

Collaboration Between the Science Center and University Department – Opportunities and Challenges

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The majority of Science Centres has been created or in other way initiated by the people directly emerging from Universities²⁰. Therefore, the close collaboration between these two types of institution would seem natural. The practice, however, shows that such collaboration is not easy to establish and even harder to keep. Though many common goals can easily be identified, the question how to achieve a balanced motivation, which can sustain long-term collaboration, remains to be the biggest challenge. The following article describes our experiences from collaboration between the Physics Education group at Faculty for Mathematics and Physics, University of Ljubljana and the House of Experiments, the first Slovenian hands-on science centre.

Any collaboration can start and be successful only if clear benefits from such collaboration can be perceived from both sides. So, the first question that has to be answered is why to start such collaboration at all.

WHY?

Since the Science centres are focussed mainly on informal forms of learning, it is reasonable to expect that the motivation for collaboration with Universities will potentially be strongest at the departments that offer special science education courses (Physics Education course for future high-school teachers in our case) or departments that work on education in general. In our opinion the following motivation elements are among the key reasons for the collaboration between Science Centre and Science department:

Motivation elements at the Science Centres side

- Better position in winning specific projects, in particularly international projects that require the involvement of different institutions from several countries.
- Advantages, that emerges from personal contacts with academics and experts in various fields, such as direct access to the top knowledge, experience, and information about the frontiers of science and current trends.
- Some academics and researchers still tend to look at the Science Centres as primarily the places where kids have fun. Personal contacts and engagement in common activities change this prejudice.

²⁰ There are some exemplary cases where Science Centre has been founded by University (see article in this book, written by Richard Walton).

- Collaboration represents source of ideas for new exhibits, science shows, events and thematic projects.
- It also provides direct access to number of motivated students who wish to get experiences in communicating science and in designing and building new exhibits.

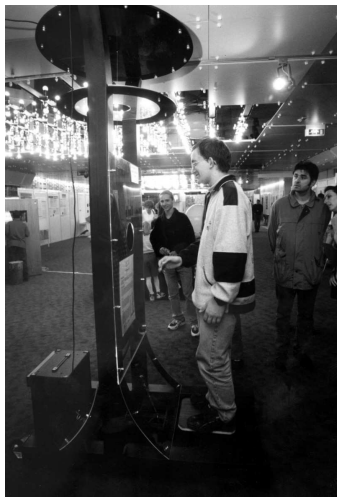
Motivation elements at the University side

- Science Centres are typically better than Universities in explaining science to general public and therefore more attractive for public media. Joint projects can result in more frequent appearance of University Departments in media and thus promote their name in public eyes. Public appearance of Universities in new contexts may also result in higher public appreciation of science and consequentially higher enrolment.
- Better position in winning specific projects, in particularly international projects that require the involvement of different institutions from several countries. Collaboration with Science Centre may be an important advantage in applying for projects especially for the departments that are involved in physics education research (PER).
- Collaboration proves to be a new source for student projects and thesis ideas. Several ideas that emerge from brain-storming between Science Centre – University staff can be tested and even improved by students. In our case such new type of student projects proved to be very well accepted by the students and eventually resulted in complete renovation of one experimental subject.
- Training of physics education students and in-service physics teachers in Science Centres adds a new value to future teachers' education. Science Centres represent a special environment that challenges future and active teachers to improve their skills in communicating science to general public by working as explainers or science show presenters. Science Centres represent non-threatening environment where children and adults react spontaneously and dare to ask any question. It request from teachers-explainers to be more flexible and more interdisciplinary than in the classroom. In addition, the high flux of visitors in Science Centres gives explainer opportunity to improve her or his didactical approach practically on-line and thus make a progress at faster rate than in school.
- Science Centres can be a unique “polygons” for PER. Aforementioned high flux of visitors and the fact that visitors range in age, social status and regional affiliation makes Science Centres ideal for performing PER analysis with ability to get good statistics in reasonably short time. Research work like this would require development of new techniques for getting data, such as combining ICT with microprocessors installed in the exhibits and video recording.

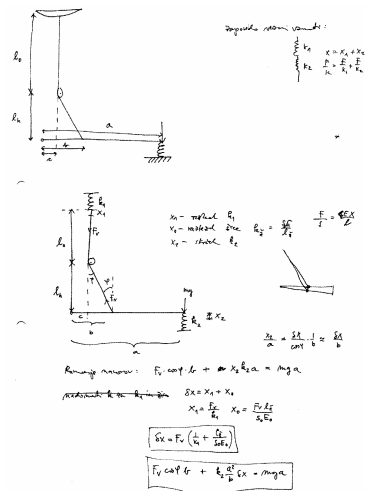
HOW?

