DISSEMINATION OF THE RESEARCH TOWARDS YOUTH: TWO ACTIVITIES OF EXPLORATORI

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Abstract

It is well known that universities and researchers have a duty towards the society: the dissemination and exploitation of their research.

The EXPLORATORI of natural resources (EXPLORATORI), a project of the Universitat Politècnica de Catalunya (UPC) aims to encourage science and technology among young people, through their teachers and young people themselves. In order to achieve this goal, EXPLORATORI organizes several activities for 23 years ago to engage youth in science using the methodology of learning by doing.

In this sense, EXPLORATORI organizes two activities with the aim to make know the research at the university:

- Knowledge Fair: It is a two-day Science Communication Event (seven editions). The specific objective is to introduce the most recent science and technology research projects held in UPC universities (9 research groups), to young people (High School).
- Catalonia Young Talent FORUM: The objective is to reward the best 40 students (15 and 16 years old) and promote science and technology interest among secondary young students (two editions). The central topic is different in each edition and prominent figures and scientists had participated.

In this presentation, the results of these two experiences will be related with several studies about the dissemination of the research towards young people, and the impact in their learning and education.

Keywords: Dissemination, Research, University, Youth.

1 INTRODUCTION

The “EXPLORATORI” is a project from the Barcelona Knowledge Campus (BKC), presented by the “Universitat Politècnica de Catalunya BarcelonaTech” (UPC) and the Berga Town Council. The main objective of the project is to bring science closer to secondary school students, their teachers and the society in general. To achieve this goal, the “EXPLORATORI” organizes activities related to scientific and technological topics. More specifically, the “EXPLORATORI” project aims to contribute to:

- Engage secondary school teachers and students in science and technology, in order to promote scientific and technological vocations.
- Match supply and demand for qualified workers with STEM skills and knowledge.
- Stimulate young people’s interest and attitudes in STEM subjects and careers.
- Strengthen links between research and education.

The “EXPLORATORI” organizes activities and projects related to scientific and technological topics, with a common background: Engage secondary school teachers and students in science and technology, in order to promote scientific and technological vocations. These activities are classified in three sections: Knowledge Fair, Catalonia Young Talent FORUM and ScienceGirls project.

2 PROBLEM DESCRIPTION

It is well known that universities and researchers have a duty towards the society: the dissemination and exploitation of their research.

Science is all around us. A holistic approach to science is imperative when choosing topics. Contextualisation of the chosen topics is imperative to move the application of the methodology from
STEM (Science, Technology, Engineering, and Mathematics) to STEAM, where "A" refers to "All disciplines."

The aim of the project is to approach scientific topics through other disciplines, and demonstrate that most disciplines are related to scientific topics.

To promote Responsible Research and Innovation (RRI) and ensure public understanding of Science, actions will be implemented that are open to everyone in which researchers explain their research.

Promoting interest in science is essential to encourage people to study science and technology related degrees, in order to match supply with demand.

"Citizens should be actively and directly involved in science research and innovation projects." “Above all there is a need to involve citizens, young and old, as active agents at the heart of inquiry-oriented science learning – in identifying and framing the research problems and leading to the discovery of solutions and innovations which help situate science in every-day life. In this way, we involve a richer pool of talent in framing a more responsible and ethical approach to research and innovation.” [1]

During the past decade, the proportion of students enrolled in science and technical studies has declined in the United States and in most European countries. At the same time, the job opportunities in these fields are expected to increase over the next years. Indeed, qualified workers with science and technical skills and knowledge will be essential for the economic future. To overcome this situation, in some parts of the world, the method STEM is being implemented in formal education. Although it’s not much known in Catalonia, the “EXPLORATORI: Natural Resources” project has been pioneering the use of this method in this region.

All research projects at the universities need supplementing a general and large-scale dissemination to various audiences previously defined. Dissemination networks provide the research projects with a highly valuable focused dissemination audience of organisations and communities pre-motivated to take an interest in the project’s missions.

