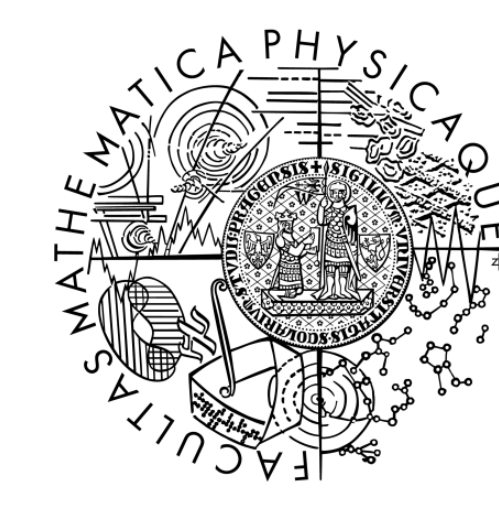
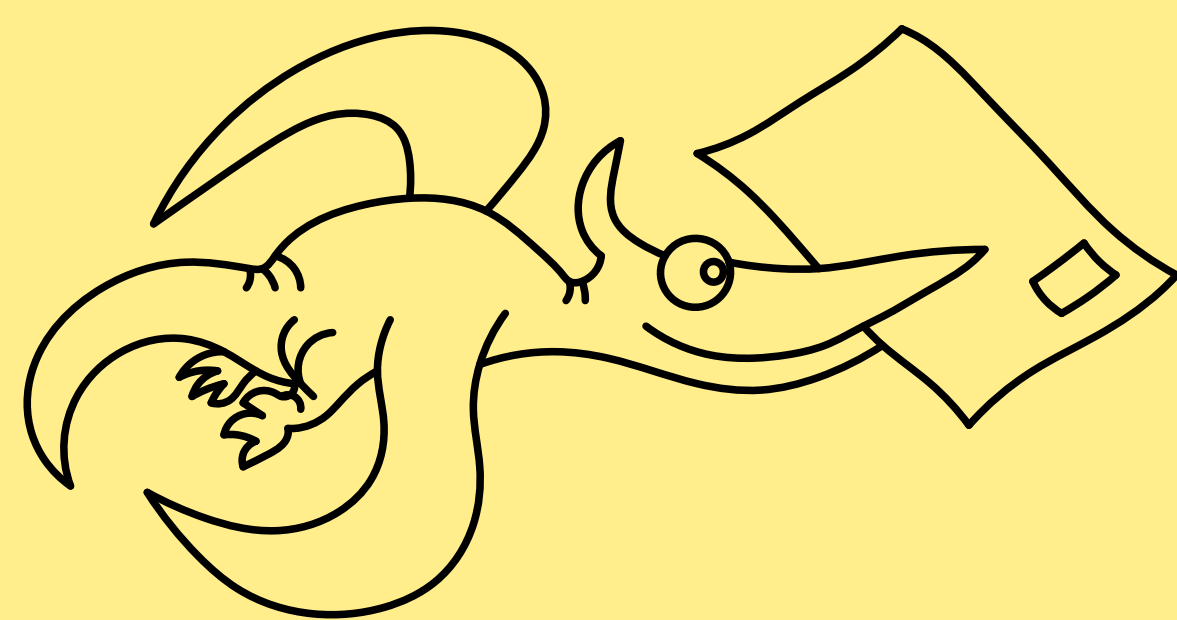


Development of Key Competences in Activities of FYKOS – The Internet Physics Competition

Karel Kolář, Faculty of Mathematics and Physics, Charles University in Prague, Czech Republic



FACULTY
OF MATHEMATICS
AND PHYSICS
Charles University



FYKOS

.CZ
.ORG

Correspondence/Internet Competition [1]

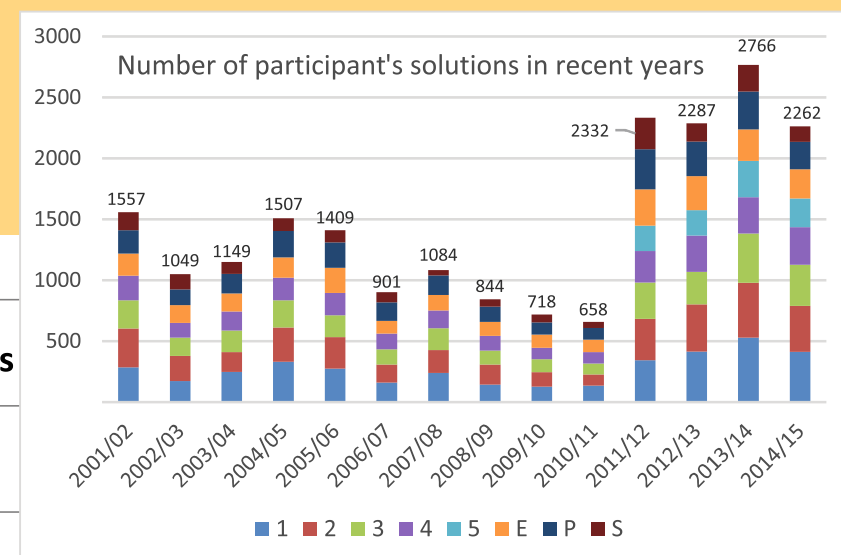
Historically more than
28 years,

1100 problem assignments on web (in Czech; 500 in English),
800 solutions (in Czech) and all the numbers all rising

The assignments are translated into English and solutions in English are also accepted.

