calcium decreases more than seven times. As antagonists inside a living cell, calcium and magnesium compete in the co-extraction process. The optimal extractant for the simultaneous extraction of these microelements is purified water at a ratio of raw materials with a particle size of 0.5 - 1.0 mm and extractant of 1:50.

The optimal extraction time, according to experimental data, was 60 minutes. A further increase in time, as well as the extraction frequency, is impractical, as it does not lead to an increase in the yield of LRS microelements. The next stage of the work will be related to the comparison of the obtained data with the results of the determination of calcium and magnesium in the leaves of nettle dicotyledons in the works of other authors.

Thus, the optimal conditions for the extraction of calcium and magnesium from the leaves of St. Nettle were selected. The results indicate the perspective of including the definition of these quality indicators in modern regulatory documentation.

Therefore, the determination of calcium ions is of great practical importance in the pharmaceutical industry and other areas of human life.

The advantages of educational and research activities are the acquisition by students - pharmacists of the following skills: - to plan their work; - use many sources of information; - independently select and accumulate material; - analyze, compare facts; - argue an opinion; - make a decision; - present the creation to the audience; - evaluate yourself and the team. Carrying out educational programs and at the same time making interdisciplinary connections and using innovative technologies, we understand that such a combination is quite harmonious and meets all the requirements of modern educational activity

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