So far the possible motives for collaboration have been described and analysed on the general level, which becomes important when the situation is ripe for formal collaboration. But everything really starts at informal, personal collaboration, which at least at the beginning is powered by enthusiasm and believe in high importance of science education. Let us give some examples from our collaboration.

At the exhibit called “The bigger the weight, the higher the pitch” visitors are asked to step on a lever and play on a string which is tensioned by the visitor’s weight (Figure 1a).



a)



b)

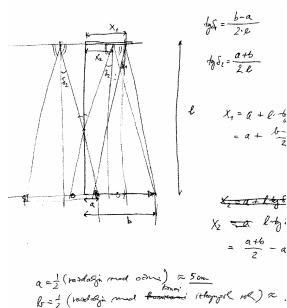
Figure 1: a) Exhibit “The bigger the weight, the higher the pitch”, b) copy of the calculations for the exhibit design.

The top end of the string is attached to the circular metal plate that works as a loudspeaker. The designer of the exhibit needs to know what should be the optimal thickness of the plate, so that the plate will not brake or deform under the weight of the visitors (taking into account all possible scenarios such as three boys jumping on the step etc). This is an example of the problem that can be given to students, physics majors in the second or third year. A calculation of the tension force that acts on the string is simple problem that is suitable for any first year basic physics course (Figure 1b). The connection of the problems with the exhibits in the House of Experiments surely raised students’ motivation.

A design of well known exhibit “Floating in the air”, where images in the mirrors give visitor an impression that he is floating in the air, requires only knowledge of basic geometrical optics and can be used as a problem on any first year physics course (Figure 2a,b).



a)

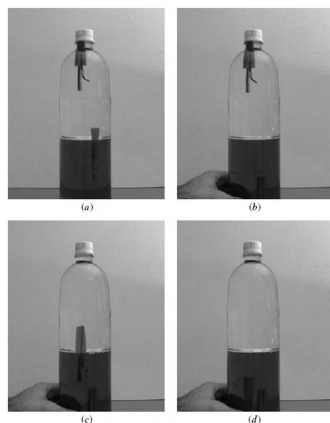


$$X = 45 \text{ cm}$$

b)

Figure 2: a) Exhibit “Floating in the air”, b) copy of the calculation for the exhibit design.

New exhibit resulted from brain storming which initially started by observing a Cartesian diver, a popular demonstration experiment and typical problems that students have with understanding the physical concepts behind it. Two-liquid Cartesian diver (to our knowledge, an original idea) has been designed, first as a simple prototype experiment (Figure 3a) and than as a large scale exhibit for the House of Experiments (Figure 3b). The description of the two-liquid Cartesian diver along with the students’ interpretation of the basic physics involved in this experiment has been reported in article published in Physics Education [1].



a)



b)

Figure 3: Two-liquid Cartesian diver: a) simple experiment, b) large scale exhibit in Science Centre.

Project laboratory is a new subject for first and second year students at the Faculty for Mathematics and Physics. The report on the design and integration of this subject into the post graduate physics education course has been given on the previous GIREP Seminar in 2003 in Udine [2]. The important characteristic of this subject is that every year every group of the students gets a new project task to be solved. This gives students opportunity to use the knowledge that they passively acquires during the lectures in a most creative way but it also presents a big challenge for the responsible lecturer to create or find about twenty new project ideas every year. It is the collaboration with the House of Experiments that represents the important source of student project ideas. Often the principles behind the ideas that emerge from brain storming between the collaborators are first tested as a student projects.

CONCLUSIONS

Due to political, economical and social changes in Europe during the last decade, education is becoming one of the important “products” on the global market, even in small countries. In such circumstances it can be expected that collaborations between Universities and Science Centres will become increasingly important in future, so better start planning today.

References

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- [2] PLANINŠIČ, Gorazd. *Revitalization of the laboratory activities and integration of the subject into the post-graduate physics and educational physics program*. V: LONGHETTO, Claudia (Ed). Second International Girep Seminar: Developing Formal Thinking in Physics, 1-6 September 2003, University of Udine, Italy. Quality development in teacher education and training; seminar book. Udine: University of Udine (2003) p84-89.