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Actıvatıon Of Cognıtıve Actıvıtıes Of Students At Laboratory And Practıcal Lessons

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Abstract

The target orientation is characterized, activization of cognitive activity of students is carried out and commented on by the example of the course “Material resistance”.

1. Introduction

In the process of improving the practical training of specialists, a significant role is played by various types of laboratory and practical exercises. Laboratory and practical work helps students to learn firmly to their chosen profession, they accustom them to creative work, without which any activity of future specialists is unthinkable. Laboratory and practical work serve as a link between theory and practice. Performing them, students deepen and consolidate the theoretical knowledge obtained at lectures, verify scientific and theoretical positions experimentally, get acquainted with equipment, instruments and apparatus, learn to use them.

In the era of rapid scientific and technological progress, this form of organization of the educational process in institutes, technical schools and schools becomes a school for the education of the future specialist human experimenter, who not only practically verifies the validity of the hypotheses of science, but also conducts an independent search.

In the process of performing laboratory and practical work, “laboratory literacy” is developed, based on a deeper understanding and knowledge of any research, experimental experience in studying the nature or its phenomena of a particular technological process. These classes educate students in the skills of a high working culture: to work according to plan, to complete the task on time, to skillfully and carefully handle tools, instruments and materials, to bring them into proper order after classes, etc. One cannot but recall the owl of the famous Soviet scientist K.A. Timiryazev: “People who have learned simple measurements, observations and experiments acquire the ability to pose questions themselves and receive actual answers to them, finding themselves at a higher mental level compared to those who didn’t do such a school. ”

The practical opportunity to apply knowledge and directly enter the circle of scientific and technical problems of a future profession attracts students, increases their interest in science, and forms curiosity. Young people tend to get involved in science, its discoveries. Therefore, it is necessary to plan and direct the content of laboratory and practical work in such a way that they enthrall students, contribute to the development of aspirations for search creative work for them, and also activate cognitive activity.

How will students add deep and lasting knowledge? It is not easy to answer this question, but we can safely say that this is largely facilitated by such a teaching methodology that activates the cognitive activity of students in the classroom.

There are many methods for enhancing the cognitive activity of students, and yet, it is impossible to give a general recipe for all occasions. It all depends on the specifics of the subject, educational material, level

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of preparedness and individual characteristics of the trainees.

In this paper, we consider the issue of enhancing the cognitive activity of students within the framework of the capabilities of one subject, i.e. on the example of laboratory work on the course "Resistance of materials".

When studying the course “Resistance of materials”, students should learn to theoretically and practically determine the linear and angular displacement of the beam and the modulus of elasticity of the wood under transverse bending (deflection and angle of rotation).

However, most laboratory work on this course is carried out by bulky stands and equipment with large dimensions, which require a special place and facilities for its installation and use. For example, the deflection and angle of rotation of a beam loaded with a transverse concentrated force are determined using a universal RIIT machine or on the SM-4A installation.

These stands and installations do not make it possible at a high level to attract each student to the active work in carrying out the assigned task, i.e. only one more active student from the subgroup does the work, and the rest remain passive visitors.

Also, not all educational institutions have the opportunity to purchase such bulky machines and equipment for the equipment of educational and laboratory rooms.

A very effective is the method of conducting laboratory work with small-sized installations and equipment that accustom students to accuracy, ensure cleanliness in the laboratory. The use of such installations can significantly increase the number of experiments conducted by each student. To this end, we developed and manufactured a universal installation for laboratory work to determine deflections, angular rotations of simple and cantilever beams, a statistical modulus of elasticity of materials, draft (Fig. 1) and shear modulus (Fig. 2) of coil springs under axial load.

The overall dimensions of the installation are as follows: length - 400 mm, width - 120 mm, height - 180 mm, weight - 4 kg, (obtained copyright certificate SU, No. 1441172 A1, (51) 4 G 01 B 5/30 1988)

