

Beauty and Physics – Physics projects based on modern esthetic and medical treatments

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Abstract. Physics as a natural science seeks to answer the questions that arise in the world around us. One of the fields of motivation is to show the students that several devices and treatments used in beauty industry or for staying healthy applies physics laws and phenomena. Examining the physical background of different modern treatments can be used to raise simple and complicated issues in Physics and also gives us the opportunity to carry out qualitative or quantitative experiments. We believe that these projects assist the students in a better understanding of Physics and also encourage teachers to make the subject more interesting.

1. Introduction

“Pure logical thinking cannot yield us any knowledge of the empirical world, all knowledge of reality starts from experience and ends in it.” (Albert Einstein)

Physics as a natural science seeks to answer the questions that arise in the world around us. Our knowledge of Physics helps us understand natural phenomena and the important effects influencing human life.

Still, presently, the standing and the popularity of Physics as a school subject is negative both in Hungary and abroad [1]. Recently many scientists and teachers have endeavoured to change this disadvantageous situation by developing more and more up-to-date methods. Of course, no best solution exists and most probably the future will not bring us a one and only method that will in all circumstances encourage students to gain enough impetus for their academic efforts. In my study therefore I introduce a project-based method that has the potential to increase the popularity of Physics as a school subject at secondary or higher level using new scientific content.

One of the fields of motivation is to show the students that several devices and treatments used in beauty industry or for staying healthy apply physics laws and phenomena. These topics create chances for the student to relate the lesson content to reality. In this context we present a semester-long, project-based program in which students investigated the working principle of an electric device or a medical treatment week by week.

2. Results and discussions

Electric devices such as flat iron or hair-dryer, facial ozone streamers, impulse light or laser hair remover can both raise and sustain students' interest while examining the physical background. They can be used to raise simple and complicated issues and they also give us the opportunity to carry out qualitative or quantitative experiments. Although at first sight these treatments are mostly for girls and these devices are mostly used by girls, after the investigation students can realize that most of these treatment methods are used in the other fields of life as well. For example ozone streamers are not only used by women to clean their faces, but even companies to fertilize ski-boots, helmets, cars or even rooms.

Students can understand that radio waves can be used in beauty industry not only for wrinkle removal but for varicose vein treatments as well, as the working effect is based on the same principle: using the heat energy transferred in radio waves. Radiofrequency is a non-invasive wrinkle treatment, in which thermal energy warms the deep layers of the skin to stimulate collagen production and promote tissue contraction for improved skin quality.

Radiofrequency ablation is a minimal invasive treatment when the walls of the vein are heated up and damaged [3].

Another parallel application of the same physics principle is the different kinds of ablations. In beauty treatments with the help of little crystals, pure water or a diamond head the upper, dried or damaged layer of the skin has been erased to get a smooth, tight and renewed skin. In the industry dry ice is used for the same purpose. Dry ice blusters use the solid form of carbon-dioxide to clean surfaces and machines as carbon-dioxid is nonabrasive, nonflammable and non-toxic. Dry ice is accelerated in a pressurized air stream and directed to the surface (e. g. to a graffiti on a wall). The high kinetic energy, the quick sublimation of carbon-dioxide, the enormous change in the volume and the thermal expansion of different materials make the pollution break and peel off the surface [4].

During the first semester students (aged 16-17) took part in 12 projects in which they investigated 12 different modern beauty or medical treatments advertised in media, finding the basic physics principles behind the procedure and made experiments with the available devices. For example with an UV lamp used for UV gel nail polish participants checked whether their sunglasses could filter ultraviolet rays or not. They applied a thin layer of special UV nail polish to a little sheet of plastic and every student put his or her sunglass between the layer and the UV lamp. If that sunglass was not of a good quality, the nail polish had been hardened, if the lens of the sunglass filtered the most of the UV rays, the layer remained liquid.

3. Results

Before and after the projects we measured participating students' attitudes with a short questionnaire. We found that each student had a more positive attitude towards Physics after taking part in the Science Club, seeing it as a more interesting and a more useful subject. We believe that these projects assist the students in a better understanding of Physics and also encourage teachers to make the subject more interesting. When selecting the topics, we focused on several key issues of our everyday lives through an integrated scientific aspect in a practice-oriented way using both the project method and the method of teamwork. To broaden students' knowledge in Physics, these projects arranged around modern treatments can be interpreted, explained and applied at different levels according to the age group of students.

References

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