STONAWSKI, Tamás: Applying digital media in elementary and high school education for improving students' creativity, problem solving and individual experiments

Applying digital media in education can play a key role in the future sustainability and possible enhancement of students' motivation. In my Ph.D. thesis I examined how the interest of average high school students into different fields of Physics can be raised and maintained by exploiting the possibilities of modern ICT appliances and project work favoured by students:

- Within the framework of projects, together with my students I carried out a scholarly check of two assertions published in the media *("Can sunlight burn out plant leaves when focussed by water drops on their surface?" "Is microwave boiled water harmful to plants?"*). In the projects students participated in research activities the outcome of which they could not have been aware of: the results verified the motivating effect of these kinds of activities.

- I searched for links between Physics and car-driving, and used them in study circle activities. The experiments, calculations and analyses carried out during the study circle activities approximated Physics to students' everyday life, and Physics became an essential and applied science in students' way of thinking (since it also assisted them when preparing for the Highway Code test).

- Through video analysis of slow and fast motions (*"At what speed do clouds move in the sky?" "Examination of the Moon's celestial movement, defining its rotation period." "Applying high frequency video recordings for the purposes of examining rapid processes." "Examination of the movement of balls rolling in flat bowls of differing shapes."*) my students could observe and analyse phenomena of nature, the observation of which could not have been accomplished with traditional methods. The majority of my students had already known high frequency recording and time-lapse methods, but applying them scientifically was innovative and had positive effects in carrying out experiments.

- Applying the periphery of Arts and Physics (with the help of painting analogies) I managed to bring concepts of modern Physics so strange from everyday approach closer to my students. Recognition of one of the "organising principles" of artworks, namely that of golden section, had a very strong attitude forming effect. After the school study circle session my students examined pictures downloaded from the Internet in the light of golden section.

- Due to the motivating effect of technology I used the QR code in Physics sessions, a pictorial code decipherable and viewable only by smart phones. Its use made illustration and the presentation of teaching aids and extra exercises to students easier. As an experiment I printed a set of exercises on paper, at the same time connected it with the help of students' mobile phones to several interactive supplements: students could ask for assistance in relation to a specific exercise, collect information, have a look at the result or follow the detailed work-out of a problem. With QR codes I linked video films to the exercises. Some of the films presented the experiments carried out with regard to the specific exercise; other films conveyed the experimental check of the calculated results.

- Based on the psychology of bets and quizzes I developed a method called "Let's bet on Physics!", and I used it efficiently both to motivate school class experiments and during my experimental presentations for a wider audience. Since individual student experiments play an essential role in making Physics a favoured subject, I prepared a compilation of experiments, which can be carried out with simple tools and devices, which are harmless, but result in spectacular and often surprising outcomes.