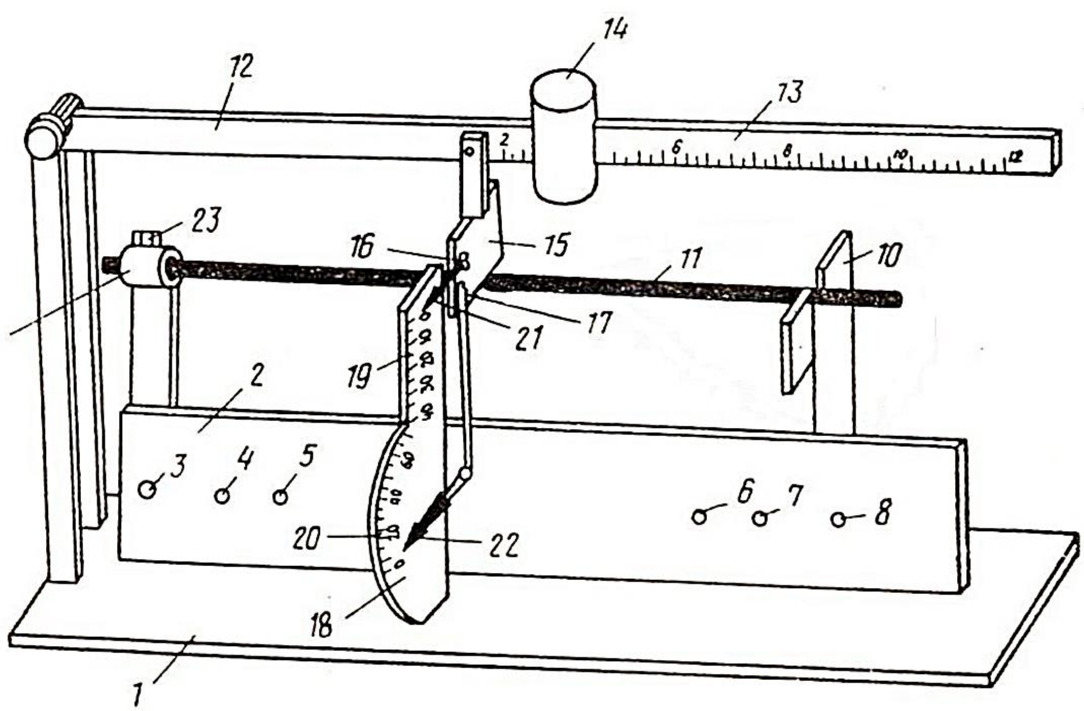

Fig.1

The installation (Fig. 1) contains a base 1, a rack 2 fixed on it with holes 3-8, holders 9 and 10 of sample 11 fixed in holes 3-8, the loading mechanism of sample 11, made in the form of a hinge mounted on the base of 1 rod 12 s a linear scale 13, a load 14 and a plate stop 15 fixed in the middle part of the rod 12 with grooves 16 and 17, and a displacement meter made in the form of a plate 18 fixed on the base 1, with a linear 19 and an angular 20 scales and indicating arrows interacting with these scales 21 and 22, arrow 22 is pivotally mounted on plates 18 with a screw. The holder 9 is made in the form of a cylindrical cartridge with a clamping screw 23, and the holder 10 in the form of a plate support. Depending on the purpose of the study, two holders 10 or one holder 9 can be used.

Installation works as follows.

In the initial state, the holders 9 and 10 are mounted on the rack 2 in the corresponding holes 3-8 and the sample 11 is fixed on them. The stop 15 is brought into contact with the sample 11, the load 14 is set to the position in which the sample 11 is loaded with a small initial force, and In this position, the arrows 21 and 22 are moved in the grooves 16 and 17 until they are combined with zero divisions on the scales 19 and 20.

When measuring, the load 14 is moved and the test load on the sample 11 is increased. In this case, on the scale 19, the amount of death on the sample 11 is counted, and on the scale 20, the angle of rotation of the sample cross section. When measuring the angle of rotation and camber of a simple beam, both holders 9 and 10 are fixed on the rack 2. When measuring cantilever beams, only one holder 9 is used (Fig. 2).

