Self-made teaching equipment in teaching physics at upper secondary schools based on active teaching methods

M.A, Duc Nguyen Lam - Huynh Thuc Khang upper secondary school Vinh City-Nghe An Province-Viet Nam.

Abstract: In active teaching, equipment plays an important part in improving the quality of education. This article about using some of the self-made physics teaching equipment, helps students take part in learning activities in an eager and active way to develop their abilities.

Keywords: Physics, teaching equipment, Viet Nam, assembly, students

1. Self-made teaching equipment in teaching physics

Self-made teaching equipment includes all kinds of equipment and technical equipment, from simple to complex, used in the teaching process in order to support teachers and students in cognitive activities.

a) The concept of self-made teaching equipment

Self-made teaching equipment is the kind of teaching equipment made by teachers themselves or improved from certain teaching facilities, as well as artifacts collected, self-made teaching equipment has principles of composition and usage that is suitable for the teaching idea of the teacher who makes it, so that it is very useful for teaching reality.

b) Organising cognitive activities for students with self-made teaching equipment

Students' cognitive activities are a sequence of activities to solve the cognitive problem:

students get the knowledge themselves under the control and guiding of teachers. The result of is that students obtain the knowledge, form and develop their abilities.

In problem-solving teaching method, teaching equipment is used in the following stages: Proposing the problem and creating situations of awareness: through experiments and real phenomena conveyed into the classroom with teaching equipment, teachers give students a learning task containing the problem potentially. Students receive their task and solve the problem eagerly and voluntarily; Problem solving stage: Teachers help students do their task; propose the hypothesis; make plans and implement the plans to solve the problem. In this stage, the hypothesis that needs impressing through proposed experiments is checked whether it is suitable for the certain teaching equipment; Discussion and evaluation stage: Teachers arrange for students to discuss whether confirming or refuting the proposed hypothesis, to state the conclusion, to get the knowledge and apply in practice.

The use of self-made teaching equipment in teaching physics is quite various and abundant, depending on the aim and the idea of teachers in teaching reality. It may be the equipment that supports experimental observations (self-made object projector), or sometimes is a subtable that stimulates students in group activities, experimental performances and students' batch experiments.

2. Self-made teaching equipment in teaching the lesson: "Magnetic fields of some currents of simple circuits" in Physics 11 for upper secondary education program in Viet Nam

1) Making necessary teaching equipment to arrange teaching-learning activities

a) Self-made object projector (Figure 1)

In teaching physics, self-made object projector is connected to an overhead projector to show the experiments and describe the process of carrying out the experiments more clearly. While teaching, large classes make it difficult for all students to observe the experiments horizontally, so teachers have to use an object projector connected to the display devices to help students watch the phenomena happening during the experiments. Besides, object projectors help students observe small patterns, pictures, details and the result of the activities shown in small

cards by students working in groups.

Despite its outstanding features, object projectors are scarely used in teaching because of the high price, in addition, teachers are not used to using this kind of teaching equipment. However, we can make an object projector ourselves from certain facilities.

Materials: A digital camera (1) with a minimum resolution of 16.1 Megapixels and 4X digital zoom sized (95x56x24)mm, 25 cm long metal shaft (2) with the threaded hole fitting the threaded hole of the racks of the digital camera; a tripod (3) a coupling (4); a cable connecting the camera to the overhead projector (5) and an overhead projector.

Assembly: put the mental shaft into the threaded hole of the camera. The other end of the mental shaft is connected to the tripod with the versatile coupling so that the camera is put horizontally and the camera lens look towards the object or the experiment for observation. The end of the cable is connected to the camera through out digital A/V gate while the other is connected to the projector through video gate (Figure 1).

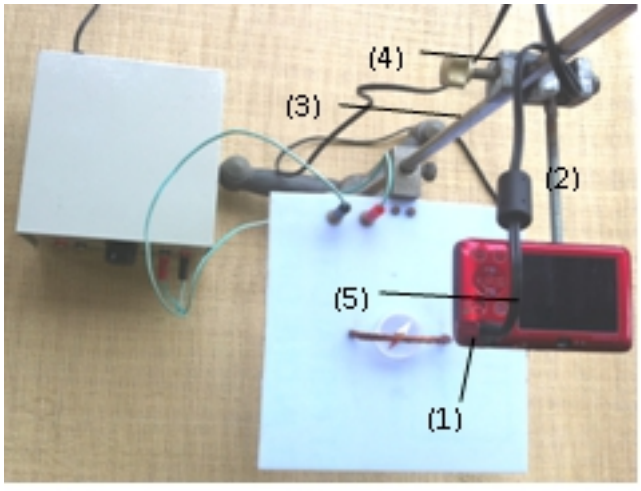


Figure1: Self- made object projector

b) The equipment for surveying the magnetic fields of a current in a long straight wire (Figure 2)

The equipment consists of materials processed as follows: a 20cmx20cm plastic board drilled 2 holes with a separate of 10 cm (1). A 6 meter copper wire with the diameter of 2mm. Wrap copper wire through the two holes to form a rectangular wire frame (2). We observe a region of space near the edge of the wire frame and consider as a survey of magnetic fields of long straight wire. Iron filings (3). Test magnetic needle (4). Direct current power (cell, battery, transformers) (5). A tool bracket. A plastic board with a long straight wire installed on the shaft and above is the self-made object projector to show the pictures of the experiment directly on a large screen through the projector (Figure 2).

