

# Communicating Science – Regional Network of Science Centres and Initiatives

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**Abstract.** The importance of networking individual science communication activities within a region has been observed and led to the formation of the Initiative Youth and Science in 2004 in the Metropolitan Region Rhein-Neckar. This network has attracted several partners in the meantime, including university and research institutions, science centres as well as projects for gifted pupils. Some of them will be described in more detail below.

**Keywords.** Network, high school students, experiments

## Introduction

Scientific progress is based on curiosity to explore new things. But how can this curiosity be mediated from the researcher to the pupils. Only motivated and skilled science teachers can emphasize the relevance of science for the public. This not only involves transfer of scientific knowledge to science teachers but also introducing pedagogical concepts, guidance and authenticity are important for successful science transfer. With the fast developments in particular in molecular biology and physics, cutting edge technology knowledge is not transferred to the pupils and experimental approaches are left outside the school curriculum due to high investment costs and intense preparations.

In this paper, we will give an introduction into different activities to communicate science in the Metropolitan Region Rhein-Neckar. Specialized centres, projects, events and science festivals can serve as a podium to introduce new cutting edge technologies with a high throughput of pupils at reasonable costs. School policy makers should be addressed to ensure that support will increase for establishing a framework of science activities for pupils for the promotion of new young scientists.

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## **1. Cooperation between Research and Schools – An Introduction**

Research development in the life science and technology sector and the industrial application of research results within this field are of eminent importance to secure our economy. Looking at the decreasing number of students, it becomes obvious, that we will run into a shortage of skilled and well trained personelle in particular in the life science sector due to low interest by the pupils. Young people quite often decide against life sciences and technology without knowing about their enormous potentials. On the other hand, pupils consider life sciences as interesing and attractive and would like to learn more about it in school.

The decreasing interest to study life sciences therefore doesn't seem to be a problem of society but rather related to the way, life sciences are taught in school. Performing experiments and challenging the students with scientific questions is often not included or badly practiced.

To compensate for these drawbacks, a number of initiatives for informal learning have been established, focussing on promoting an authentic picture of the life sciences and technology. In cooperation with research institutions, universities and industry, a network of teaching laboratories for pupils, inittatives for gifted pupils, science centres and science museums as well as science activities and festivals have been established in the Metropolitan Region Rhein-Neckar. In those new learning environments, the bridge can be built much easier between abstract life sciences and every day questions. Common to all these activities is the fact, that they highly interest and motivate the students. Unfortunately these activities quite often show no long-term effect because they are set up as individual stand-alone projects. It is therefore very important to connect them to the school curriculum.

## **2. Initiative Youth and Science**

### *2.1. An Overview*

To establish a cooperation between different institutions for the promotion of the life sciences, the Initiative Youth and Science was founded in March 2004. It focusses on building a network of universities, research institutions, school adminsitrations and curriculum designers to promote the dialogue between science, research, industry and school. Currently there are twelve partners in this initiative, including:

- City of Heidelberg
- Department of School Administration (Regierungspräsidium Karlsruhe)
- European Molecular Biology Organization (EMBO)
- Fraunhofer ICT Pfinztal
- German Cancer Research Centre (DKFZ)
- Hector-Seminar
- Ministry of Education
- Technology Park Heidelberg GmbH
- University of Applied Sciences Mannheim

- University of Education Heidelberg
- University of Heidelberg
- VDI Nordbaden-Pfalz

The sponsoring takes place at different levels, e.g. by promoting complete school classes in teaching laboratories or supporting gifted and motivated individuals in specific courses and in research practicals. Figure 1 illustrates the network of the different partners and initiatives in the Metropolitan Region Rhein-Neckar. A more detailed description of several examples will be given in the following.

