

Recruitment of talents for life sciences in Slovakia: Finally moving

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Abstract. A general problem of decrease in interest of high school students for science education in Slovakia is amplified by local-specific 'phenotypes' including culturally inherited preference of conformity and discrimination of originality and talent. In this context it is not surprising that Slovak universities are very passive towards talented high school students. This lack of an assertive attitude might eventually lead to a massive exodus of gifted young individuals and the Slovak universities will be left out with average and marginal importance. To avoid this pessimistic outcome, the implementation of a systematic search for talents, their recruitment and motivation, is a necessity. The specific aim of our project is to organize one-week workshops for 10-15 high-school students (15-16 years of age), where they are exposed to several topics of the contemporary genetics, molecular biology and biochemistry. The students are selected for the workshop based on (i) recommendations of their teachers, and (ii) letters of intends they are required to write in order to apply. The selected students are divided into 4 groups (2-3 students per group). The personnel involved in the project prepare four one-day laboratory courses, ranging from functional complementation test through DNA isolation, transformation to analysis of gene expression. Each student performs the experiment with an assistance of the assigned teacher. The students are obliged to write down notes into laboratory notebook and generate conclusions and hypotheses resulting from their experiments. We believe that the workshop represents a powerful tool for attracting young talents into the field of life sciences.

Keywords. Laboratory workshop, TalNet, genetics, molecular biology, high school students and teachers

Introduction

As pointed out two years ago at the 2nd NATO-UNESCO Advanced Research Workshop, activities related to talent recruitment for biomedical sciences in Slovakia were nearly absent and local grant agencies completely ignored even sparks of interest that would eliminate this ignorance [1]. In the final remarks of that chapter it was stated that "the only Slovak governmental grant agency supporting educational activities rejected the proposal for building the talent network based on a vague statement and without any (positive or negative) feedback. However, the potential fruits of the effort are too

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irresistible to give up yet. Exchange of ideas with communities having long-term experience with successful quest for talents should be instrumental in overcoming the current (and perhaps transient) obstacles in Slovakia.” During the next two years, thanks to the enthusiasm of a handful of people, we were able to raise financial resources (see Acknowledgements) and organize two pilot workshops for high school students with the ambition to expand this type of activity to other fields and institutions.

1. TalNet 2005: Let us play with genes I

Thanks to the financial support of UNESCO-ROSTE we organized a one-week workshop for 12 high school students from the School for exceptionally gifted children in Bratislava. The students were selected by a biology teacher and we did not interfere with the selection (see **2. TalNet 2006:...** below). We called the workshop “Let us play with genes!” as all laboratory activities as well as lectures were connected by different aspects of genetics. The students were divided into 4 groups and each group performed a single laboratory exercise a day. Namely, we have prepared the following laboratory activities:

- *Genes are inherited* – using *Drosophila melanogaster* as a model organism the students learn one of the basic rules of mendelian genetics
- *Genes are mutated* – students perform complementation test using two strains of *Saccharomyces cerevisiae* mutated in two genes affecting the same biochemical pathway
- *Manipulation with genes* – plasmid DNA is digested with selected restriction enzymes to obtain its physical map. In addition, students construct a necklace with their own DNA precipitated with ethanol.
- *Genes are regulated* – using a simple bacterial system the students learn how to analyze differential regulation of gene activity by polyacrylamide gel electrophoresis

Each exercise is supervised by two teachers who spend with the students the whole day including the lunch break. This provides an opportunity to explain all details of the protocol and interpretation of the results. In addition, the whole-day interaction of the teacher with the students is instrumental in explaining more general issues including the prospects of studying life sciences at the University.

The laboratory exercises were complemented by two (60 min) lectures, one general (*Biology as an experimental science about life*) and one about the great potential of transferring DNA into cells (*Genetic transformation or how (and why) we introduce DNA into cells?*). The lectures took place during the last day of the workshop and each was followed by informal discussion with the students.

The workshop was evaluated by the participants using a questionnaire (Fig. 1). Overall the students rated the workshop very positively. Some of the negative comments were taking into account (*e.g.*, the corresponding parts of the textbook were modified) for the TalNet 2006 workshop.

