



## METHODOLOGY OF DEVELOPMENT OF RESEARCH SKILLS OF FUTURE ENGINEERS BASED ON AN INNOVATIVE APPROACH (IN THE EXAMPLE OF THE SCIENCE OF "MATERIALS SCIENCE")

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### Abstract

It is important to create an environment based on competition, depending on their abilities and capabilities, in developing the research skills of future engineers based on an innovative approach.

In the article, an example of the scientific and research elements used in the course of the lesson is given in order to acquire in-depth pedagogical and psychological knowledge related to the specialty "Material Science", and to form a person capable of scientific and research work.

**Keywords:** search, research, creative approach, skill, competence, resource, activity, method.

### Introduction

When creating conditions for future engineers freely choose the direction of professional education, first, the problem of forming him as a freethinking person should be solved. In the theory of world pedagogy, the general foundations of the formation of a freethinking, independent personality have been widely researched and many results have been obtained. However, most of such studies are focused on the general aspects of the problem and cannot fully meet the requirements of the educational reform implemented in our republic.

It is important to create an environment based on competition, depending on their abilities and capabilities, in developing the research skills of future engineers based on an innovative approach.

Reforms in the education system are primarily focused on the education of a person who can think freely, is inquisitive, and strives for innovation. By developing the research skills of future engineers, it is possible to develop the skills and competencies of in-depth acquisition of specialized, pedagogical and psychological knowledge, capable of scientific and research work, and creative approach to the education and training process. In order to form such a specialist, it is necessary to apply scientific and research elements in the activities of students of higher educational institutions.





Scientific and research work of students, in turn, requires them to acquire deep and solid knowledge. Without independent knowledge, it is impossible to approach practical, educational-educational work.

It is appropriate to assign tasks such as using an innovative approach and creating lesson developments by creating problem situations in attracting future engineers to scientific and research work. When assigning tasks to students, it is necessary to pay attention to the following:

- Development of students' creative approach to research, research activities, educational work;
- Formation of study-research skills and qualifications in the subjects related to the specialty;
- Development of skills to study and analyze literature and other scientific sources;
- To be able to see the problems in the field of educational and educational work with students, as well as in the field of specialized sciences, and to acquire the skills and qualifications of conducting scientific and research work in this field;
- Learning to use scientific-research methods in successfully organizing one's activities.

An example of the development of a lesson in "Materials Science" that can be prepared by students in order to develop the research skills of future engineers can be cited.

### **The Topic of the Lesson:**

Physical, mechanical, hygienic properties of wool and silk fiber fabrics.

### **The Purpose of the Lesson:**

**Educational:** to introduce the properties of wool and silk fiber fabrics, to provide information on how to make clothes from them.

**Educational:** To teach students to be careful when sewing clothes and to take into account all the features of fabrics.

**Developer:** Further development of knowledge about the properties of gases. Studying the method of determining the properties of gases.

**Type of Lesson:** Providing new knowledge, practical.

**Teaching Methods:** Oral, demonstrative, practical.

**Interdisciplinary Communication:** botany, drawing, mathematics, physics, chemistry





**Material and technical equipment and visual aids:** Samples of wool and silk fiber fabrics, poster, samples of silk, wool, chit, linen fabrics, alcohol for burning, matches, iron.

### **The Progress of the Lesson**

1. Organizational part. (5 minutes).

The teacher enters the class and greets the students, determines the person on duty, after checking the cleanliness of the room, determines the attendance.

2. Repetition of the necessary materials for the topic of the previous lesson and the new topic (10 minutes).

Student responses are summarized and guidance is given on the new topic.

3. Instructions on the new topic (30 minutes).

### **Plan:**

1. Determination of physical and mechanical properties of gases in a laboratory manner.

2. To determine the hygienic properties of wool and silk gauze in a laboratory manner.

3. Analysis of the results of determining the properties of wool and silk fiber gauzes and preparation of conclusions.

### **End of Lesson**

1. Giving homework.

- Draw the sequence of fiber extraction from wool and silk.

- Preparation of a table showing the characteristics of wool and silk fabrics.

2. Collecting the workplace.

### **Synopsis of the Lesson**

The physical properties of gases include its hygroscopicity, air permeability, vapor permeability, water permeability, wettability, dust absorption, heat retention, permeability, elasticity and other properties.

Hygroscopicity is the attraction of moisture to the gas itself. Hygroscopicity is determined by the moisture formula. The hygroscopicity of the same gauzes increases after washing. The thickness of the same products is increased by the method of double combing of the thread, in which the hygroscopicity is reduced. Hygroscopicity is the most important property in the assortment of underwear and summer clothes. The hygroscopicity of natural fiber gauzes is high.





Air permeability - property depends on the density of its fiber composition and finish. Loosely woven gauzes are breathable, densely woven gauzes are not breathable. Canvas weave is poorly breathable.

Vapor transmission - the property includes the retention of vapor released from the human body. For example, gauzes woven from wool fibers are less permeable to steam and retain relative humidity of the air under the clothes than other gauzes.

Water permeability is the ability of gases to resist water transmission. Watertightness is characteristic of special gasses.

The property of dusting is the pollution of gases. It depends on the composition, density, finishing of the fiber. In terms of dust absorption, feather gauze gives the highest index. Glass gauze does not attract dust at all. Carpets and rug products are very good at attracting dust. They are difficult to clean and stutter.

Properties of gauzes made of wood fiber.

Gauzes woven from wool fiber are soft, warm, and not very durable, wrinkle quickly, retain heat well, drape moderately, and attract dust. The thread is flexible, it penetrates when washed, and it retains moisture for a long time. Takes the iron well.

Properties of gauzes made of silk fiber.

Gauzes woven from silk fibers will wrinkle quickly when ripe. It has good drape and good ventilation. Absorbs water well. The thread is flexible, it will come in when washed.

In the example of "Materials Science", the tasks assigned to develop the research skills of future engineers can be evaluated as follows:

- 5 points for complete and correct coverage of the content of the assignment;
  - Being able to apply theoretical knowledge correctly in examples - 3 points;
  - Ability to express thoughts clearly, concisely and fluently - 2 points;
- 10 points in total.

Assignments for each subject are evaluated according to the plan during the semester. After completing the tasks on all the planned topics, the average arithmetic value of the points obtained on the recommended task is calculated and the average rating point for the semester is set.

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