FINAL PUBLISHABLE SUMMARY REPORT

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Section A: Project abstract

Time for Nano developed and spread creative new ways of engaging young Europeans on the topic of nanotechnology. The field of nanoscale research, engineering and technology has always posed significant challenges to science communicators, and this project demonstrated a number of successful methods of engaging the general public, and particularly young people, on the associated benefits and risks.
Two key tools were developed: the **Nanokit**, a box full of specific activities to be carried out using real nano materials; and the annual **online video contest**, a YouTube-based European competition inspiring young people to create their own films to explore themes of nanotechnology.
The project and its tools had a significantly wide impact thanks to the three formats it developed: **Nanoday** events, which took place across Europe, engaging young people face-to-face with science communicators and researchers; **Multipliers' training** sessions, training educators to work with young people on nanotechnology; and the online **webplatform**, promoting the project, hosting resources and acting as the hub of the community of users which the project developed.

From a pedagogical perspective, the two central methodologies of the project were **enquiry-based learning** and **debate**. Since the project made use of real materials related to nanotechnology, as part of the Nanokit, enquiry-based learning allowed the young people to engage with the objects in an ideal way. As for debate, the project tackled five central controversial topics: Health, Privacy, Environment, Socioeconomic divide and Improvement.
Thirteen partners from ten different countries, a well-balanced representation of countries from all over Europe, worked on the project:

- P1. Fondazione IDIS-Città della Scienza (IDIS), Italy
- P2. the European network of Science centres and science museum, Ecsite, Belgium
- P4. Ciência Viva, the National Agency for Scientific and Technological Culture in Portugal
- P5. CCSTI La Casemate, a French science centre based in Grenoble, France
- P6. The Turkey Science Centres Foundation
- P7. Technopolis®, the Flemish science centre, Belgium
- P8. The Warsaw University of Technology, Poland
- P9. Heureka, the Finnish Science Centre
- P11. The Deutsches Museum in Munich, Germany
- P12. A research group in Social sciences, Observa , Italy
- P13. A publishing company, CUEN, Italy
- P14. BridA, a collective of artists from Slovenia
- P15. The Association for Science and Discovery Centres, United Kingdom

Project website: www.timefornano.eu

Section B: Project context and objectives

The Time for Nano project finds its context at a time when research on nanotechnologies and nanosciences is widely contributing to the advancement of science. The applications of the results of this research are revolutionising our society in many fields such as medicine, computing, materials science, energy production, and manufacturing, with significant impact. Yet, to the general public, these advances can be invisible or difficult to understand because of the nano scale and of the complexity of such phenomena.

Studying phenomena and manipulation of matter at the nanoscale and developing nanotechnologies leading to the manufacturing of new products and services is the current approach of European research in this sector. It has a huge potential to improve competitiveness and sustainable development across a wide range of industrial sectors. On the other hand, while understanding and technologies advance, some critical aspects appear in relation to the possible impact of nanotechnologies development on human health and environment. Current knowledge concerning toxicity and eco-toxicity of nano-materials is still incomplete and many civil society organisations have already pointed out to citizens many possible risks. Moreover, recent public debates on controversial scientific issues – such as genetically modified organisms – have taught us that scientists and society should engage in dialogue sooner rather than later, if we are to build a climate of trust and openness and develop robust policymaking processes.

This was the challenge for nanotechnologies which the project addressed: the fast development of nanotechnologies is raising radically new public policies fostering upstream citizens' participation in the debate about the governance of these emerging issues.

Time for Nano was designed to ensure that N&N research activities would be made be comprehensible to the public and even more should respect fundamental rights and be designed, conducted, implemented, disseminated and used in the interest of the well-being of individuals and society.

The initial objectives of Time for Nano can be divided into three broad categories:

1. To implement innovative tools to engage young people

The first objective of Time for Nano was to inform the public, with a special attention to young people and students, about nanoscale research, engineering and technology, as well as about the related opportunities and risks of their development for our society through the **implementation of an innovative model** that integrates an inquiry-based learning process with discussion and debate.

