Circles of Self-Education in Science: Innovative Methods to Mentor Talents

Posted on 2011-03-11 5:44 am by Tamas from Hungary

Category: Outreach to Marginalized Communities

Background:

Science education is on the decline in Hungary in an extremely rapid and alarming fashion and is on the decline around the world as well. Hungary used to have excellent traditions in science education, which produced, among others, J. von Neumann, E.P. Wigner, L. Szilárd and E. Teller, each of whom had a major impact on our world by providing key contributions to computer science, nuclear reactors, nuclear chain reactions and national defense. Based on the still-remaining traditions of science education and also on innovative applications of modern, internet based communication tools, a new form of science club: circles of self-education in sciences is proposed. The model for such small networks of self-education in sciences, or Science Clubs, has been already proven to be effective, inspiring and successful in one particular location in Hungary. There are several other locations with similar or "resonant" traditions that can be revived and revitalized in the same manner.

The main goal of this proposal is to spread the example of a proven model from the local to a national level, engaging 5 new locations across Hungary. By capturing new experience and inspiring new talents, a new kind of educational experience can be generated, pulling together scientists, students, teachers and parents in weekly or biweekly activities related to science that can be also utilized for the international mentoring of talents, and providing inspiration, motivation, training, and promotion of science talent.

Project Description: We place emphasis on finding talent in remote, marginalized communities. We will organize Summer Camps in small villages fighting for the survival of their schools in the face of low funding for local education, and Science Clubs predominantly in country towns in such Middle and High Schools where mentoring from active scientists is not yet organized.

Activities include weekly or bi-weekly meetings of Science Clubs in Middle and High Schools (age group: 11-18 years old) during the academic year and summer mentoring camps organized for the most active and dedicated students, scientists, and teachers. The Science Clubs will hold an average of 30 meetings during the academic year, while at the one-week mentoring Summer Camps about 35 topics will be covered during the summer. Nearly half of these topics are forseen to be covered by researchers, scientist, similar number of topics is presented and discussed by students, while teachers talk rarely, only at about 10-15 % of the time. However these Science Clubs have Teacher Patrons who are present at each occasion and who encourage the students to find a topic of their own choice and interest and provide directions and material. Such Science Clubs also include a Scientist Patron who gives more detailed direction and whose network among fellow scientists is utilized to involve them – so they are the contact points between the Science Club and the world of science. Students prepare their topic for discussion using modern internet based resources and mentoring help from scientists and teachers. Parent Patrons may also help the Science Clubs with their network of connections and experiences, even with little things as telling a story or

making tea or baking some cookies for the next meeting.
By the second round of evaluation, April 15, 2011 we have found the location of more than 5 new Science Clubs, the host Middle and High Schools are listed below (age group of students including 11-18 years). We estimate that at least 5 of these Science Clubs will remain functional even at the end of the 2011/12 academic year. Negotiations, project preparation will continue during May/June 2011 with these new Science Clubs, and work will continue in the model valued BerzeTÖK Science Club. The BerzeTÖK Summer Camp will be self-organized in July 2011 is not forseen to be funded by this project proposal.

The funding cycle for this project will start from September 2011 and lasts till August 2012, covering the academic year followed by Summer Camps in 2012. These activities will be boosted if the project is selected for funding, and partial support for the Science Clubs and their Summer Camps is planned as detailed in the budget proposal.

These science clubs are desired to be sustainable, so we are looking for all means to make that possible. Five methods to reach that goal have been already proven successful in the Berze Middle and High School in Gyöngyös, Hungary, where the pilot project is running since 4 years. These can be listed as follows. First of all, we will base these clubs on volunteerism - 2011 is designated as the European Year of Volunteering. Second, we will keep the expenses as low as reasonably possible. Third, we will carefully generate web-based archives of the talks and the presentations, which will be useful for education as well as for project monitoring and transparency. Fourth, we will develop a good relationship with local news and media and will inform them about significant events. Fifth, we aim to include parents as much as possible, and, if possible, we plan to form public/private partnerships, in order to make these clubs sustainable.

The project will be implemented by US Alumni and supporting individuals, including professors, researchers, teachers and students, as well as by supporting institutions.