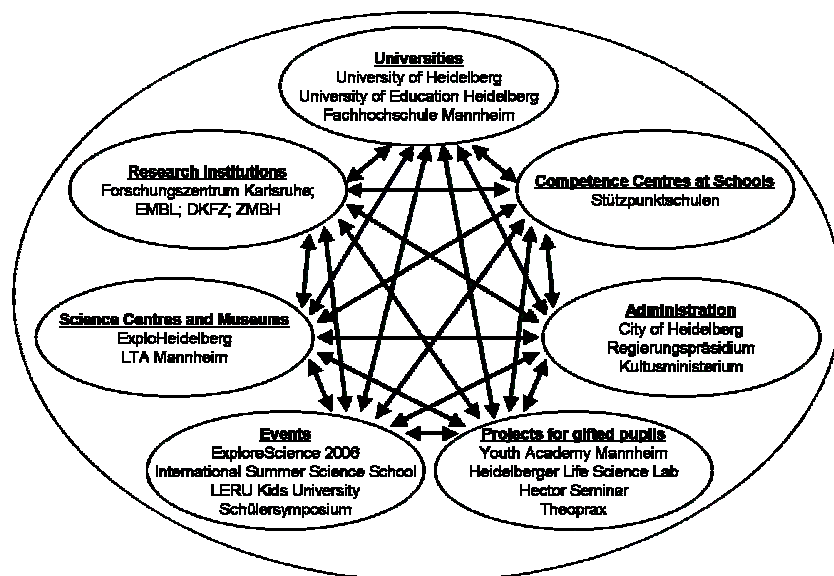


Figure 1. Network of partners and initiatives in the Metropolitan Region Rhein-Neckar that are associated with or partners in the Initiative Youth and Science. EMBL (European Molecular Biology Laboratory), DKFZ (German Cancer Research Centre), ZMBH (Centre for Molecular Biology Heidelberg), LTA (Landesmuseum für Technik und Arbeit), LERU (League of European Research Universities).

## 2.2. Competence Centres for Molecular Biology at regional Schools

Six Competence Centres for molecular biology (so called “Stützpunktschulen”) have been established since 2003 in schools in the area to serve as contact points between school classes within the schools and in neighbouring schools and current research in scientific institutions. Scientists from the university and research institutions in close collaboration with secondary school curriculum designers have developed molecular biology experiments that can be done in afternoon practicals. These experiments are closely related to the biology curriculum and demonstrate the power and ease of new biotechnological development. Since the start, 250 teachers have been trained in those competence centres for the visit with the school class, 60 pupils have been trained as mentors and about 2000 pupils have participated in practicals.

### *2.3. Symposium for pupils*

The Symposium for pupils on life sciences and technology was first established in 2005 as an annual one day event, to offer pupils that are involved in extracurricular courses and projects a platform to present their work with posters and as short oral presentations to the public. In order to realise this project all secondary schools in the region are contacted and supervisors are encouraged to submit proposals of their extracurricular projects. A jury of teachers and researchers selects the best projects which are then awarded with a prize. The main focus of the symposium is to establish dialogue and discussion between the approximately 300 participating pupils, teachers, researchers, industry representatives and the general public. This serves to stimulate the pupils to have a critical and intense debate with life sciences and technology. Participants and project coordinators obtain information and gain new ideas about extracurricular projects in the region. The event also serves for recruitment of young talented pupils into new projects. School students learn about presentation techniques, get ideas for new innovative projects and obtain information about support. Despite the information platform, the day is filled with scientific lectures by representatives from research, industry and local agencies. In 2005, the topic of these lectures was “green biotechnology”, this year, lectures were focussed on “nanotechnology”. For the upcoming symposium in 2007, a closer connection to industry and private companies is aimed for.

### *2.4. LERU Kids University*

For the second year in a row, several LERU universities have scheduled the LERU Kids University project; a science program for children aged ten to twelve years and (indirectly) their parents. LERU, the League of European Research Universities, is a network of 12 universities across Europe with the overall objective to develop joint strategies for the future and communicate them to specific policy-makers or the broader public. The research oriented universities organising the LERU Kids University project have committed themselves to play a pro-active role as partners in the process of lifelong learning, and aim in particular to help young children, their parents and their teachers to experience new and exciting approaches to knowledge and science. Additionally, the universities aim to develop closer relationships between themselves and society. 2005 was the “Year of Physics” and in this context, a series of interesting lectures was offered to the pupils. It was also the first time that several of the university departments and partner institutions offered the possibility for practical workshops that were in close context to the lecture topics. Children were invited to take part in the Heidelberg Kids’ University via the local paper. After online registration, all children received a confirmation Email and a student identity card. 332 children registered in total for the 5 Lectures and 7 Workshops, 66% were Boys and 34% were Girls. On November 23 in 2005, representatives of the ten LERU universities participating in the Kids University met in Brussels to assess the success of the initiative during a final event. Selected experiments and lectures were presented at the Natural History Museum. The afternoon event in Brussels was followed by an

evening reception for invited representatives from the LERU network, the EU institutions and the Press.