In the first half of the project, educational instruments were developed to train people, used in public debates and events. The second half of the project devoted itself to extensive implementation of these tools, amplifying the project impact. The **Nanokit** was developed, produced and distributed during the first phase of the project, and the second phase saw its continued use. The kit continued to be used in the science centres or in classrooms. In this period, 20,000 people attended **Nanoday** events in the science centres that used the nano-kit as well as to encourage participation to the second edition of the **online video contest,** which received 117 entries. The promotion of this contest was achieved thanks to a relaunch of the **project webplatform,** obtaining 11,000 unique visitors in this period and 45,000 pageviews.

2. To communicate on five key issues

The second objective of the project was to introduce young people to the European public discourse, understanding and debate on nanotechnology. In the first half of the project, **five "nano-dilemmas"** or challenges were identified to be specifically addressed and debated, and the second half of the project sustained the debate on these topics:

- Health: Nanorobots inside your body: "cool" stuff?
- Privacy: Tagging the whole world?
- Environment: Mending or harming the living world?
- Socioeconomic divide: What do you get if you can't pay?

- Improvement: What nano-powers would you choose to have, and why?

Each killer question is associated with a video made by BridA, a collective of artists, so as to encourage creativity. In the second year of the project, BridA worked even more closely with the science centres in order to ensure a greater level of stimulation for the events.

3. To develop a community

The third objective of Time for Nano was to create **a growing community of people interested in nanoscale research, engineering and technology**, starting from the community of researchers, science communicators and informal science educators. This community grew significantly in the second half of the project, through partners' national and regional relationships with science centres, science festivals, and schools; and particularly through Ecsite and its large community of science centres and science museums all over Europe. It grew to include teachers, explainers, science educators and communicators and PhD students in science communication. The organisation of 74 multipliers' training sessions in this period was crucial in developing this community, resulting in 953 multipliers fully trained in this period only. The webplatform received 11,000 unique hits in this period, sustaining the community online. Links with other European projects were also crucial in this community development.

Section C: Project actions and results

The Time for Nano project drew on the European Commission's 2004 communication 'Towards a European Strategy for Nanotechnology' and the 2005 document 'Nanosciences and nanotechnologies: An Action Plan for Europe 2005-2009', as well as the Commission's 2008 recommendation on a code of conduct for responsible nanosciences and nanotechnologies research which stated that 'good governance of nanotechnology and nanoscience (i.e. N&N) research should take into account the need and desire of all stakeholders to be aware of the specific challenges and opportunities raised by N&N. A general culture of responsibility should be created …' The 2010 document "Communicating nanotechnology: Why, to whom, saying what and how? – An actionpacked roadmap to a brand new dialogue" went into greater detail about the challenges of engaging the public on nanotechnology.

This document "Communicating nanotechnology" outlines a framework according to which public engagement activities can be examined. It is within this framework that we can analyse the impact of the Time for Nano project more usefully, looking at who the project targeted, what the project achieved, how, and how well the project achieved its aims. According to this framework, the tools and activities developed in Time for Nano can be divided into three types of action:

- **OUTREACH**: The overall communication actions of the project, which focus on raising awareness among the target audience. In Time for Nano, the main outreach activities were the **Nanoday** events, and the general **project dissemination** through the project website, online activities, press relations, conferences and publications.
- **DIALOGUE**: These were the project activities which aimed at truly engaging the public with nanotechnology. The **Nanokit** activities and **online video contest** were the key Time for Nano activities in this category.
- **EDUCATION**: These activities were those that integrated public engagement with nanotechnology into the education system. The **multipliers training sessions** fall into this category.

We will look at each of these categories of activity to see:

- to which target audience they were addressed;
- how the activities were carried out;
- their impact, and to what extent the activities achieved their aims.