The idea of a Science Communication Event is relatively new. Likewise, the science museum is well-established, although the science centre which is not collection-based but communicates using interactive and hands-on exhibits is quite new. The idea is to communicate and discuss not only the results of scientific work but also the way science is carried out as a wider concept. [2]

3 ACTIONS OF THE EXPLORATORI

This paper presents the results from the impact assessment of three activities organized by the “EXPLORATORI: Natural Resources”.

Firstly, in this paper we analyse the impact of the Knowledge Fair, a Science Communication Event which introduce the most recent science and technology research projects held in the UPC University, as well as in other research institutions, to secondary school students. This is a clear example of how science can impact on society, particularly to young people.

Secondly, the paper also examines the impact of Catalonia Young Talent FORUM with the objective to reward the best 40 students (15 and 16 years old) and promote science and technology interest among secondary young students (two editions). The central topic is different in each edition and prominent figures and scientist had participated.

Finally, another project is analysed (ScienceGirls) in order to show other activities that can be useful to promote interest in science, but not directly related to research dissemination.

3.1 Knowledge Fair

Knowledge Fair is a two-day Science Communication Event (seven editions). The specific objective is to introduce the most recent science and technology research projects held in UPC University (9 research groups), to young people (High School). Two PhD students represent each research group. The close age between them, allow providing participants with an enriching exchange of their academic experiences.

They all deal with very different topics/subjects, such as natural resources or medical issues. Its purpose is to increase young people's interest in these fields, as well as society in general. This is achieved by encouraging the spirit of learning in the research context. The aim is to bring science
closer to society, especially to the young ageing from 16 to 18 years old, in order to arouse their scientific vocation, which is so often missing. Furthermore, we show that science is attainable for everybody.

At the same time, each year it is organized one exhibition about the topic of the International Year, in order to be more flexible for the visitors. In the first edition, it was International year of Chemistry and the exhibition was “Where is the chemistry?” [3]. Simultaneously, it takes place several conferences about different topics in each edition.

On the other hand, the incomparable frame that the Berguedà County has to offer allowed visits to other areas. Particularly, visits took place in the protected natural interest area of Serra de Queralt. There the participants were able to compare the characteristic species from the local wildlife in two well defined habitats: Shaded and sunlit areas.

### 3.2 Catalonia Young Talent FORUM

The objective of this action is to reward the best 40 students of the 4th course of “ESO” and 1st course of “Batxillerat” and promote science and technology interest among secondary young students (two editions). The central topic in the first edition has been “Water in Earth” and prominent figures and scientist had participated. In the second edition the central topic has been “Energy: transition towards the future”.

This enabled the participation of students from 19 regions and 26 towns or cities across Catalonia. In particular, 25 girls and 15 boys took part in 2015 and 19 girls and 21 boys part in 2016. This action took place in the city of Berga over a four-day period.

This year will celebrate the third edition; the main subject will be the Nexus Water – Energy.

### 3.3 ScienceGirls Project

The EXPLORATORI currently is participating in an Erasmus+ project “ScienceGirls” with a similar goal of present project, but focused on the engagement of girls in Science. There are eight European countries involved in the project.

The ultimate aim of the project is to provide useful and attractive guidance for gender-sensitive science learning in schools for interested secondary schools across Europe, and at the same time to contribute to the Commission’s Science Learning Innovation Agenda.

To do this, the girls’ teams need to qualify their contributions and build capacity to feed into the project's outcomes which will take place in the project’s third major phase: VISIONS OF EARLY SCIENCE ENGAGEMENT.

Consequently, the project will take the teams through 2 epic capacity building phases: first looking at what science learning means to girls (HOW WE FEEL SCIENCE), then experiencing what science, research and innovation looks like in real-life, including for women engaged in this fields - SCIENCE IN REAL-LIFE.

Based on these 2 epic phases, the girls’ teams are expected to be able to deliver highly qualified input to the project outcomes, including during the project's co-creation climax, the 5 days ScienceGirls Science Vision Encounter.

