Ostravská univerzita v Ostravě
UNIVERSITY OF OSTRAVA
Faculty of Science, Department of Physics

THE PHYSICAL EXPERIMENTS AND THE MODELLING WITH ICT

Lenka Ličmanová

Abstract

The physics is a very important field necessary to the development of modern civilization. Today the students are not interested in science. Undoubtedly important part of today's modern education is information and communication technology. The research said that students want to use ICT in learning and also want to do experiment it yourself [1]. Information and communication technology associated with student's experiments seems to be as a good and interesting idea. This is not a simple experiment, but the inquiry-based teaching, which to contribute to the development of student imagination, to better understand and to better remembering the curriculum.

1.   DVOŘÁK, Leoš. *Lze učit fyziku zajímavěji a lépe?: příručka pro učitele.* 1. vyd. Praha: Matfyzpress, 2008, 161 s. ISBN 978-80-7378-057-9.

Introduction

The aim of this work is to create a set of inquiry-based teaching using ICT. These experiments should develop creative thinking, increase the level of knowledge and skills and learn students to work with ICT. In particular, students should be able to work with Vernier system and then to process and evaluate the measured data using some program such as Excel.

Materials & methods

Inquiry-based teaching is called as methods of scientific knowledge. [2,3,4] These are the methods by which the physicists find to the facts. These methods include the idealization of objects and processes, formalization, system approach, which is further comprised of various processes - analysis, synthesis, abstraction and concretization. [5,6,7]

Recently, the emphasis is on that appearing of the inquiry-based teaching in the education. Inquiry-based teaching has a great and an invaluable contribution. Because what the man himself appears and explore, he will never forget. Additionally, the research is interesting and should be attractive and to entice the students. The degree of development of creativity will be evaluated on the basis of hypotheses that students create. Difference between result of the test before research and of the test after research determined increase knowledge and skills. The increase of knowledge in the group in which they will learn methods of inquiry-based teaching will be compared with the increase of knowledge in the group who are learning the traditional way. On this basis, the contribution of inquiry-based teaching will be determined.

Students use Light sensor and Motion detectors by Vernier. The Light Sensor approximates the human eye in spectral response. Use it for inverse square law experiments or for studying polarizers, reflectivity, or solar energy. Motion detectors ultrasonically measure distance to the closest object and create real-time motion graphs of position, velocity, and acceleration. [8]

2.   REDISH, Edward F. *Teaching physics: with the physics suite.* Hoboken, NJ: John Wiley, c2003, xi, 216 p. ISBN 04-713-9378-9.
3.   MINTZES, Joel J, James H WANDERSEE a Joseph Donald NOVAK. *Teaching science for understanding: a human constructivist view.* San Diego, CA: Academic Press, c1998, 360 p. Educational psychology. ISBN 01-249-8360-X.
4.   LOUCKS-HORSLEY, Susan. *Designing professional development for teachers of science and mathematics.* 2nd ed. Thousand Oaks, Calif.: Corwin Press, c2003, xxxii, 376 p. ISBN 07-619-4686-1.
5.   MECHLOVÁ, Erika. *Specifické problémy vzdělávání fyzice 1.* Ostrava: Ostravská univerzita v Ostravě, 2006.
6.   MECHLOVÁ, Erika. *Specifické problémy vzdělávání fyzice 2.* Ostrava: Ostravská univerzita v Ostravě, 2006.
7.   FENCLOVÁ, Jitka. *Úvod do teorie a metodologie didaktiky fyziky.* Praha: Úvod do teorie a metodologie didaktiky fyziky, 1982.
8.   WWW.VERNIER.COM. [online]. [cit. 2012-08-20].

Inquiry-based teaching

1. phase
Teachers and students will get worksheet. At the first, teacher tells about problem to the students and he explains the necessary concepts. Students will try to formulate their own assumptions and hypotheses.

2. phase
Students with teachers help design the necessary tools to perform an experiment and also design procedure of the experiment.