C1 Outreach: Nanodays and dissemination

Outreach: target audience

The project's target audience was always broad, and the outreach activities aimed at the broadest range of targets within the project, since their primary aim was to raise awareness of the issues at stake regarding nanotechnology and nanosciences. The specific target audiences of these activities were the following:

Young people: Young people were the primary target audience of all the project activities, and as such were also the primary targets of outreach events and dissemination, both in order to raise awareness of the issues at stake in N&N, but also to raise awareness of the project's dialogue activities.

General public: Adults and families were also key targets of the outreach events, both as direct secondary project targets, to raise awareness of the issues at stake in N&N, but also as an indirect target, raising awareness of the possibilities for their children to participate in the project dialogue activities.

Professionals and teachers were secondary targets, reached primarily through professional conferences, publications, activities of networks such as Ecsite and ASDC and the local and national networks of project partners.

Outreach: Actions

The Nanoday events, which took place at science centers, museums, universities and festival locations, were the central outreach actions of Time for Nano.

The strategy behind the coordination of the Nanodays events was to ensure that partners were able to share from each others' experience and specialisation in order to generate true European collaboration. This meant that the format of the Nanodays was multiple and flexible, allowing the partners to adapt the events to their audiences and their facilities, making the most of local collaboration with researchers, schools and other stakeholders. Throughout the project, partners documented their experiences carefully, and shared the results among the consortium, at project meetings and electronically. The result was that partners were able to share activity formats and ideas, trying out new ideas from other countries, exploiting the Nanokit – both with the schools and with the general public – and supporting the participation of youngsters in the Time for Nano videocontest.

France: CCSTI Grenoble

During the 1st year the nanodays took place mostly during the month of May. The Nanodays were officially advertised between 3 and 7 May 2010, although other activities took place outside these dates as well. 562 students were directly involved in the workshops and events. During the 2nd year of Time for Nano, Nanodays activities and events were spread all along the year, to take advantage of the various partnerships created during the 1st year. This new way of scheduling a "Nanoday" increased the number of participants, the length and quality of certain activity (i.e. "Nanoscience class") and the commitment of scientists and teachers.

934 students were directly involved in the workshops and events.

In addition, the Nanokit has been used everyday in the Poitiers Science Centre (Espace Mendès-France) as an animation of the exhibition "The secrets of the Nanoworld" (20 October 2010 – 22 May 2011, http://maison-des-sciences.org/).

Germany: Deutsches Museum

The Nanodays organized by the Deutsches Museum took place between place between April and July 2010, the first year, and between December 2010 and July 2011 the second year. The

approach of the DM has been threefold: it organized Nanodays at the Centre for New Technologies, where demonstrations, experiments and live encounters with scientists were held; it developed specific programs for schools, in order to bring Time for Nano outside of the museum and directly into the classrooms; and it supported schools in creating their own Nanodays, programs and provided training to the students to create the videos for the Time for Nano competition. All these activities were produced in cooperation with the teachers, and included programs for the students and their parents as well. Despite the fact that nanotechnology is not yet in the curriculum of schools and that teachers are overloaded with extra-curriculum activities, the Nanodays have been very successful and the Nanokit has been a superb tool to engage younger and older students with nanotechnology.

On both events, the Deutsches Museum organized an introduction to Nano, instructions for the Nanokit and PlayDecide, a tour of the Centre for New Technologies, and a video workshop in collaboration with BridA. The schools organized one NanoDay on their premises and supported the students to produce their videos for the Time for Nano competition.

Finland: Heureka

Heureka organized 14 Nanodays on its premises in collaboration with Finnish schools: 2 events were specially designed for teachers, to learn how to utilize nanotechnology and its achievements as a part of teaching; 2 events were designed for students, to teach students what nanotechnology is and how it can make life easier; and one event was produced for the general public, with lectures, workshops and science shows. Heureka organized also 2 Nanodays at Finnish schools and several nano workshops in high schools under the LUMA-week in Autumn 2010. In addition, Heureka organized also a video workshop for high school students to support them in creating their entries for the time for nano video competition.