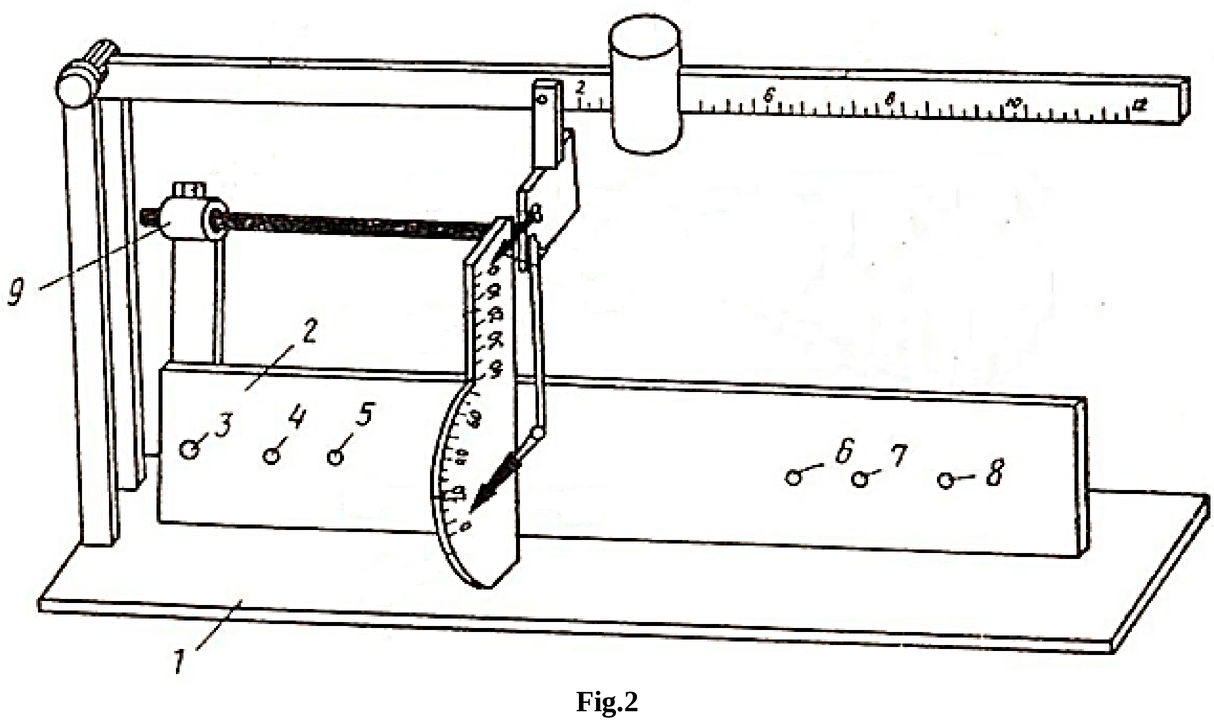

Fig.2

To determine the draft and the shear modulus of coil springs under axial load, remove the sample holder 9 and 10, also the plate stop 15 (Fig. 1), and other sample holder 1 and stop (Fig. 3) are installed in their place, with the sample holder and stop 2 made in the same forms in the form of a round plate. The sample holder 1 is welded to the installation bolt 3, and the bolt 3 with the lower threaded end is mounted on the nut 4 welded to the stand 5. The stop 2 is provided with an arrow 6 for measuring the amount of spring draft during the test and arrow 7 for indicating the angle of rotation of the spring branch.

When measuring, the load 8 moves and the compressive load on the spring 9 increases.

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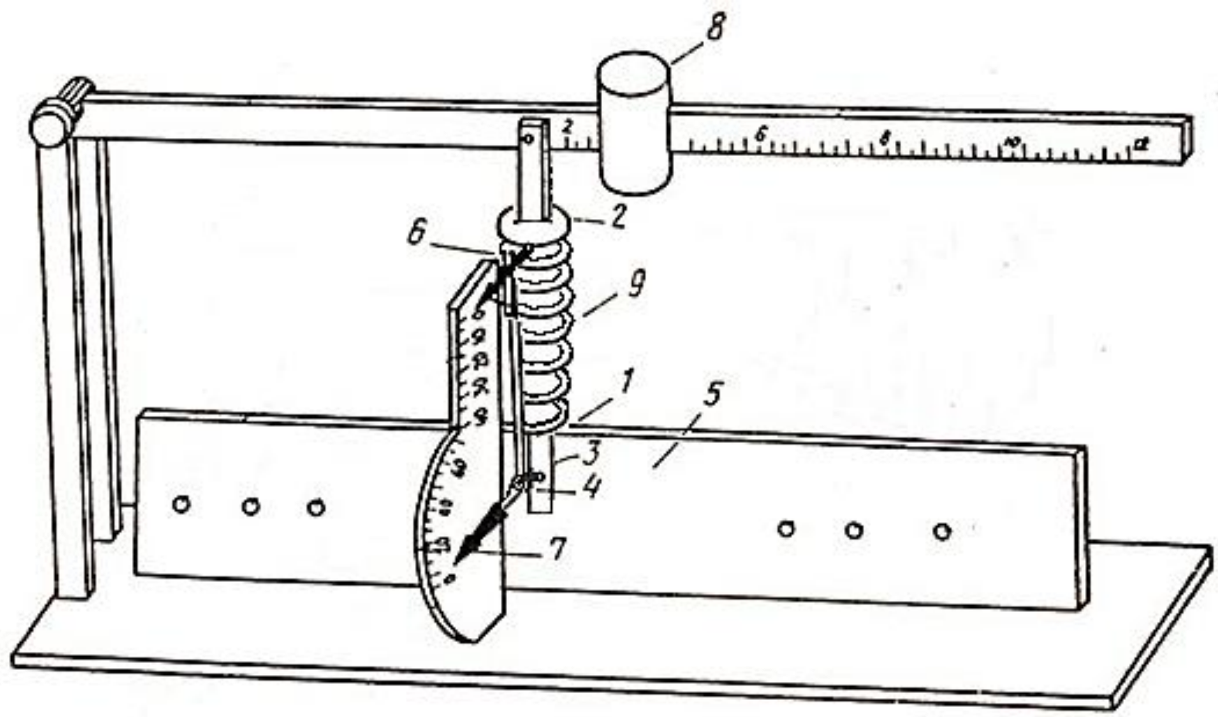