My interest for life science, especially biology and/or chemistry is:

- a. high (30%)
 - b. average (I still consider to study life sciences) (35%)
 - c. average (I do not consider to study life sciences) (35%)
 - d. none (0%)
- in case of the answer b.-d. state what do you plan to study

My overall impression from the workshop is:

- a. excellent (75%)
- b. good (15%)
- c. neutral (10%)
- d. loss of time (0%)

If somebody asks me, if he/she should apply for the workshop, I would say:

- a. certainly yes (82%)
- b. if you do not have any other activity, it might be helpful (18%)
- c. it is one of the many possibilities how to escape one week in school (0%)
- d. certainly not (0%)

The content of the workshop:

- a. was incomprehensible for me (0%)
- b. was a good complement of my current knowledge (100%)
- c. copied my current knowledge (0%)
- d. was trivial (0%)

Evaluate the corresponding categories by grades from 1 (excellent) to 5 (useless):

	Lab 1 Genes are inherited	Lab 2 Genes mutate	Lab 3 Manipulation with genes	Lab 4 Genes are regulated	Lecture 1 Biology as experimental science...	Lecture 2 Genetics transformation..
Textbook	1.2	2.1	3.2	4.0	1.4	1.8
Explanation by the teacher	1.0	1.0	1.4	2.5	1.0	1.2
Quality of the laboratory material	1.1	1.3	1.1	1.2	-	-
Possibility for individual work	1.0	1.4	1.3	1.5	-	-
Novelty of provided information	-2.2	1.3	1.0	- 1.3	2.5	1.6
Possibility for discussion	1.0	1.0	1.0	1.8	1.4	1.2

Write comments to the individual activities associated with the workshop that would help to improve it in the future:

	Comments
Textbook	
Lab 1	
Lab 2	
Lab 3	
Lab 4	
Lecture 1	
Lecture 2	
Organization	
Other comments	

Fig. 1. Questionnaire filled out by the participants of the workshop. The numbers are derived from the evaluation of the TalNet 2005 workshop.

2. TalNet 2006: Let us play with genes II

Whereas the workshop TalNet 2005 was aimed exclusively at students from the School for exceptionally gifted children in Bratislava, the TalNet 2006 was organized for high school students from the whole Slovakia. The workshop itself was basically identical to that organized in 2005. In 2006 we wanted to train the logistic involved in organization of a workshop for students from the whole country. This included propagation, selection, organization of travel and accommodation¹.

We realized that the critical part of the 2006 workshop will be selection procedure. In March 2006 we have e-mailed application forms to almost 150 Slovak high schools with the cover letter asking the schools authorities to distribute the forms to students through biology teachers. The deadline for application was April 25, 2006. In addition to personal data, the forms contained an entry for the teacher to characterize the student and his/her qualities. Finally, the student wrote a short motivation letter explaining why he/she was interested in attending the workshop. We received about 100 applications from almost 40 schools and based on the information we selected 10 students and 5 accompanying teachers.

It must be noted that the selection was slightly biased by legal and financial limits. Namely, each student under 18 years must be accompanied by an adult (teachers were preferred before parents as they can participate at the activities and then possibly implement some of them at their schools). As we had financial resources that would cover travel and accommodation expenses only for 15 participants, in some cases we selected two students from the same school that were accompanied by a single teacher. In some cases we coordinated the selection with the parallel chemistry workshop (see footnote 1) such that one teacher accompanied two students, one attending the biology and one the chemistry workshop.

After the selection (finalized in early June 2006), all schools whose students have sent the application forms were informed about the results. In addition, all participating schools received a CD with electronic versions of textbooks for both biology and chemistry workshops. The selected students and their teachers were asked to confirm their participation and provide an agreement signed by their parents the director of their school.

As in 2005, the workshop took place in mid-September. This proved to be an ideal period of the year for two reasons. First, the winter semester at Comenius University starts about at this time and so the laboratories and seminar rooms are not occupied by university students. Yet, the participating children are exposed to the atmosphere at the University. Second, the school year at high schools is just in its third week and the schools are more willing to excuse their students.

3. Perspectives

Although limited, our experience with organizing the workshops is very positive. In spite of still rigid administrative rules and various types of obstacles, the week of

¹ A team led by dr. Andrej Bohac from the Department of Organic Chemistry at the Comenius University organized a parallel workshop for children interested in chemistry. Both workshops were supported by the grant ESF SOP-LZ (2005/1-101).

interaction with motivated high school students is highly rewarding. Importantly, the reward seems to be reciprocal and a substantial fraction of children originally aiming at the Schools of Medicine or Pharmacology started to think about a future career in life sciences. Thus the workshops provide an excellent opportunity to recruit students for our Faculty in general and our Departments in particular. The only limitation is the number of students that can participate at a single workshop. Therefore it is extremely important to expand this type of action to other departments (as is the recent case of the Department of Organic Chemistry) and possibly other institutions. This is the major task of our future activities.

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References

- [1] L. Tomaska, Recruitment of talents for life sciences in Slovakia: State of the art. NATO-UNESCO Advanced Research Workshop No. 980515: Science Education: Talent Recruitment and Public Understanding. Eger, Hungary, October 1-3, 2004. In: Science Education: Best Practices of Research Training for Students under 21. Csermely, P., Korcsmaros, T., and Lederman, L. (Eds.) IOS Press, Amsterdam, The Netherlands, ISSN: 1387-6708, pp. 226-231, 2005.