Two videos documenting the Nanodays organized by Heureka are available online: http://youtu.be/HI8051TQPrk captures moments of the public event, and http://youtu.be/8D2NqQKE0-4 shows the students producing their videos during the video workshop.

The teachers who took part to the Nanodays came from several schools in Finland, some as far as Raahe, 600 km north of Heureka.

Italy: Fondazione IDIS-Città della Scienza

Citta della Scienza organized Nanodays at the science center and at various science outreach events in Italy. The nanodays were organize both during the week, to address the school visits to the science center, and in the weekend, with activities targeted to the general public. A broad dissemination effort took place at national level, with activities organized by Citta della Scienza at several important science and film festivals in Italy. During the Nanodays it also offered training on video making to support the participation of the students in the time for nano videocontest. A permanent exhibition space dedicated to Nanotechnology and Time for Nano allowed to have an everyday channel of communication on the project with the general public of the Science Centre of Città della Scienza.

Poland: Warsaw Technical University

Nanodays and several promotional activities were organized by the Warsaw Technical University. Four Nanodays took place at the National Museum of Technology, where in addition to the activities for teachers, students and the public, a special "fun corner" for small children was organized as well. One Nanoday took place in Wroclaw. During the 1st year, WTU took also part on 12 June 2010 to Piknik Naukowy, the largest science festival in Poland.

An exhibition highlighting the everyday use of nano materials was also produced for the Nanodays; after the events at the museum, the exhibition has been shown also at the Warsaw Technical University.

The promotional activities took place at several locations in Poland; furthermore, a 60 minute program on the first channel of the Polish TV featured Time for Nano with a series of demonstrations an experiments led by prof. Malgorzata Lewandowska.

The Nanodays at the National Museum of Technology were held during a major municipal action in Warsaw called "Winter in the city." Over the course of 4 days, more than 500 people enjoyed the exhibition and the presentations performed by the team of the Warsaw Technical university. The exhibition was open from 11 to 27 February 2011.

On 18 and 19 June 2011 the Warsaw Technical University organized two Nanodays at the Lodz Shopping Center „Galeria Lodzka". The Nanokit was used to perform experiments and demonstrations for the general public.

The last Nanodays were organized at the EduPark Gdańsk (http://www.centrumedukacji.gpnt.pl/aktualnosci/322-nanonauka-w-eduparku)

Portugal: Ciência Viva

During the 1st year, Ciencia viva organized 5 nanodays at the Knowledge pavilion in Lisbon, in addition to several activities and events at various schools in the country. During the 2nd year, Ciência Viva organized 3 Nanodays at the Pavilion of Knowledge in Lisbon, and 4 Nanodays at other locations throughout the country. The Nanodays were targeted to both school and adult

audiences; the success of the initiatives was such that Ciência Viva will continue with the organization of the Nanodays also in the next year.

Belgium: Technopolis

During the 1st year Technopolis organized 5 nanodays from 20 to 24 May 2010. During the 2nd year, it organized 5 Nanodays from 11 to 15 April 2011.

The Nanodays, which included interactive workshops, demonstrations with the Nanokit, quiz, exhibits and displays, were developed in partnership with Umicore and the University of Antwerp. During the Nanoodays the visitors had also the opportunity to interact with researchers from the University of Antwerp, who engaged in dialogue with the visitors about their research in nano sciences. A total of 4591 participants took part in the Nanodays.

Turkey: Istanbul Science Centre

Istanbul Science Center organized 12 Nanodays in several schools and universities across the county. The Science center trained their explainers to develop and deliver Nanodays activities in different settings and locations; these skills will be used also in the coming years, for the development of further Nanodays after the end of Time for Nano. In addition to the Nanodays, the Istanbul Science Center participated also to Science Festivals at shopping centers where public activities were organized and school festivals where specific programs for younger children were delivered to hundreds of pupils.