The correspondence competition of FYKOS is held throughout the school year. FYKOS' year consists of 6 series. Each series consists of 8 problems - two which should be simple (1-2), three more complicated (3-5), one challenging problem (P), one experimental task (E) and one task related to the study text which they receive with the assignment.

The assignment is revealed on the FYKOS' web soon after the deadline for previous series. The participants have about a month for the formulation of their solutions. The assignment is usually very challenging for most of the participants. They can use various sources and hence develop their learning to learn KC (5). Participants receive feedback from organizers in the form of comments to their solutions.



Participants

High school students (ISCED 3)
Interested in Physics and Science

Currently mostly Czechs (~ 75%) and Slovaks (~ 20%)
Participation in competitions is free

Participants have usually competed before FYKOS in Physics or Mathematical Olympiad and their motivation is to improve their physics knowledge or they want to compete on more occasions.

Participants can choose from variety of activities and later on they can continue in FYKOS as organizers. If they are active they can deeply develop practically all key competences.

Organizers

University students (ISCED 5, 6, 7)
Mostly former participants
Most of them from our faculty

The organizers are often confronted for the first time in their life with responsibility for preparation of programme and organizing. They think of the programme, its impact on participants, many practicalities... They invent new activities and innovate the existing ones. Hence they develop KC 7 and partially 6 and 8.

They have to communicate intensively in the mother tongue (actually in Czech and in Slovak) in order to successfully organize activities. In some cases they also communicate or translate in English. (KC 1, 2 and 6.) For communication and organization they use some software which they have to learn to use. (KC 4)

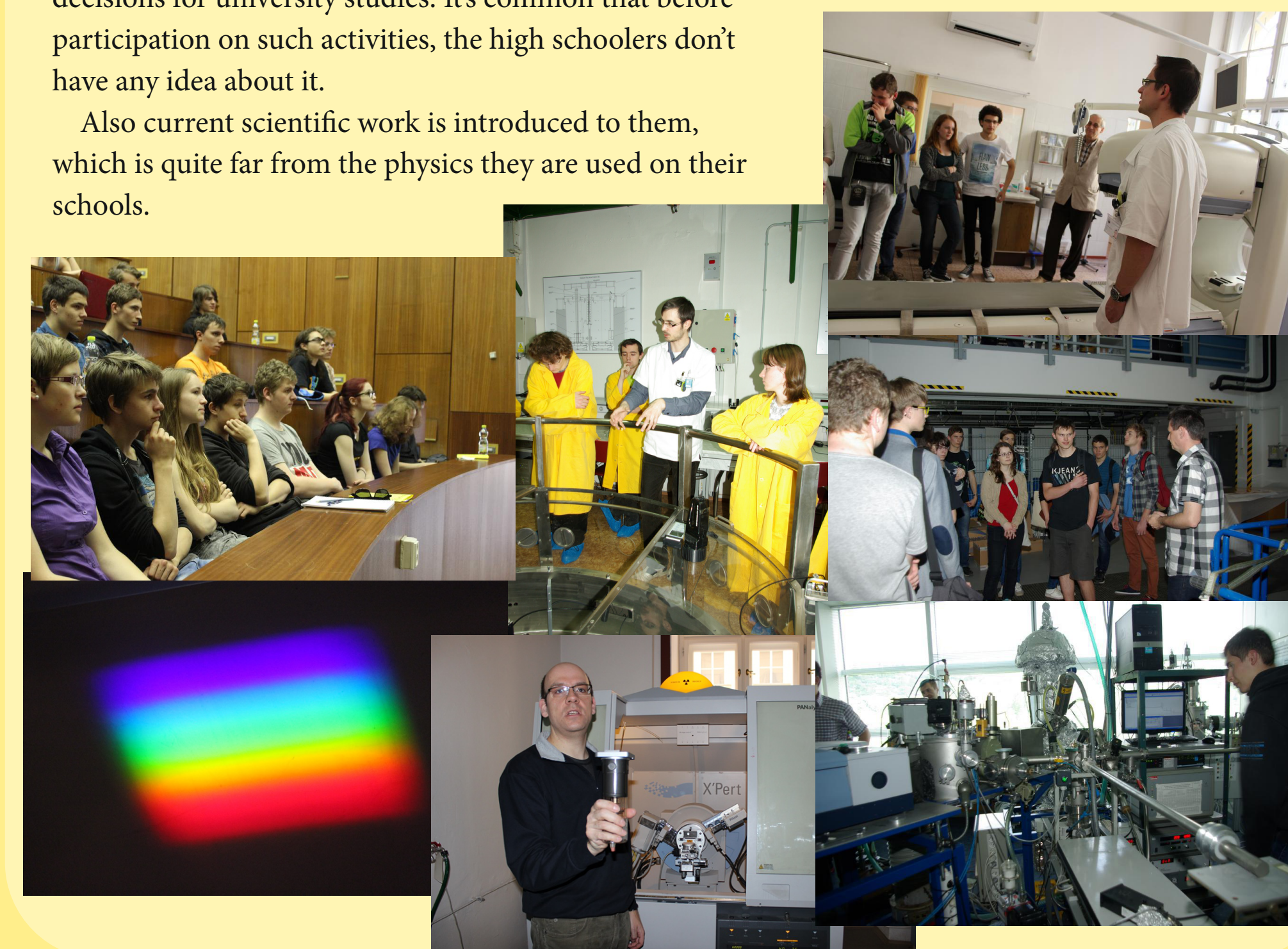
They prepare the assignments of Correspondence part, Physics Brawls and their solutions. They also prepare and have lectures. In this way they develop KC 5.

