

Building an empowered relationship with science: the examples of Bjork's *Biophilia* educational program, KiiCS/SiS Catalyst *Raconte ta science* workshops, and *Ateliers de créativité technique*

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Abstract

This paper presents three activities carried out at Espace des sciences Pierre-Gilles de Gennes – the public venue of the engineering school and research centre *ESPCI-ParisTech*, in Paris - combining art, science and social inclusion: The Bjork *Biophilia* educational program, the *Raconte ta science* workshops and the *Ateliers de créativité technique*. In these three cases, we explored the benefits of embedding science engagement activities targeting teenagers in a empowering context. The scientific content is presented as a starting point for a creativity exercise (an electronic music composition, a short fiction film, an artefact, respectively). The creativity exercise is conceived as a way to redefine the relevance of the scientific content according to the personal needs of the participants, and as motivational factor for the young participants to meet science and scientists equipped with authentic questions and desire for knowledge.

The results of the evaluation of the three activities (which will be carried out throughout 2014) will form the basis of an action-research on the way arts and narratives can be used to help teenagers build a sense of ownership of scientific knowledge.

Introduction

At the heart of public communication of science there is not only a process of simplification of knowledge to a more accessible language, but also and mainly the capacity to provide a new meaning to a piece of knowledge in a context that is different from the one where it was produced.

This approach, which we believe is crucial in science communication, can be implemented in many different ways. In the case of journalism, the capacity to provide a new relevance to scientific knowledge meaningful to a specific audience mainly relies on the skills of the journalist, and its ability to interpret the needs of its readers/listeners/viewers. In activities involving face-to-face interactions with the public, there is the possibility to go one step further, and let the public itself participate in the redefinition of learning and setting the agenda of the communication. Activities for adults such as discussion games can provide a policy-oriented frame for this. But when dealing with family audiences or with teenagers, creativity can become an extremely valuable tool to empower the public in defining the relevance of the scientific knowledge they encounter. This audience-led agenda setting approach has an additional, fundamental benefit: it lowers the impact of exclusion mechanisms that act implicitly whenever we propose to the lay public a piece of knowledge that has a clear link with school and social “performances”, such as with scientific knowledge. In fact, social exclusion mechanisms do not operate only at the moment of access to knowledge (such as selecting non-visitors to science centres and museums, or non-readers of science magazines), but also in the way the public frame and use knowledge in their lives. Therefore, even when a science communication activity reaches the hard-to-involve public, it does not automatically increase their inclusion (or even their freedom to choose to be included or not). Unless the activity build an ownership of the knowledge presented, it might very well reinforce social exclusion (see also Merzagora *et al.*, *Empowering children: crossing the science in*

society and the social inclusion agendas in this Book of papers).

In order to be inclusive, the building of this ownership needs to be governed by the public. We are developing a series of strategies that foster the encounter of young audiences with science through the development of truly personal and creative activities. The development of personally meaningful projects becomes a starting point to develop (or just to create the conditions for) a desire for learning, interpreting, and seeing knowledge as something sought for. Knowledge that can help us interpret the world and maybe make it as close as possible to the one we would like to leave in.

We will present three different examples: the Bjork *Biophilia* educational project workshops, in which early teenagers meet scientific concepts while discovering the artist's view on these concepts and learning music through a purposely built tablet application; the *Raconte ta science (Tell your science tale)* workshops, in which teenagers meet scientists and visit science labs in order to write and shoot a fiction film in less than a day, following Michel Gondry's *usine de films amateur* protocol; the *Ateliers de créativité technique (Workshops of technical creativity)*, based on the Tinkering Studio experience at the Exploratorium in San Francisco, in which families meet science and technology themes through the making of creative handicraft. For each of the examples, we will try to highlight their potential impact on the inclusiveness of public engagement activities.