UK: Association of Science and Discovery Centres
After issuing a tender for the organization of the Nanodays in the UK, the ASDC selected 5 venues where the events where delivered in 2010 and 2011.
At-Bristol, Bolton Science and Technology Centre, Dundee Science Centre, Magna, and Science Oxford organized several events with a variety of formats and methods. The offered an exciting mix of interactive experiments from the Nano-kits, added experiments from the science centres, video making, role playing, debate and dialogue about the issues, drama and meeting and chatting to local nanoscientists. One of the centres (Dundee in Scotland) created and ran an excellent "nanomagic" show for families and public and attracted lots of visitors and press attention through this.

In total 28 Nanodays were organized and 4204 people took part to the activities. The venues included science and discovery centres, science festivals, schools and science cafés.

Outreach: Impact

		Nano Days	Events (confer., workshops)	Festivals and theatre	Exhibitions	Others (Newsletter)	Website	TV	Press
ITALY									
	Adults	270		2500	600	10000	14000		
	Youngsters	2148		2800					
	Professionals		50		100				
	Teachers	19				3000			
PORTUGAL		**Nano Days**	**Events (confer., workshops)**	**Festivals and theatre**	**Exhibitions**	**Others (mailing)**	**Website**	**TV**	**Press**
	Adults	969				300			

	Youngsters	3690							
	Professionals					1500			800
	Teachers		700						
FRANCE		**Nano Days**	**Events (confer., workshops)**	**Festivals and theatre**	**Exhibitions**	**Others (Newsletter)**	**Website**	**TV**	**Press**
	Adults	292	1000			8000	19000		150000
	Youngsters	1156	1000				16000		114000
	Professionals					2000	1000		5000
	Teachers	48					1000		1000
GERMANY		**Nano Days**	**Events (confer., workshops)**	**Festivals and theatre**	**Exhibitions**	**Others (Flyer, mailing)**	**Website**	**TV**	**Press**
	Adults	400					300		
	Youngsters	1937					200		
	Professionals		15						
	Teachers	35				819			
UK		**Nano Days**	**Events (confer., workshops)**	**Festivals and theatre**	**Exhibitions**	**Others (mailing, flyers)**	**Website**	**TV**	**Press**
	Adults	1459					18000		3000
	Youngsters	2249	141				8000		2000
	Professionals	9	908			680	2300		
	Teachers		19			1000	2000		
BELGIUM		**Nano Days**	**Events (confer., workshops)**	**Festivals and theatre**	**Exhibitions**	**Others (Press release, mailing)**	**Website**	**TV**	**Press**
	Adults	500				760		8200	44360
	Youngsters	4734						7000	
	Professionals					3447	300		
	Teachers	20				4605			
TURKEY		**Nano Days**	**Events (confer., workshops)**	**Festivals and theatre**	**Exhibitions**	**Others (Press release, mailing)**	**Website**	**TV**	**Press**
	Adults	211				3000			
	Youngsters	1661							
	Professionals					1800			
	Teachers	35				1000			
POLAND		**Nano Days**	**Events (confer., workshops)**	**Festivals and theatre**	**Exhibitions**	**Others (Cinema campaign, newsletter)**	**Website**	**TV**	**Press**
	Adults	900	31150		700	15300	2000000		
	Youngsters	3220	21425		400	5200	1000000		
	Professionals		10						
	Teachers	10							
SLOVENIA		**Nano Days**	**Events (confer., workshops**	**Festivals and theatre**	**Exhibitions**	**Others (specify)**	**Website**	**TV**	**Press**