The Day With Experimental Physics [4]

One day, usually, once a year; 40 - 64 participants
Many excursions in physics research facilities in Prague

Main goal of this day is to introduce research facilities in Prague where participants can study in only a few years or they can start to work there. This bits of information can be vital in their decisions for university studies. It's common that before participation on such activities, the high schoolers don't have any idea about it.

Also current scientific work is introduced to them, which is quite far from the physics they are used on their schools.



The Week With Applied Physics [5]

Held when the sufficient funding is obtained, last ones 2012, 2014 and planned for 2015.
The week starts in Prague with excursions and introductory lecture.
The rest of week is excursion tour by bus abroad.
The main destinations are one of the largest research facilities in Europe (CERN, DESY, ASDEX-Upgrade).
The other places of interest are technical museums, science centres, automobile or plane factories and the like.

We have feedback from several participants that this week was an intensive experience and a great motivation for further study of physics.
Thanks to being abroad communication in foreign language is also needed hence KC 2 is developed.



Lectures [6]

Once in two weeks
In Prague on faculty, also streamed online and recorded
Currently piloting invited lectures on high schools
Preparation for Physics Olympiad and further study

References - FYKOS' sites

- [1] <http://fykos.org/problems> - Problem assignments of FYKOS
- [2] <http://fyziklani.fykos.cz> - FYKOSi Fyziklání (only in Czech)
- [3] <http://physicsbrawl.org/en> - Online Physics Brawl
- [4] <http://dsef.fykos.cz> - Den s experimentální fyzikou (only in Czech)
- [5] <http://tsaf.fykos.cz> - Týden s aplikovanou fyzikou (only in Czech)
- [6] <http://prednasky.fykos.cz> - Přednášky FYKOSu pro středoškoly (only in Czech)
- [7] Kolář K.: Fyzikální korespondenční seminář na MFF UK - reflexe a rozvoj, diploma theses <https://is.cuni.cz/webapps/zpp/detail/130102/> (only in Czech)

Acknowledgments

The activities of FYKOS are funded by the Faculty of Mathematics and Physics of Charles University in Prague. The presentation was supported by the Charles University in Prague, project GA UK No 188515.

Camps

For the best (~28) participants of correspondence competition
One week twice a year - spring (3. - 5.) and autumn camp (9. - 11.)
Educational program - formal and informal
One day for experiments - measuring and presentation
Also intensive experiences like overnight games