Participating US Alumni include

professors, Doctors of Hungarian Academy of Sciences:

Team Members:

Cs. Bagyinka (biophysics)
A. Csótó (physics)
T. Csörgő (physics, team leader)
D. Karátson (volcanology)
J. Kubassek (geography)
P. Gyarmati (mathematics,informatics)
K. Nagy (dentristry)
L. Nánai (physics)
P. G. Szalay (chemistry), currently in US

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Á. Zsigmond (chemistry)

Researchers (with Ph.D):

F. Borondics (chemistry, currently in Canada)
B. Botos (climate, sustainable development)
M. Csanád (physics)
I. Fórizs (isotope geochemistry)
Á. Gali (physics)
E. Kirs (international law)
Gy. Kovács (intellectual proterty law)
J. Laczkó (mathematics and biology)
Gy. Jordán (geology)

marketing specialist, engineers, consultants:

A. Kecskeméti (marketing)
A. Nováki (environmental engineering)
E. Márton (architect, designer, in the US)

Ph.D students:
R. Vértesi (physics)

Other partners include:

- professors, or Doctors of the Hungarian Academy of Sciences

P. Ábrahám (astronomy, physics)
I. Scheuring (biology)

- researchers with PhD.

G. G. Barnaföldi (physics)
P. Ódor (biology)
A. Ősi (paleontology)
V. Müller (biology)

- PhD. students with M.Sc.

V. Finta (environmental science)
M. Vargyas (physics)

- Medical Doctor:

T. Solymosi (physician)

- B.Sc student

J. Csörgő (math and chemistry)

- teachers

T. Ádám (informatics, geography)
Bognárné Nagy Éva (biology)
E. Császár, Kissné (mathematics, physics)
G. Endrész (biology)
M. Kiss (math, physics, informatics)
A. Kormos, Nézőné (math, physics)
K. Kopasz (math, physics)
L. Nagy (math, physics)
I. Pálinkás (English)
I. Szittyai (math, physics)

- Middle and High School students, age group 11-18 years:
András Cs. (BerzeTÖK Science Club, Gyöngyös)
Martin B. (BerzeTÖK Science Club, Gyöngyös)

Institutions include

- Museums:

Hungarian Museum of Geography
Hungarian Museum of Natural History
- Research Institutes of the Hungarian Academy of Sciences

Biological Research Center, Szeged
Inst. for Geochemical Research, Budapest
KFKI Research Inst. for Particle and Nuclear Physics, Budapest
Konkoly Observatory - Inst. for Astronomy
Research Inst. for Solid State Physics and Optics, Budapest

- Universities

ELTE University, Budapest (several departments and institutes)
Pázmány P. Catholic University, Budapest
Corvinus University, Budapest
University of Debrecen, Debrecen
University of Miskolc, Miskolc
University of Szeged, Szeged

- Consulting firms:

COWI Hungary Consulting and Planning Ltd, Budapest
QANDA Consuling, Budapest

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- Supporting Middle and High Schools (secondary education institutions, students in the age group of 14-18 years).

Berze Middle and High School, Gyöngyös
Dobó Middle and High School, Eger
Németh László Middle and High School, Hódmezővásárhely
Móra Ferenc Middle and High School, Kiskunfélegyháza
Ságvári Middle and High School, Szeged
Szent László Middle and High School, Budapest
Szilády Protestant Middle and High School, Kiskunhalas

other Schools for example

Deák Ferenc Middle and High School, Szeged and Radnóti Middle and High School, Szeged as well as the Evangelist Middle and High School in Békéscsaba also are being contacted and may join the project at a later stage.

These discussions will be finalized in May-June 2011, introductory talks may be given in this period, while the new Science Clubs will start their regular operation from September 2011.

Other supporting organization:

Hungarian Foundation for Innovation
(J. Pakucs, P. Závodszky)

Who will be affected :

At least 250 students, each several times!
At least 40 scientists, based on their availability, each 1-3 times.
At least 5 Patron Scientistis several (20+ times).
At least 4 Patron Teachers, each about 50-60 times.
At least 5 Middle or High Schools (in the academic year of 2011/12).

On the long run, the Hungarian middle school system may potentially be revitalized. After testing the model in Hungary we would like to explore its potential for international spreading. In particular we may relate this project to the activity of the Bill and Melinda Gates Foundation and the Harvard Think Tank on Educational Reform. This effort emphasizes the efficiency of smaller schools and merit based evaluation of the educational efforts. For reference of these activities in the US, see the interview with Bill Gates entitled “Gates seeks plans to better teachers”, Wall Street Journal, March 23, 2011, p. 9 and “High-tech tools for change - Wide ranging think tank promotes educational innovation” (Harvard Gazette, April 1, 2011). As this note emphasizes, education is not just the school and we would like to include researchers and parents to the process of motivating students to increase their self-education in sciences.

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Region: Europe

Location: This is a country-wide project, with a pilot project going on successfully in Gyöngyös, Hungary, since 4 years. Now the goal is to strenghten it and to spread its best practices to at least 5 new locations, including middle or high secondary schools in Eger, Hódmezővásárhely, Kiskunhalas, Szeged and other locations.