TRACES and the Espace des sciences Pierre-Gilles de Gennes

Espaces des sciences Pierre-Gilles de Gennes (ESPGG) was created as the public venue of the prestigious *Ecole Supérieure de Physique et de Chimie Industrielles de la Ville de Paris (ESPCI)*, home of 5 Nobel prizes belonging in turn to the city of Paris. It was a dream and a realisation of the 1991 Physics Nobel prize Pierre-Gilles de Gennes, and it took his name after his death in 2007. *ESPGG* activities revolve around art, science, culture and science communication, ranging from participatory exhibitions to public lectures, from dialogue activities to art-science performances, without forgetting more traditional science communication activities such as experimental demonstration about cutting edge science. Since January 2011 *ESPGG* is managed by the *TRACES* association, a non-profit think-and-do tank about science, its communication, and its

relationship with society. *TRACES* currently designs and runs all the activities taking place at *ESPGG*.

Raconte ta science workshops

The *Raconte ta science* project was created in the framework of two European projects, KiiCS (Knowledge Incubation in Innovation and Creation for Science) and SiS Catalyst - (Children as change agents for science in society). KiiCS is “a three-year European Commission-funded project (2012-2014). Led by Ecsite, the European network of science centres and museums, the project aims to build bridges between arts, science and technology by giving evidence of the positive impacts of their interaction for creativity as well as for triggering interest in science. The project will stimulate co-creation processes involving creators and scientists, and nurture youth interest in science in a creative way”. *Raconte ta science* involves teenagers from underprivileged areas in a two days workshop. Following a protocol inspired by Michel Gondry’s project *L’usine des films amateurs*, teens have to write and shoot a short fiction film in half a day, based on encounters with scientists and visits to science labs. After a free brainstorming to liberate ideas, dreams, questions that teens have on a scientific topic (e.g., brain-machine interfaces, chemical analysis, memory), they visit a research team, learn the basics of scenario writing, and shoot a fiction film using smartphones and tablets.

Through interviews with the teenagers, we are observing that beginning with free questioning and having a final creative task such as developing a fictional story and shooting a film, has a very strong “push and pull” effect on the type of interaction that teenagers have with scientists. It allows them to combine personal needs and curiosity with scientific knowledge coming from the scientists. Although in several cases the stories developed have quite stereotypical science fiction or mystery plots, they include many insights on what are the main views of teenagers on topics with a high social relevance (such as the development of brain-machine interface or the possibility to induce or remove memories). But what is most important in our case, is that it confirms that the access to science as a mean to nourish a personal and creative project (the story) can provide an extraordinary motivation for learning, and a great attention to the social implications of science.

Moreover, several teenagers greatly appreciated the possibility of combining their true curiosity for science with their interest in film-making, storytelling and new technologies, making the participation to the workshop a particularly unexpected, enriching and enjoyable moment.

Björk's *Biophilia educational program*

As described on the program's website, “*The Biophilia Educational Program is designed to inspire children to explore their own creativity, and to learn about music and science through new technologies. It is a hands-on program, groundbreaking in its highly original effort to break up conventional teaching modes by merging music and science together.*”

The program is based on a mix of science, music, and IT educational activities, revolving around Björk's *Biophilia* album, in which all the songs are inspired by a scientific theme (Virus, Dark Matter, Crystalline, Moon, etc.). In a week-long workshop, teenagers learn about science and music, to end up composing science-inspired electronic music through a purposely built iPad app (now also available on Android platforms). During Björk's residence in Paris in February-March 2013, the program was hosted at *ESPGG* thanks to a collaboration among three structures: *Deuxième labo*, *TRACES* and *Association Science Ouverte*. The workshop involved several groups of 10 to 12 years old children. Some groups were selected through an open call (mostly children of artists, designers, scientists), and some groups were involved through a science education NGO (*Science Ouverte*) operating in underprivileged areas of Parisian suburbs.