			)						
	Adults				2000				
	Youngsters		95		500				
	Professionals		150		500				
	Teachers								
FINLAND		**Nano Days**	**Events (confer., workshops)**	**Festivals and theatre**	**Exhibitions**	**Others (specify)**	**Website**	**TV**	**Press**
	Adults	300							11167
	Youngsters	2181							
	Professionals	13							
	Teachers	82							
OTHER (Ireland, US, Europewide)		**Nano Days**	**Events (confer., workshops)**	**Festivals and theatre**	**Exhibitions**	**Others (mailings)**	**Website**	**TV**	**Press**
	Adults		200				15000		
	Youngsters						30000		
	Professionals		1870			4000	62000		
	Teachers								
ALL LOCATIONS	**TOTALS over the entire duration of the project**	28.548	58.733	5.300	4.800	66.411	3.189.100	15.200	331.327

C2 Dialogue: Nanokit and video contest

Dialogue: target audience

The dialogue activities can be seen as the project's central activities, with a heavy focus on the primary target audience of the project: young people. The aim of these activities was to fully engage young people in the issues at stake in N&N.

Young people: Young people were engaged in N&N through all the project's dialogue activities. Both the Nanokit and video contest were specifically designed with this target group in mind.

Teachers: Teachers were an indirect target group for the Nanokit and video contest activities, as it was through schools that many young people became aware of the Time for Nano project.

General public and professionals: These target groups were strictly secondary, and although few of the project's dialogue activities were targeted at these groups, a significant number still participated.

Dialogue: Actions

There were two central dialogue-based elements to the Time for Nano project: the **Nanokit** activities and the **online video contest**.

Nanokit

The Nanokit is based on the enquiry-based learning approach, specifically developed in science centres and science museums, and consists of hands-on and interactive activities in which the public can understand nanotechnology and nanosciences through practical experiments. 1000 editions of the ket were distributed throughout schools and science centres where they were also used as a tool for the Nanoday events and to increase the involvement of young people in the online video contest. It was also made available in schools to be used by teachers as an educational tool in class and

integrated into the school curriculum at different levels. It was also used by scientists in public lectures and conferences.
The kit is a 22 x 22 x 33 cm box full of nano objects, worksheets describing each activity intended for young people as well as students and teachers, an instruction book, two card games: a version of the game PlayDecide specially personalised for the kit and a illustrated game for younger children. The composition of the kit is detailed below. These activities and games aim to engage the public in basic knowledge about nanotechnologies, to make them experiment with nanoscience, and to stimulate discussion and debate about the ethical and societal implication of these techniques.
In addition to the physical nano-kit, feedback tools were designed to provide data on the opinions, knowledge and reactions to opportunities and risks related to nanotechnologies. The concept behind the nano-kit was that it would have an impact on three layers of information: On the cognitive level, the experiments and demonstrations included in the kit provides understanding of the unique properties of nano-materials. The kit also influences the experiential knowledge of the public. Experiential knowledge is the knowledge based on common sense and personal experience. It tends to be higher in emotive content than cognitive knowledge and thus can cause greater conflicts. The kit contains real products and applications of nanotechnology, which together with the training modules provided by the project, foster discussions about appropriateness and potential of the research. The third level is social or political knowledge. The discussions on these subjects are centred on how "good" these activities can be said to be. Such discussions are extremely engaging for the public.
It was decided to have ten activities in the Nanokit, all related to at least one experiment or one nanoobject. Each activity is accompanied by worksheets which describe the procedure of the activity, give background information on the phenomenon and additional information on applications, for example. The target audience for these worksheets is very broad, ranging from 8-year-old children to school teachers. Therefore, it was decided to adapt two sets of worksheets. The first is designed for young children with simple and comprehensive words that is approximately 2000 characters. The second, longer, is designed for students and school teachers and includes more background and additional information, learning objectives and internet links. All the worksheets were commented and approved by the partners, and checked by the Scientific Advisory Board. They were translated in all the project's languages. A 48-page instruction booklet is also included in the kit. It gives some information about the Time For Nano project, instructions on how to use the kit, a description of the activities as well as instructions for the PlayDecide game for students and for kids. This instruction book includes translations of this information in all the nine languages of the project (5 pages per language).
A prototype was produced in ten copies and tested by the project partners, before finalising and producing the kit in February 2010.