It mixes good old traditions with modern communication tools. Trains scientists in communication with 14-18 years old students and teachers. Trains students and teachers in modern sciences and in web-based communication of science results. Utilizes web-based tools like archiving best presentations on youtube videos and talks in .ppt and .pdf files so that they could be re-used again or can be utilized as resources for preparation for student talks in Science Clubs at different schools. Also they are great as reminders or resources for follow-up talks and presentations at later times. These new educational channels will provide a local community that is educated and embedded to modern science and the tools and archives will useful for students at more remote locations too.

Innovation: For high level reports on one of the outcomes of the prototype science club, and its innovative nature, see the following article in the prestigeous Science Magazin and at the web-page of a US National Lab:

Science Magazin vol 331, no. 6014 p. 129 (2011)
http://www.sciencemag.org/content/331/6014/129.4.full?sid=da6b0100-5b46-45b3-a2fb-fc57aa5d4ae9

Quarks Matter at RHIC, feature story, Brookhaven National Laboratory, Upton, NY, USA, January 4, 2011:

http://www.bnl.gov/rhic/news2/news.asp?a=2175&t=today

Goals and Objectives: Some of these goals are quantitative, others are more qualitative but equally important. Quantitative objectives are:

In every given Science Club, we plan to have about 25-30 annual meetings and a summer camp with 30-35 topical discussions. We expect that about 45 % of these topics will be presented by researchers, including former State Alumni, while about 40 % of the talks and presentations will be done by students. The rest 15 % of the events will be covered by teachers or parents.

At each meeting of the Science Clubs, a list of attendants will be made, and at the end of the academic year, we will summarize how many students and teachers and researchers as well as how many parents attended these performances.

We will call attention to other forms of self-education in Science for example problem solving in Hungarian High School Journals for mathematics, physics and chemistry (KöMal and KöKél) and we will give visibility in the Science Clubs for those students who are active problem solvers. We also will record the number of

Outcomes:

students who attends the Science Club meeting. Out of the most important presentations, we will create youtube videos or other shared video contents and will create a database of these presentations. We will also monitor how many high school students enroll to Universities on a Science or Technology related subject, and how many of them intend to be science teachers in middle and high schools? We expect that the number of such science teachers will be significantly increased in Hungary, by more than 20 %, due to this program, as compared to the current situation where data from the 2009/10 academic year are known. We also will monitor attendance in Summer Camp and participation in science contests at the appropriate age groups.

However, we decided not to monitor more qualitative features that are difficult to access – the qualitative results should speak for themselves and could be judged by anyone who inspects the archives of the talks, the programs of the Summer Schools and the youtube video archives of the presentations.

In the beginning of the academic year and the beginning of the program, we will collect the expectations from the participants (students, teachers, researchers and parents). At the end of the academic year and at the end of the Summer Camps we will collect anonymous (and voluntary) opinions and evaluations from all participants again including students, teachers, researchers and parents. These outcome expectations and opinions will be handled confidentially but their totality will help us to improve and to sustain the Science Clubs and their Summer Camps, as a civil society educational and cultural, scientific outreach initiative in Hungary.

Outcomes also include coverage of this Clubs for Self-Education in Sciences in the media in local, national and global level. We will create a web-page where media reports are summarized. This will be done also based on voluntarism but also we may seek assistance from other supporting organizations to perform this task better.

A very important outcome is qualitative: namely we plant the culture of voluntarism and self-determination as well as readiness to absorb most modern scientific results to the Hungarian middle school system. Also we plan to create a friendly competition among the schools (who has the best program, who was the most active during the academic year, who had the best summer camp, who had the best student talk? Best researcher talk? Best teacher presentation? Best contribution from parents? Who has prepared the best home-page for the Science Club? Who contributed with the best on-line materials ? We will also ask at least three students per Science Club and at least three researchers to blog regularly about their experience (students will blog in Hungarian, researchers if possible will be asked to volunteer to blog, both in English and in Hungarian). Importantly, we will

Timeline and activities:

disseminate information on science related competitions, challenges, innovation or problem solving competitions and call for actions on local, regional, national and global levels. These international events will increase the prestige of the Science Clubs and will increase the awareness of the young Hungarian generation about globally important science related problems.

Recent example includes the on-line off-line science endeavour game Vanished that the Smithsonian Institute and MIT announced recently to increase awareness of science and environmental issues by middle and high school students, or the recent

call of Google Science Fair competition.