The term “epic” indicates the nature of these 2 phases: the duration and intensity of the 2 phases will allow an epic experience among the participating teenage girls, deeply influencing their mind-sets, interests and curiosity.

The epic dimension links learning experience to personal experience, and precisely to the forming of identity thus qualifying the teenage girls to feed valuable visions into the project’s final outcomes.

Each project phase includes at the end of the phase informal sharing-sessions with the school, with the girls’ families and with interested resources in the community. This is another system of science and research dissemination.

### 4 RESULTS

In the case of Knowledge Fair, the purpose of the study was to measure the effect of participation in this action on students’ attitudes towards science and technology.
In this sense, the participants answered a questionnaire before (pre-test) and after (post-test) their participation in the Fair. The study was about the participation in two editions of the Fair. A total of 1,293 students from 23 secondary schools in Catalonia completed and returned the surveys [4].

In the 2014 edition there are statistically significant differences between the pre-test and post-test mean scores for the areas of physics (p<0.001) and chemistry (p=0.008).

**Interest in learning STEM disciplines:**

The most interesting area to learn for male students was technology, while this area received the lowest interest rate among female students. Female students had higher interest in learning biology, whereas male students considered it as one of the least attractive.

Both male and female students ranked geology as an uninteresting area.

**Perception of science and technology education:**

The proportion of students who conceive science and technology studies as uninteresting and hard is higher in girls than in boys.

The Knowledge Fair has a significant influence on the personal perception of science and technology studies, regarding the level of interest in studying them (p=0.027 for 2014 edition; p=0.009 for 2015 edition).

**Perception of the importance of science and technology research for society:**

Nearly 93% of the students shared a positive perception about the utility and the importance of science and technology research for society.

About 80% of the students recognized that the research projects presented at the event have relevant future applications for everyday life.

**Choice of the future field of study:**

Before participating in the Knowledge Fair, 41% of the participants had already decided their academic future.

Fig. 1 shows several stands of the Fire, with examples of several activities, in order to make know different research projects (reference [5] shows more photos).
In the case of Catalonia Young Talent FORUM the participants answered a questionnaire before (pre-test) and after (post-test) their participation in the Forum, with a similar system as in the Fair. Fig. 2 to 4 show the answers obtained.

**Question 1:** Which adjectives define better your opinion about Science and Technology studies?

**Question 2:** Is what you could see during the Forum the same that you learn at school?

**Question 3:** Indicate your level of interest in learning about the following topics.

**Question 4:** Score from 0 (not satisfied) to 10 (very satisfied) your participation to Young Talent Forum.

Taking into account the questions asked at the beginning of the Project and at the end, the results show that at the end of Forum, the young students considered that science and technology are cooler than what they expected. More of half of the students thought that it was a very interesting experience that was, moreover, new in comparison with the teaching in their respective schools.
In website [6] there are several images and videos about this action.

Another interesting aspect is the fact that, among the interest of the youth on different science and technology subjects, math, physics and chemistry are considered the most interesting, whereas geology and biology do not have such an interest for the assisting young students.

This action resulted in a success and, as observed in Fig.4 approximately a 80% of the young student valued the FORUM between 9 and 10.

With the Erasmus+ ScienceGirls project, one activity organized was the participation in Barcelona Youth Mobile (YoMo). In this activity, the girls prepared a questionnaire for the young visitors at the event. The Figures 5 to 7 show the results about questions answered in YoMo 2017.
5 CONCLUSIONS

The obtained results show that science plays a fundamental role in education. This fact proves that the questionnaires carried out during YoMo where young students showed a significant interest on science topics (90%, Figure 6), and answered that they consider both science and technology are an important fact for the development of a society (Figure 6).

On the other hand, despite the awareness of the importance of these subjects, results shown in Figure 7 are surprising given the fact that a 73% of the young students would not want to get involved in science.

For this reason, divulgation is necessary in order to bring science and research from university closer to society, in initiatives as those carried out by EXPLORATORI.

REFERENCES