Fig. 3

Processing of the results of the experiments is made out according to the well-known method for this course.

The pedagogical effectiveness of laboratory work on the proposed installation lies in the possibility of increasing the number of students performing individual tasks due to the possibility of changing the length of the support and the size of the cross sections and materials of the tested samples, in the simplicity of design and easy accessibility of the methods of work, in saving time.

The installation is compact and versatile, since it gives the opportunity to give each student an individual task for performing laboratory work, are also beneficial from the point of view of safety, in addition, it can be used in the classroom during frontal oral interviews.

The use of such an installation gave us the opportunity to organize single jobs, which greatly affected the activity of students. Now they conduct experiments completely independently, they feel responsible for the order in their place. And the teacher has the opportunity to more effectively control their activities.

To carry out laboratory work to determine the collapse of a simple and cantilever beam, a static modulus of elasticity of a material, we have developed thirty versions of data, including the sizes and materials of samples, in which the deflections and angles of rotation are measured. The teacher gives these data to students in accordance with their serial number in the journal, which ensures a reduction in unproductive time losses in the lesson.

To test the effectiveness of laboratory work on the proposed home-made installation, we conducted preliminary pedagogical experiments. To do this, laboratory work was carried out on the developed home-made device among 3rd year students in one subgroup, and on the existing machine in the second subgroup. The experiment was carried out in two directions: firstly, we clarified how laboratory work carried out on a home-made device and an existing installation affects the strength and completeness of knowledge and, secondly, how much time students spend on their implementation.

Our observations were carefully recorded and then analyzed. Verification work was carried out to test the knowledge and skills of students. A check based on the results of laboratory work showed that in the experimental subgroups where students conducted independent research on the proposed home-made installation, 94.5% of the students gave the correct answers, in the control subgroups - 89.1%. Also, for experiments, students spent more than 20 minutes less time on a makeshift installation than on an existing machine.

Thus, for carrying out laboratory work on the proposed universal educational and laboratory installation, it makes it possible to attract each student to the active work at a high level when doing work, which significantly affects the activation of cognitive activity. Its application can significantly increase the number of experiments conducted by each student.

The pedagogical effectiveness of the installation consists in the possibility of using it not only during laboratory work, but also for use in lectures for a visual demonstration of the theme: bending, compression, torsion, shearing, crushing, etc., also the scope of design and versatility, readily available ways of working and saving time.

In addition to the main purpose, the installation can be used to carry out all kinds of scientific, technical and educational research works of students and other scientists: for example, to determine the static modulus of elasticity of fruit wood (apple, pear, cherry, plum, etc.), when designing vibratory machines for harvesting tree fruits: efforts and the angle of fracture of steels (kenaf, reed, fruit wood, cotton, etc.), crops for the construction of harvesting machines. Also, the installation can be used in technical schools, where the study of "Technical Mechanics" is provided, also in secondary schools for the course of physics, for laboratory work to determine the Young's modulus, as well as a visual demonstration of the elastic force (VI class) and body deformation, etc.

Carrying out laboratory work on our proposed installation has many advantages and plays a large role in enhancing the cognitive activity of students and pupils.

It can be made by students in the training workshops of any educational institution.

The operating experience of the installation showed its undoubted advantages over existing options for laboratory equipment. Therefore, it would be advisable to centrally develop such universal educational and laboratory facilities and organize their mass production, which would greatly accelerate the modernization of educational laboratories of mechanical engineering.

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