We find a very strong and enthusiastic reaction from among the US Alumni community as well as from among the researchers and also the middle school teachers. We will determine at the end the share of each researcher /alumni participants i.e. the contribution to the generated merits. As the project broadens, and as new Science Clubs open up, we plan to involve more and more alumni and more and more researchers. Currently the main limitation is probably the candidate new locations for Science Clubs in middle schools, but apparently already more than 5 schools expressed their interest.

Quantitative outcomes include the number of lectures, number of topics, number of attendants, number of new science clubs etc etc. However one of the most important Outcome will be the relative increase of students who start University in a science engineering, or technology related orientation, and also the increased participation of students in science or engineering related competions and community activities.

We will also summarize how many times we have been covererd by the media, and if available the number of hits to the web-pages related to the topics of Science Clubs. We also plan to actively use new media like video sharing, blogs, web-based archives of the talks and will generate new web-based learning tools. We also will direct the attention of the students to the wealth of educational materials that are online available and will encourage them also to contribute (eg. writing Wikipedia articles in Hungarian).

A new element of outcome expectations is that in certain research projects like the Hungarian Dinosaurus project of Attila Ősi, or in the determination of radioactivity of rainwater of István Fórizs, or in the determination of exposure to radiation due to mobile/cell phone technology by Viktória Finta, it is possible to collaborate with students in particular in the data taking periods. We intend to introduce these colleagues to several student communitites and advertize the research opportunities after the researcher is personally introduced to that given Science Club. Using this method, a student with modest means and difficult background already participated in the 2010 Bakony Dinosaurus Digging project of Attila Ősi. In some of these projects, for example in the analysis of the composition of isotopes in the rain water, not only students but also High School teachers can participate in certain research projects.

This project also will connect the Hungarian Fulbright and other State Alumni communities by providing a common and meaningful project where they can work together on building a better society and providing a more enlightened future for the subsequent generations. Such a project will then also result in invaluable interconnectedness and networking opportunities among the members of the State Alumni community, and Hungarian communities of researchers, teachers, students and parents.

Finally let us mention that this project can also naturally be considered as a form to

strenghten Civil Society in Hungary, spreading not only the culture of science and scientific problem-solving but also the culture of self-education, self-determination, voluntarism. Sustainability, puritanism and realism in the execution of the project also carry important values that point way beyond the goals of a simple educational program in sciences. We also will provide moral support and an educational pipeline for students and teachers of marginalized schools, science teachers and students in small country towns and villages, supporting their fight for survival and for quality science education in small communities.

We aim at developing the culture of scientific, critical thinking, giving the opportunity of independent and self-determined student exploration. We also will push the students to new, previously unexplored territories that correspond to modern, up-to-date and relevant scientific problems and will mentor them so that they could make their first independent reviews or small contributions. We will encourage them to ask questions for themselves and to the presenters of topics and teach them the culture of scientific discussions and problem selection and identification. We also will help them to see excellent examples from the areas of Sciences, Technology, Engineering and Mathematics, and to help them to distinguish these areas. These topics will be represented by the selection and by the composition of the speakers during the academic year as well as in the summer camps. This implies that although we mainly focus on Sciences, our vision is broader and includes other areas of quantitative knowledge. We also will include certain areas of humanities in the spirit of spreading not only the culture of science but the totality of culture and knowledge in general.

Detailed Budget:

The only major change in our budget proposal, as compared to the first round of applications, is that we have quantified, based on the suggestion of the representative of the US Embassy to Hungary, the value of the various in-kind contributions that will be provided by the researchers, by the schools and by other contributing partners. The requested budget and its justification is given in a more detailed form and a summary table is provided.

Preparations start in this academic year, BerzeTÖK Science Club goes on with the programs and its started youtube broadcasting programs and will have a summer camp in July 2011. Interested teachers /students are invited on their own, minimalized expense estimated about 10-15 kHUF/week, in order to get the feeling.

Winning this funding will enable us to expand the activity/coverage of our circles of self-education significantly, acting as a cathalyst for an already ongoing activity to realize its full potential on a shorter time scale. To indicate our dedicatedness we decided not to include organizational or internal communication costs by the project team, instead of these expenses we attempt to maximize the support given to the participating schools and teachers. There are several free on-line available communication tools (google e-mails and blogs, youtube video sharing, skype calls instead of payed phone calls, that we shall use effectively to reduce our communication expenses). We will also utilize modern scientific communication tools like the Indico web based talk organization software developed at CERN that will help us to keep track of the on-going activities in these networks of Science Clubs. So our main costs will remain the travel costs of scientists, some compensations for the time of the teacher patrons of such Science Clubs and also the costs of accounting and

trackable administration of the expenses of the project. These are summarized in a Table form, while the items are justified in the text.