For the upcoming event in 2006, the general theme will be the “climate”. Eight LERU universities have chosen different topics, ranging from the Ice Ages to Asteroid Impacts or Animal Adaptation to Climate Changes. From September to November 2006 the Universities of Edinburgh, Geneva, Heidelberg, Leuven, Milan, Oxford, Strasbourg and Zürich will open their doors to welcome children to the world of science.

#### *2.5. EMBO International Teacher Workshops – Teacher Training*

The EMBO Science & Society Programme organises activities that promote information flow from the life sciences into public debate, education and policy making. As well as supporting scientists, the Programme organises events that enable multidisciplinary public dialogue on topics of importance to society. From international conferences and teachers workshops, to communication competitions, EMBO strives to make science and scientists more accessible to society.

EMBO's Science & Society Programme offers teachers in secondary education workshops where they can study molecular biology, and benefit from exchanges of resources, experiences and best practice at international level. Through its network of scientists, educators and teachers, EMBO can strengthen links between research and the creative disseminators who communicate it to the next generation of young minds. The workshops – expanded across Europe via EU funding in 2003-2004 – are a unique platform for international exchange of educational experiences and resources.

#### *2.6. International Summer Science School Heidelberg (ISH)- Foreign Exchange Program*

The International Summer Science School Heidelberg (ISH) has been founded in 1996, so it has passed the 10<sup>th</sup> year. It is organized and supported by the City of Heidelberg and offers selected high school students with a high interest in life sciences from the sister cities of Heidelberg a chance to explore Heidelberg. Besides it gives a lifetime research experience in analogy to the International Summer Science Institute at the Weizman Institute in Israel. Starting with an introductory week of scientific experiments at the Teaching Lab of the ExploHeidelberg and the EMBL (European Molecular Biology Laboratory), the students work for three weeks directly in selected research groups on their own project, supervised by the researchers. This year's participating institutions included the German Cancer Research Centre (DKFZ), the Max-Planck Institute for Medical Research and for Nuclear Physics as well as several

institutions of the University of Heidelberg. The aim of this project is to promote young talents into science careers and to improve the international exchange.

### *2.7. Explore Science 2006 – Science Festival*

The Klaus Tschira Foundation with its Explore Science festival wants to encourage children and pupils for life sciences. The Event was composed of the following parts: a scientific competition of pupils within different scientific tasks, lectures for students and adult visitors, a public science show, and an interactive exhibition for all who are interested in scientific phenomena. The exhibition was realized by local university departments, companies and science centres. Pupils starting at grade 5 and the whole public were invited to participate at the science show and festival in Mannheim. About 1800 pupils participated in the competition. They could choose one of seven scientific questions and build an exhibit/machine on one of these topics, e.g. a throwing machine, growing crystals or chain reaction. The interactive exhibition showed life science phenomena in a playful experimental way. Children learned about mirrors, the world of colors and 3D imaging in the physics section, about climate change and simulation of volcanic eruptions in the chemistry and geography section and about food biotechnology and DNA techniques in the biology section. The enormous success of this event with about 10.000 visitors in three days convinced the organizers to repeat the Explore Science event in 2007 with a similar program.

### *2.8. Heidelberger Life Science Lab – Gifted Pupils*

The Heidelberger Life-Science Lab is a project of the German Cancer Research Centre in Heidelberg (DKFZ), aiming at encouraging and advancing the interest and talents of secondary-school students in mathematics, natural sciences and technology. The Project focuses mainly on the life sciences, which are characteristic for this area while at the same time learning processes are to be introduced which will assist in the development of interdisciplinary competencies and personality characteristics relevant for education. The basis and the goal of the Project are to encourage independent, responsible social involvement, pleasure in discoveries and constructive cooperation, which is emphasized also by its 4 main components – self-organized workgroups under the mentorship of a scientist, a teacher and a student, weekly lectures, weekend seminars and international science academies (ISA).