The kit includes 10 hands on activities which are of three different kinds:

- Activities 1 to 3 are activities that introduce the nano world and the nanoscale;
- Activities 4 and 5 present two nano objects;

- Activities 6 to 10 present applications of nanotechnologies.

All these activities can be undertaken by young people from eight-year old children to high school students. They are meant not to exceed half an hour.

The activities in the kit are the following:

Activity 1: How tall are you in nanometres? How big is your hand in nanometres?

The aim of this activity is to make the public realise how small a nanometre is. This activity is divided in two parts. The participant first measure themselves with a special wall chart which is a rule graduated in metres and in nanometres. They will realise that their height is between one and two billion nanometres. In the second activity, they draw their hand on a diagram which will give them the size of their hand in nanometres. Here again they will realise that the size of their hands seems very big when expressed in nanometres.

Activity 2: Dilution

In this activity, the participants make dilution from 10-1 to 10-9 of a scented food colorant. They will notice that they are able to see the colours only down to 10-5 but that their sense of smell is able to notice the presence of the colorant in much more diluted solutions (down to 10-8). The aim is to demonstrate that very tiny molecules can be detected by other means than sight.

Activity 3: Magnetic probe

This activity is about the tools that are fundamental to study the nano-world. The participant manipulates a model of a magnetic probe made of a special magnetic sheet which represents the surface and a long rectangular magnet that represents the probe. This activity allows to “feel” the way a probe works and how it can give an image of the surface. It is a very demonstrative hands-on activity.

Activity 4: Make your own buckyball

This activity presents a nano-object: the Bucky Ball. It was one of the first nano-objects discovered. It is an amazing molecule and has a lot of potential applications. The model is made out of a pre-cut template that needs to be folded and assembled. The public also learn during this activity about other members of the fullerene family, the carbon nanotubes that have a lot of current and potential applications.

Activity 5: Virus

Make your own biological nano-machine. This activity is an introduction to the world of viruses which are biological nano-machines. In this activity, the model of an icosaheadral capsid of virus is made. The participants will learn background information on viruses with an emphasis on how viruses can be studied by nanotechnologists so as to find solutions for building nano-machines that can self-assembled.

Activity 6: Ferrofluid

This activity presents the ferrofluid which is a suspension of magnetite nano-particles. This liquid shows a very unusual behaviour when submitted to a magnetic field. The ferrofluid is compared to a fine grained sand of magnetite. This illustrates how the properties of a material, here the magnetite,

can be very different depending on the size of the particles. Ferrofluid has also quite a lot of potential applications

Activity 7: Magic sand

This activity presents sand that is coated with a hydrophobic layer of nano-sized particles. When put in water, the grains of this sand stick together and the sand is dry when removed of the water. One application could be the cleaning of oil spills in the ocean.

Activity 8: Hydrophobic textile

In this activity, the participant discovers how nanostructures of a piece of fabric can repel water. The water does not stick and stays in the form of round droplets. This effect, called the Lotus Effect, also allows the textile to be self cleaning. Clothes made by this fabric are completely waterproof and would need to be washed less, which could reduce the use of detergents in the future.

Activity 9: Anti fog

This activity presents an anti fog spray. Participants can compare the difference when they breathe on a slide of glass on which anti fog was sprayed and when they breathe on a slide not covered by the anti fog. They learn the notion of hydrophilia and the potential applications of anti fog and other hydrophilic coating.