The program slogan - “Creativity as a Learning Tool” – proved to be highly realistic and performing. In fact, the mix of motivational factors arising from being in a scientific environment to discover science, discovering music, playing with electronic devices and creating one's own music piece, provides an energizing environment for the participants (the visit to Björk concert stage and the use of art-science musical instruments such as a gigantic Faraday's cage provided an additional thrill to the experience!). Our challenge was to create a meaningful encounter with very diverse scientific topics in a very limited time. The choice was to present scientific researchers not as people that are interesting for what they know, but as people that are interested by

what they ignore. This simple shift allowed proposing the topics as a questioning exercise. For example, the picture of a lightning bolt was shown, then Björk's song Thunderbolt was listened to collectively. Children had to ask questions about thunderbolts, trying to be as honest as possible on what their authentic questions were. What don't we know about them? What would we like to know? Explanation of the properties of lightening etc. came afterwards respecting as much as possible children's questions, and making it clear that, due to their complexity and the available time, most of the questions would have remained unanswered.

We observed a clear difference in the way this exercise was carried on by the two groups of students. In fact, the children coming from higher educated families had a tendency to look first at their existing knowledge, forgetting their authentic questions and thus to focus on the unknown, while the so called "underprivileged" group tended to develop extremely creative, real research questions. We are aware that this type of consideration risks to reinforce stereotypes and are biased by our ideological background: however, we think they prove that the "push and pull" strategy outlined above (motivation for knowledge is pushed by a free brainstorming and pulled by a creative final goal such as composing a song) has a strong effect in removing unintentional exclusion mechanisms.

Ateliers de Créativité Technique

The *Ateliers de Créativité technique* are strongly inspired by the Exploratorium's *Tinkering studio*, "a studio workshop for playful invention, investigation, and collaboration". The Tinkering Studio is "an immersive, active, creative place where museum visitors can slow down, become deeply engaged in an investigation of scientific phenomena, and make something—a piece of a collaborative chain reaction—that fully represents their ideas and aesthetic " Typical examples of this are the creation of machines that scribble, with daily life simple materials such as rubbers, fruit baskets, pens; or the realisation of an object that flies in a wind tube by assembling objects that would not fly if taken alone.

ESPGG being the science culture centre of a highly creative engineering teaching and research institution, it seemed obvious to adopt this approach in welcoming family

visits. In fact, tinkering is an activity with many elements in common with the science and innovation endeavour. In our appreciation of these activities, we value in particular the possibility of each participant to choose the posture and the objectives that he or she wants to have. This ranges from the very « techy » spirit, tending to build incredibly performing artefacts, to the more aesthetic oriented spirit, that tend to build extremely good looking objects with little or no technical performance. Most importantly, the approach allows for a constant, freely chosen movement between these two poles for all participants, pushed by imitation and dialogue. In this very element we spotted a great potential for improving the inclusive character of our venue. In participating to these activities, people feel they can control the rhythm, the scope, the relevance of their scientific learning. Most of the time, we do not know what they learn, but they know they do learn a lot, providing a fulfilling sensation, which is systematically highlighted in the feedback from the participants.

Creativity as a motivational enhancer of curiosity for science

These three examples are intended to promote empowerment in science communication activities involving direct contact with the public, so that each individual can contribute to the definition of the relevance of scientific knowledge for its own cultural, professional or personal life. One way to promote this empowerment is through an authentic creative activity mediating and motivating the encounter with scientists and scientific knowledge. Through this approach, the risk that science communication reinforces rather than fights social exclusion are lowered: in fact, actions promoting social inclusion operate not only at the moment of the access to knowledge (reaching the public), but also in the phase of embedding knowledge in people's lives and choices (empowering the public).

The experiences presented here provide a very rich ensemble of insights, that we truly hope to be able to analyse and reflect upon in order to produce proper research work, that would in turn allow to transform somehow sporadic, experimental activities into stable institutionalized practices.

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References

<http://tinkering.exploratorium.edu/>

<http://biophiliaeducational.org/>

<http://www.kiics.eu/>

<http://www.espgg.org/Atelier-Raconte-ta-science-Le-11>

<http://www.espgg.org/Ateliers-de-creativite-technique>

<http://www.espgg.org/Bjork-Biophilia-Education>