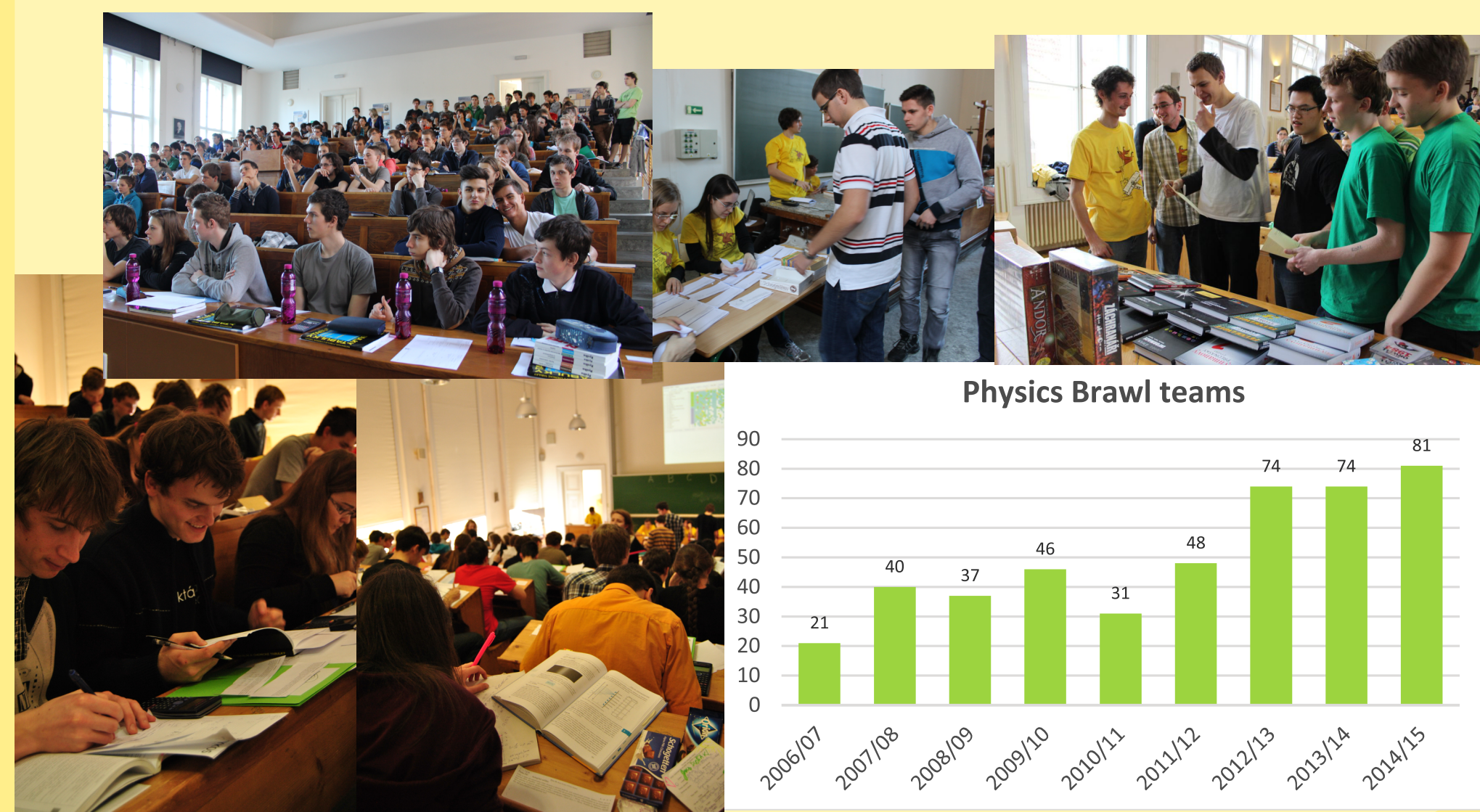
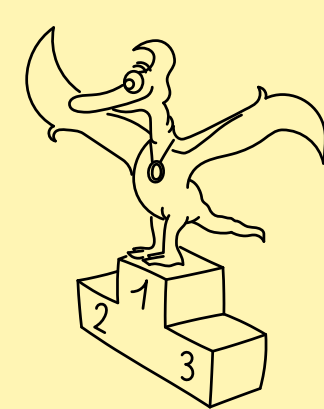
We know from feedback of participants that the motivation, why they continued solving and sending the solutions, was that they wanted to go on next camp again. It's not the only motivation but is the most common one.

Camp is a complex set of activities. The program is very rich. Usual day starts with two lectures and in the afternoon and evening there are games - some are informal education of physics/science, some are focused on developing of social competences (KC 6), sense of initiative (7) and sometimes even cultural awareness and expression (8). Virtually all activities are developing communication in the mother tongue (1).



FYKOS' Physics Brawl [2]

Competition for teams of 5 in Prague
Largest team competition in Physics in Czech Republic
3 hours of solving problems



Online Physics Brawl [3]

Online competition for teams of up to 5
It has open category for everyone
From the 2nd year participation translated in English
-> solutions from three OPBs available online

Online Physics Brawl and FYKOS' Physics Brawl are very similar, actually FYKOS' PB was an inspiration for OPB. Both competitions have three categories for Czech (and Slovak) high school participants. OPB has category for high school participants from everywhere and open category for everyone.

The participants have to put their team together and register for competition (KC 7).

Then they solve problems which are usually not so challenging like those in series but are also not easy and often combine physics knowledge from different topics. They can use their literature (KC 5) and in case of OPB even computer and programs they like (KC 4). They can communicate among their teams so they can together crack more complicated tasks they wouldn't solve alone in the restricted time they have (KC 1, 6).