### *2.9. ExploHeidelberg – Science Centre*

The ExploHeidelberg is an informal learning and interactive science centre located in the Technology Park of the City of Heidelberg in close proximity to the life science institutes of the University of Heidelberg and several research institutions. It consists of

three different components: an Interactive Exhibition, a Media Lab and a Biotechnology Teaching Lab. About 50 exhibits challenge the visitor to experience optical, acoustic and mechanical phenomena in the Interactive Exhibition. The exhibits release their scientific secrets by playing with them. Pedagogical concepts and design of the Interactive Exhibition are developed in close collaboration with the University of Education Heidelberg. Pre-service teacher students and staff members of the physics department are actively involved in the different tasks: e.g. in taking care of visitors as scouts, in designing exhibits, in developing workshops, in teacher training, and in research projects on the teaching and learning within an informal learning site. The Teaching Lab offers pupils of Middle- and High School level the possibility to perform biotechnology experiments in full day practical courses that are not possible in class rooms. A Media Lab with 12 workstations, a web cast computer and a video imaging workstation complements the study centre. Practical experiences from the exhibition and teaching lab can be deepened during supervised internet sessions in the virtual world. Especially developed software can be used to learn more about different scientific topics. While the Interactive Exhibition and the Media Lab are open daily to the general public and focus on interesting the visitor for life sciences in general, the Teaching Lab offers special courses that are in context of the school curriculum and offer an insight into modern biotechnology techniques. One day courses on handling DNA or proteins to specialized full week courses that involve sophisticated techniques and are usually only taught at university level are possible. Development and testing of courses and experiments are done with consultation of teachers and teacher trainers. Besides that, teacher training is of fundamental importance for the success of the centre. Teachers get involved in the courses since only well trained and motivated teachers can motivate their students. Starting this autumn, we will have a series of teacher training courses on different subjects of modern biotechnology.

#### *2.10. Regionale Network – the minimal infrastructure*

Within this regional network, it appeared as vitally important to have a central institution that can provide some man power, office space and secretarial assistance to support the network and attract new partners and associated members. Once a nucleus is formed, more and more pieces will fill into the puzzle.

#### *2.11. Resumee of Activities*

The Metropolitan Region Rhein-Neckar is in a particularly good position when looking at the teaching lab situation and the activities for motivated and gifted pupils.

Among the approximately 200 teaching labs in Germany, several are located in the area. The LTA (Landesmuseum für Technik und Arbeit) in Mannheim with its Elementa offers a laboratory for physical and technical experiments. The BASF with its Xplore laboratories covers chemistry and biotechnology and another biotechnology teaching lab at the Forschungszentrum Karlsruhe is operational for many years now. This together with the ExploHeidelberg Teaching Lab and including the competence centres at schools, we can estimate that from the approximately 8000 high schools students in the region, about

half have made the experience of a hands-on scientific experiment per year. Long-term effects for the promotion of new young scientists have to be evaluated and will follow.

To our opinion, the success of the network is directly related to the fact, that a critical number of diverse partners was attracted to bring in new ideas and contacts. On the other hand, it is crucial to attract a few of them into new project teams to establish short ways, effective communication and strong personal contacts to develop new challenging ideas.

### **3. Future Perspective**

We only managed to describe a small number of initiatives and projects in the current paper. An overview of the activities and interactions is given in Figure 1. Certainly, we forgot some and we would like to apologize for that and ensure that this was not due to bad will but shortage of space. The reader has seen that it is possible to establish programs and projects that address the general public, pupils of all different age groups and their teachers as well as motivated and gifted individuals. Within the Initiative Youth and Science, a lot of different partners have been combined and they all benefit from the interaction.

While the positive response from the participating pupils and their teachers is highly motivating, financial support is crucial for the future progress. We will continue to convince industry and funding agencies to sponsor projects within the network. Several partners have already committed themselves to support the infrastructure of the network in the long-term. One of the most important future goals will be to establish contacts with other networks, regional as well as across borders. Only a strong network can influence policy makers and the Network of Youth Excellence could play a very active role in this.

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