About the Project Education at the Secondary School at Czech Republic

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Abstract
In this paper we present some experiences from the Project Education at the Secondary School in Czech Republic at the present.

Keywords: project education, secondary school, Czech Republic.

Resumen
En este artículo mostramos algunas experiencias presentes del Proyecto de Educación en la Escuela Secundaria en la República Checa.

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I. INTRODUCTION

To catch up secondary school pupils' real interest in physics is one of those generally mode difficult tasks of their teachers in present-days. Modern conceptions of physics education emphasise that it is essential to understand "where" pupils are and what they can manage, what they can do and what they really do, which aspects are the most essential ones for their learning [1]. A pupil should feel that he is able to understand physics. The themes should be preferred which secondary school pupils are interested in, which they see around, by which they are enclosed—and pupils really want to understand them.

The discussion with pupils about a suitable problem is an unambiguously useful way to developing the pupils' interest in physics. The good question motivates pupil's natural curiousness, a physical model is presented as an answer to the question, activities govern pupil's skills. Pupils' critical thinking is the centre of their education and preparation for the university studies. And from pupils these themes are much gained!

The basis of natural sciences is important for general scholarship and it is necessary for scientists and technicians. The physics education must capture the corresponding reflection of the advancement of physics as well.

The good scholarship in physics is gained via understanding the allotted amount of subject matter and physical laws especially—applying onto contemporary problems. "The gist of natural sciences for everyone in the 21st century" demands understanding fundamental ideas of natural sciences and their explanation. Point is that we must avoid rigorous academic systematisation but go upon the very everyday phenomena. That is why the goals of the physics knowledge at the secondary school are: motivation—why the things are as such as we observe them, activities—to suggest utilisation for a physical concept and eventually its illustration in some situation, thing or phenomenon, polling—to understand everyday things; problems—how the physical knowledge can help pupils understand the world around, how the physical knowledge can be used in routine everyday activities, how the physical knowledge can help us understand things—which our senses cannot afflict—more deeply.

For example "Physics in Photography as integrated physics course" can occupy pupils by its factual conception: by means of small projects pupils can reach the understanding specific themes—optics, heat, kinematics, electromagnetic wave, eye, colour etc. Then the group discussion about created photographs takes place, of course.

The common denominator of many suggestions dedicated to reforms of physics education at the secondary school is to accent the fact that pupils will be more interested in physics when they will solve problems "from the world around", from those things which enclose them. Of course, the pupils' project work is emphasised, that kind of work which is so successfully being developed in the USA, Japan and Canada.

II. FORM OF THE PROJECT EDUCATION

The form of project education in the intentions of modern physics education concepts in connection to the development of pupils' interest in physics has been applied within the scope of homework from physics at the EKOGYMNÁZIUM.

The first step of this way was teacher's discussion with his pupils about the conception of the scientific work of a pupil and secondary school graduate, and his relationship to solving problems. Not only of the teachers' experiences were presented but the pupils' ones as well.

The natural opening of such discussion was: let us advance by process which has got significantly high effectiveness and which is also in its own way attractive, motivating and prepares for the university study. There still governs: pupil will learn the most by his own work!

Pupils were relatively intimately informed about the conception of project education in our country and abroad, especially at the universities. Pupils were interested namely in which universities in the Czech Republic apply the project education, what the project education stands for at particular school specifically, what it requires from students. Next they were informed about conceptions of secondary school education and their implementations in the world. Pupils are interested not only in which school they attend but also who and how teaches them, how high will their final secondary school level be. And their parents are adequately interested in this information as well. Then the so many proclaimed cooperation between the teacher, pupil and his parents can take part.

Every month there is a theme for a writing work introduced to pupils, i.e. ten particular projects in a school year. Pupils document their relationship to the task's theme by the quality of the elaboration. There is principle that "they elaborate the task for themselves, not for the teacher"! The dimension of the task is recommended, not commanded—that is why pupils elaborate it in range of about up to ten pages of A4 paper. The problem naturally lies in the selection of home projects. There is a series of parameters involved: actuality, everyday phenomenon, rounding things and processes, problems discussed in society, scientific interest of pupils, contemporary physics problems, connection of physics and technology, relationships between natural sciences etc.

The selection of the themes of the home projects is naturally the challenge. There are several parameters in stake: actuality, everyday phenomenon, surrounding things and processes, problems discussed in society, scientific interest of pupils, problems of contemporary physics, relationship between physics and technology, relationships between natural sciences etc. That is why the home works' themes like biodiesel, solar power plant in Úštěk, ebb, flow and surf, physics and archaeology, hurricane, health capability for flying, physics and telecommunications, Airbus A380, clouds, chaos, physics and musical instruments, Chernobyl power plant accident, alternative sources of energy, tomography, physics and fire, Chinese astronautics, physics and railway, physics and textile, space technologies, history of Boeing, tsunami, physics and food industry, the structural unit of human's skeleton—a bone, winter tyre, physics and building design, ultra light aeroplane, space shuttle, Y. A. Gagarin's flight, sauna, ball lightning etc. were set.

It is pleasant, that the most of pupils in principle assumed such form of homework as their "work activity". They look for data for quality solving of a project or for elaboration of homework's theme, respectively, at selected institutions including Academy of Sciences, universities, from reputable specialists, from the internet, literature, journals, newspapers, they discuss with the others etc.

It is usual that the project work's theme is very imminent to pupils or they are so interested in it so they give a big amount of time for solving it. These pupils gain possibility of presenting their result to the other schoolmates, vide pupil—amateur pilot preparing himself for study at the CTU Faculty of Mechanical Engineering.

III. PHYSICS COMPETITIONS AND THE PROJECT EDUCATION

The purpose of project education or of its form, respectively, is significantly fulfilled when global solving of a problem overgrows into a quality work in the Secondary School Scientific Activity in physics [2]. Here the teacher's creative approach, providing the work's consultant but especially the pupil's "never-dying interest" and necessary support of the school representatives necessarily takes part. The factual examples verifying this fact are two first prises for the school's pupils from the Prague final of the Secondary School Scientific Activity in physics from 2007 and 2008: L. Pichrt's "Physics and Building Design" and M. Minič's "Problems of Thermonuclear Fusion". The consultants were Assoc. Prof. Eng. P. Konvalinka, Ph.D., from the CTU FME and employees of the Embassy of the Peoples' Republic of China in Prague.

IV. CONCLUSIONS

All the homeworks are evaluated, the best outcomes are told to pupils or a class, respectively. Of course, the teacher makes some global conclusion about the problems studied. Thirty texts of the solved problems give pupils, who apply for the appropriate university study, not only some basis of their project university study but also a certain benefit for understanding selected scientific problem included into the pieces of fundamental knowledge.

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