In-kind contributions (rental fee for lecture rooms, USD equivalent for the teaching expenses, offer of office space use of equipment etc) has to be quantified. Currently we estimate that a teacher hour is (including all legally binding expenses) about 5000 HuF ccan 25 USD/hour, providing the location of the Science Clubs corresponds to about 4000 HUF/hour or about 20 USD/hour in-kind contribution from the Middle Schools, while for special occasions (very prestigeous cases) a representative room corresponds to about 10000 HUF/hour or about 50 USD/hour in-kind contribution. Calculating with about 28 regular and 2 elevated, more representative lectures, one estimates an in-kind contribution of about 660 USD/School. Summer camp locations are a bit less prestigeous so estimated at about 2000 HUF/hour, 10 hours/day corresponding to 100000 HUF/Camp or about 500 USD/camp in-kind contributions. These in-kind contributions are summarized in a separate table and added as a Figure to this proposal.

We have developed our public-private partnerships plans, based on the large number of organizations: museums, universities, middle and high schools as well as certain foundations like the Hungarian Foundation for Innovation. Our previous very promising contacts with some individuals and organizations who sponsored some of the Science Club efforts include, for example, some help from parents, sponsorship from ATOMKI, the Research Institute for Nuclear Physics of the Hungarian Academy of Sciences in Debrecen, who provided popular science books for the student lecturers, or the Hungarian Nuclear Society who provided prizes for the Edward Teller Centennial competition. We consider possible further involvement of parents both as parent mentors and also as potential agents and evangelists for the Science Clubs in the private sector. We expect some modest contributions from companies that are “close” to the parents and that are interested in funding such Science Clubs on the longer run, including for example books to reward student presentations, or modest financial contributions to the expenses of the invited speakers or in the best case sponsoring patrons (primarily teachers or possibly also researcher patrons) of the Science Clubs. These sponsorships can be developed after at a successful start and a demonstrated inspiring operation of these science clubs, based on the already collected merits. We hope at present that such contributions will be made possible through the various Foundations run by almost every Middle School in Hungary. We will rely on assistance and help from the Hungarian Foundation for Innovation who has a large network of companies and more than 10 years of experience to coordinate such private-public partnership to provide advice, methods and possible contacts and promotion material to ignite these efforts. However, the most important element of making these Science Clubs sustainable is to keep their operation costs at the minimum necessary level while at the same time maximizing their intellectual impact.

In-country travel of scientists to science clubs:

4,000 USD

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Operation of science clubs, compensation for teacher patrons:

15,000 USD

(30 meetings/club/year, 2 hours/meeting, 2 teachers/meeting, 25 USD/hour, 5 science clubs/country)

Science club summer camps:

15,000 USD

(3,000 USD/camp, 1 summer camp/club, 5 clubs.)

This is an estimate, based on the experience that the summer camps provide about the same number of lectures and mentoring opportunities as do the annual weekly-biweekly meetings during the academic year, but this will be refined if we pass on to the second round of evaluation. Details are as follows:

About 60 participants (students + mentors) can be expected to show up at these camps, a support of 50 USD/participant corresponds to 3000 USD support request per camp. Students will be expected to contribute, too, at a rate of about 50 USD/student, to cover expenses related to their meals and basic accommodation as well as for the travel of their mentors, this is an important cost-sharing model working towards the sustainability of the project. These summer camps are recommended to be organized in small villages in a rural area, close to a small school that has a good reputation but fights for its survival. One of the goals is to give mentoring help and moral support to these schools, to their students as well as to their teachers. This arrangement also helps in keeping costs down. We will also encourage merit based primary school/middle school/private sector partnerships to support quality education initiatives in marginalized Hungarian communities.

Administration, web based management:

1,000 USD

Cost sharing is forseen to work as follows:

Supporting museums, research institutions and universities provide the salary for the professors and researchers who volunteer to visit Science Clubs.

The grant covers their travel expenses only.

Supporting middle schools provide the facilities and meeting places for the Science Clubs. The grant covers the extra time for participating teachers from those Schools.

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Other supporting organizations assist in publicity and outreach to media and general public, in disseminating the results. The grant covers necessary project related administration costs for each item, in particular if bookkeeping of the expenses cannot be organized on a voluntary basis. Experience indicates that bookkeeping costs about 10% of the itemized costs above and is at present included in each itemized expense.

Students are expected to contribute to about 50% of the minimized costs of the summer camps. Detailed budget table will be attached to the proposal.
About 10 % of the expenses (3500 USD) will go to the Hungarian Foundation for Innovation.

Total Funding Requested: 35,000 USD