3. Phase
Students will work in the group and they will be supervised by teacher. Students do the protocol of experiment using pc. Their hypotheses and assumptions compare with actual measured data and they find the dependence of individual variables. The protocol will have all the elements of the protocol on research activities, supplemented commented solution. [5,6]

Problem: In everyday life we encounter the concept of lighting. From parents and teachers we hear that it is important to read and work with adequate lighting. What is the dependence of illuminance on the distance from the light source? Design an experiment which verifies your hypotheses. (Teacher explains the necessary concepts and subject matter.)

This problem has been awarded to students of first-year of studies at the University of Ostrava. Students measured with Vernier system. There were light meter and a sensor of distance. Immediately, Vernier system draws them chosen dependence. The measured data, students copied and then processed it in Excel. Then students had to create protocol. The protocol has the following parts: name and enter tasks, tools, theory, measurement procedure, measurement data, processing, conclusions.

Dependence of illuminance on the distance
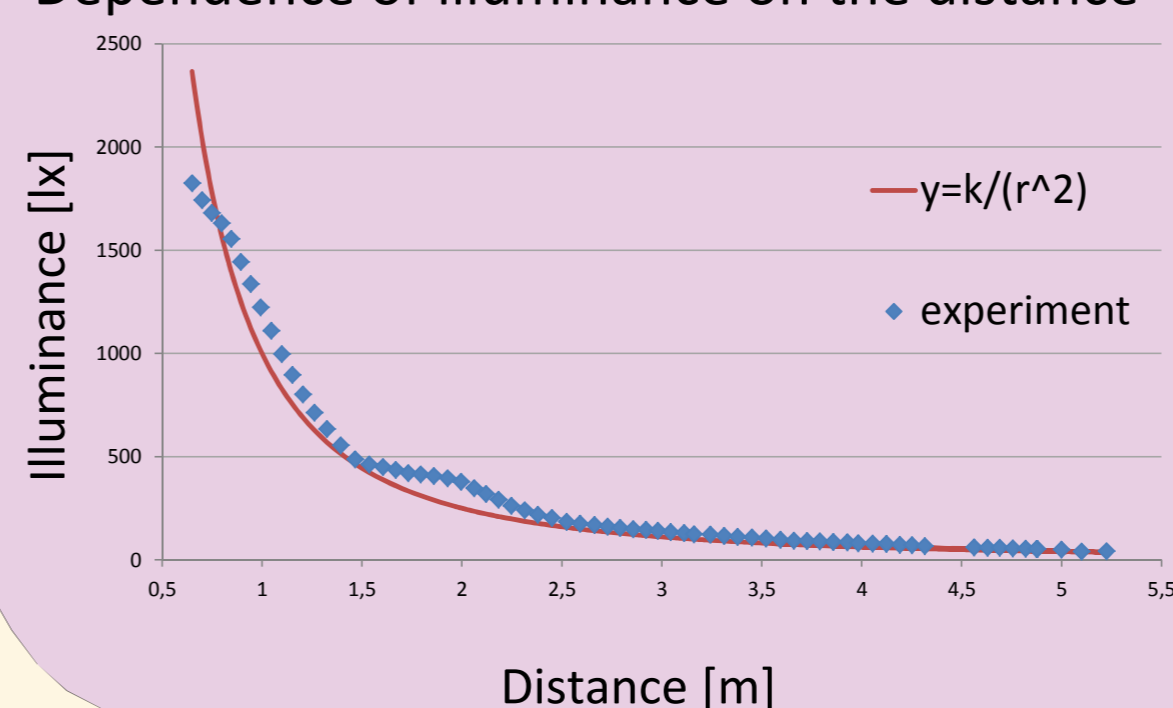
We found that the dependence has the form $y = \frac{k}{x^2}$, where x is the distance from the source and k is constant. We confirmed the hypothesis that light decreases with increasing distance.
This dependence is second degree.

Conclusion

Inquiry-based teaching should contribute to the overall development of students, both in terms of knowledge and skills to develop creativity, as well as to develop skills for learning, problem solving, social and personal, communication and working.
Inquiry-based teaching should have its place in teaching, because as the old Chinese proverb:
"Tell me and I forget, show me and I remember, let me do it and I understand."