When the Informal Becomes Formal Enough

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The Warsaw Science Festival, Science Fair and all that

We have no permanent science center in Warsaw, but several initiatives have started and have been flourishing in the last decade. The most prominent is the Science Festival [1]– a series of science-related activities that takes place during the last 9 days in September. Almost all scientific, artistic and other institutions offer a lot of public engagement events – workshops, lectures, exhibitions etc. One of the components of the Science Festival is the very popular interactive exhibition "Physics and Toys" organized at the Faculty of Physics of Warsaw University. Another interesting event is the Warsaw Science Fair, at present the largest in Europe outdoor event popularizing science. It takes place on a Saturday in May or June. Since the very beginning we have run there a tent with interactive physics experiments. We select and provide the exhibits and demonstrations, organize the stands and run the events, providing the staff and supervising things. Our staff, of necessity, is temporary, but very good; it consists of undergraduates – some of them teacher trainees – and Ph.D. students. We estimate that so far our toys' exhibition was visited by 25 000 people altogether – small kids, schoolchildren, parents and some teachers.

Our problem

Watching the behaviour of our visitors in all age groups we first noticed only joy, amazement and interest. However, we noticed also that some kids, instead of having a good time, concentrated not so much on watching the toys in action and playing, as on writing down the descriptions put on posters that accompanied the exhibits. They were apparently more interested in the written word than in the toys and experiments themselves. In the following years, when the cameras became ubiquitous, both youths and their parents kept taking pictures – of toys, but primarily of posters. When asked, the kids and their parents told us that the teacher ordered the kids to visit the exhibition during the weekend and prepare a report from it, describing the toys and the physics that made them work. All of them were frustrated, in a hurry and with a feeling that this particular piece of homework would be hard to do. We never heard from them the so-often uttered "We shall come next year" or "We shall build it at home", which are sure signs of satisfaction.

What is going on ?

It has been recognized all over the world that teachers should get some instruction on how to profit from the vast offer of informal education. There is a large bibliography on the subject (see e.g. [2], where a study of a systematic approach is presented, of special courses, at which teacher trainees learn how to work with children in an informal setting). Our teachers, for most of whom this is still a novelty, do what they know best – set formal tasks for their students and try to mark them in a formal way. This discourages the children and does not allow them to profit fully from the informal education environment.

Some examples of good practice

We found, not surprisingly, that on the whole it is the young teachers who find, often intuitively, the right way to cope with the follow-up of informal events, visits etc. Below, we show some examples how some of our young teachers balance on the interface between the school requirements and the "informal" spirit of our events. The teachers (all but one) are our graduates and at some stage worked at our events, interacted with the visitors and had time for reflection.

- *Mark only the successful elements*

A teacher can refrain from giving a formal mark. **Ela**, who teaches physics and elements of computer science in upper secondary school, visited us with her students; as an aftermath, the students were supposed to describe and draw one selected toy they especially liked; they were promised a mark in physics and in computer science (for using some graphical software). The pictures turned out acceptable, but the physics descriptions were rather poor and showing numerous misconceptions. Ela is, however, a very experienced teacher, so she gave only the marks in computer science. Instead of thinking the opportunity to give marks in physics was wasted, she was glad she could address the misconceptions.

- *In your own words only!*

Ula puts a great store by individual work and thinks it is very important. As a demonstrator at the toy exhibition she observed the abovementioned results of too strict tasks set by teachers. When she next brought her own class, she told the students in advance they would have to write about one chosen toy, but only from their observations and using only their own words. It took some effort to convince the students of the uselessness of producing copied texts, but she succeeded [3]. She encouraged her students to use their wits and to trust their own intuitions; her role as the teacher was to explain, to discuss and to foster understanding. Ula found her students remembered the exhibits long after the visit, and related to them whenever they encountered a similar phenomenon or situation.

- *Give them a serious job to do!*

Monika, who teaches very bright students, but her school has so far no physics lab, was a demonstrator at our stand at one of the yearly Science fairs. She suggested bringing her students – not just as visitors, but as help and part=time demonstrators. The upper secondary school students were very keen on doing a lot of experiments, and doing them in front of, and together with, the varied and inquisitive audience only added to their delight. It was a success, and this year the students started to ask about the fair already in winter. This year, because of the 80^{th} anniversary of Polskie Radio, we presented at our stand various electromagnetic waves an the beginnings of radio – fairly advanced stuff. So Monika gave her students some preliminary materials, discussed the physics beforehand, ad we showed them how the equipment worked. They felt the satisfaction of explaining things not only to the proverbial "kid brother", but also to an intelligent non-scientist. Our school does not as a rule offer such opportunity.

- *Let them show they appreciate it!*

Agnieszka, who acted as a demonstrator and invited her class to the toy exhibition, without any strings attached, got a surprise of her life. After the visit, four of her students built periscopes; the device impressed them, and they were able to construct one as a spontaneous proof of enjoyment and understanding. The students were from the humanities class in upper secondary school and the standard school physics usually held small (little?) joy for them. They wouldn't have welcomed a formal homework!

- *Let them grow a bit!*

One of our young teachers, **Anna**, usually takes her students (lower secondary school) also to the lectures with demonstrations organized for schools at our Faculty. As a follow-up, students are supposed to write up some of the experiments. Anna writes [4]: "The experiments proved a bit too much. A rather weak student found only one sentence to describe what she saw or registered: *the experiment with liquid nitrogen – it is very cold.*". Fortunately other experiments in the session were more accessible. Next year the same students attended a similar series of lectures. This time she understood much more about what was happening with liquid nitrogen, as could be seen I her homework. The attendance at the lectures was voluntary, and the critical comment of the teacher on the poorness of the first attempt would probably had discouraged the student from going the second time; she obviously went in a well-founded hope to understand better! On the whole, strong criticism, even if justified, is not always very helpful.

Conclusions

- We need permanent science centers not only for obvious reasons, but also because it is much easier to arrange cooperation with schools and teachers on a regular basis.
- Still, our school has to open to a larger extent to informal education - a great source of quite new educational experiences, that contains an emotional component and can be shared by teachers and students.

References

[1] http://www.icm.edu.pl/festival
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[2] Chin C C 2004 Museum experience – a resource for science teacher education, *Int Journal of Science and Mathematics Education* **2** 63-90

[3] Wojcikowska U 2004 *Influence of the form of knowledge transfer on efficiency of physics teaching in various age ranges*; M.Sc. Thesis, Faculty of Physics, Warsaw University

[4] Tarkowska A 2005 *How to develop interest in physics of a lower secondary school student*; M.Sc Thesis, Faculty of Physics, Warsaw University