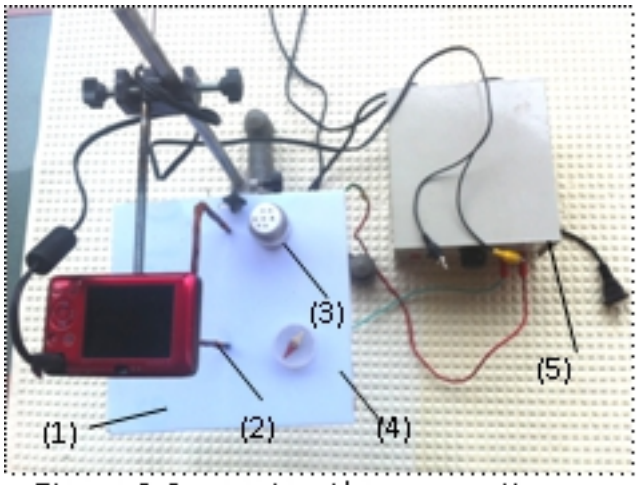


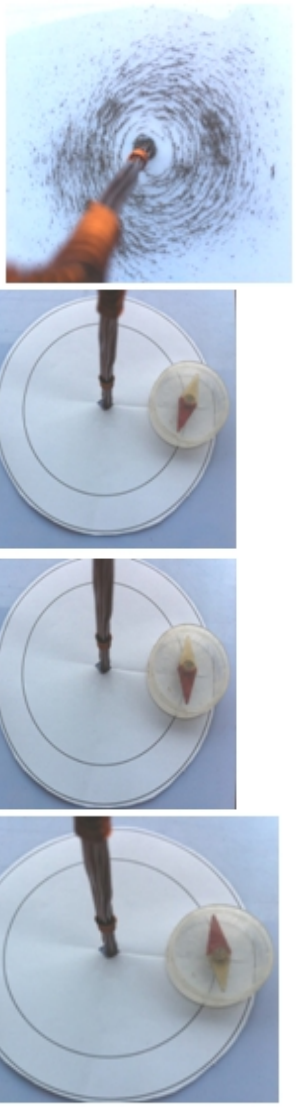
Figure2:Surveying the magnetic fields of a cussent in a long straight

2) Using self-made teaching equipment to arrange cognitive activities for students.

Researching activities on magnetic fields of a straight current: Teacher arranges for students to make a research problem, then prepare an experiment with a long straight wire, turn on the camera, change into the connection mode of the projector. Students look at the pictures on the screen directly. Teacher asks one student to sprinkle the iron filings on the surface of the plastic

board and tap it. The other students observe the phenomena (the process of the experiment and the pictures displayed directly on the large screen. Teacher asks students to give comments on the spectrum. Teacher takes a photo of this spectrum (Figure 3a).

Teacher puts a test magnet in the region of magnetic fields of a wire on the circle illustrating the magnetic field lines, then turns off the power and ask students to look at the orientation of the test magnetic needle (north-south oriented) (figure 3b). Turn on the switch, let the wire carry a current and ask students to look at the test magnetic needle (the axis of the test magnet tangents to the circle and has the direction determined) (Figure 3c). Change the direction of the current and ask students to look at the test magnetic needle (the axis of the magnet doesn,t change). Observing the colour of the test magnetic needle helps students recognise the opposite direction of the magnet (Figure 3d). Thus, students can see the relationship between the direction of the magnetic field lines and that of the current.



a b c d

Figure3: Picture of spectrum and the orientation magnetic needle in researching the magnetic fields in a long straight wire.

3. Conclusion

In fact, the use of self-made teaching equipment makes students eager for the lesson They express their ideas actively and work together to solve the problems voluntarily. It is easier and more convenient for students to obtain the knowledge. In order to prove the effectiveness of the use of teaching equipment mentioned above, some lectures were given at class 11A1 and 11A2 of school year 2013-2014 at Huynh Thuc Khang upper secondary school-Vinh City-Nghe An-Viet Nam.

The result has indicated the effectiveness and the practicability of self-made teaching equipment in teaching physics.

References

1. Ministry of education and training of Viet Nam, the project for self-made teaching equipment development in Preschool and secondary education period 2010-2015, Ha Noi, 2010.

2. Department of secondary education, Ministry of Education and Training of the evaluation of learning results in the orientation of developing students abilities, secondary education development program, Ha Noi, 2014.

3. Department of educators and managers of educatinal institutions, training materials for methods and techniques of active teaching, Viet Nam-Belgium Project, April, 2010.

4. Binh Luong Duyen (editor-in-chief), Physics 11, Education Publishing House of Viet Nam, 2013.

5. Phu Pham Thi, Improving skills of making and using laboratory equipment in teaching physics at upper secondary education level for students of physics Department, research project evaluated by Ministry of Education and Training Vinh University, 2006.

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