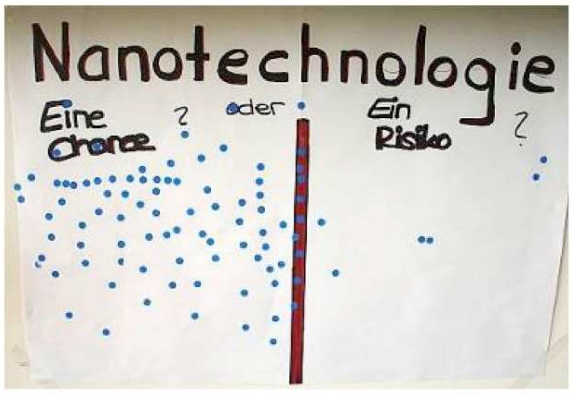
Activity 10: Memory metal

This activity presents shape memory metal. The participants are given a piece of memory metal that they can bend and then see how it returns to its original shape in hot water. They also learn how to reset the original shape above a flame. The atomic mechanism is explained and potential applications of those shape memory alloys are described.

Each activity is accompanied by worksheets. In the instruction book, the activities are presented so as to give a quick idea of the content of the activity and to encourage the reader to do the experiments. There are also suggestions for the teachers on how to organise those activities within their class.

PlayDecide

It was decided to add a new version of the game PlayDecide to the kit. This game has already demonstrated its effectiveness in triggering debates and discussions among the participants. This game is meant for young people above 12 years old. The game was adapted for the nano-kit. The last part of the game has been modified so as to introduce the nanodilemmas defined in the description of work and to trigger debates around these issues. The youngest children will not be able to play Decide. On the back of the PlayDecide cards, there are images made by BridA with which the children can tell a story by lining them up like a comic book. It was called PlayDecide Junior. The story can feature the member of the Nano family. Some objects proposed for the story are objects involving nanotechnologies. They are individualised by a distinctive sign and a glossary explaining in very simple word the nanotechnology involved is add in the kit.



Online video contest

An international online video contest was launched in two editions during Time for Nano. The aim of this contest was to engage young people in N&N by encouraging them to create short videos communicating one of five ethical issues, or “nanodilemmas”, in an innovative and creative way. The contest was heavily promoted by project partners across their vast networks of schools, through project activities. This produced a real engagement with many complex issues related to

nanotechnology and nanosciences in the classroom and in science centres and museums as students got to grips with the five nanodilemmas and came up with ways to communicate them to their peers through the medium of video. The result was also a total of 207 videos uploaded to YouTube by young people, which also serve as an excellent tool to engage other young people on nanotechnologies, and which have attained over 30,000 views during the project alone.
Any non-professional video relating to nanotechnology, either concerning the basic science and definitions or the applications and social implications of research and products could be submitted to the contest. The video must relate to at least one of the proposed themes – the "killer questions" described in deliverable 4.3, and have a maximum length of 4 minutes. The Time for Nano consortium prepared 8 "channels" on Youtube and one on Vimeo to receive and host the videos submitted to the contest. The use of Vimeo was necessary in Turkey, where there are restrictions on the access to Youtube. These channels were also linked from the main project website. The competition was open to all European countries; the promotion of the contest and the workshops to support the youngsters to produce the videos were held in the 9 countries of the Time for Nano consortium. The Time for Nano partner in each country nominated a jury to select the winner of the contest; in some countries a second winner was selected based on the highest popularity on the YouTube channel or through a popular vote by the visitors at the nanodays. The finalists of each country were admitted to the European final competition; the international jury selected the German movie "Nano Games" as the European winner.
The first edition of the contest was launched on 1 February 2010, and the deadline for submissions was 31 August 2010. The consortium decided to keep the competition open until 31 August in consideration of the different school calendars in each country and to allow for a wide participation of young people, both during the school term and the summer holidays. For the first edition, five "killer questions" were developed, one related to each nanodilemma, in order to inspire participants to come up with creative interpretations:

- Health: Nanorobots inside your body: "cool" stuff?
- Privacy: Tagging the whole world?
- Environment: Mending or harming the living world?
- Socioeconomic divide: What do you get if you can't pay?
- Improvement: What nano-powers would you choose to have and why?

In total, 92 videos were submitted to the first edition of the contest

- Belgium: 5 videos submitted, Winner: "04_Wedstrijd Nano_Georgia Widjaja" http://www.youtube.com/user/timefornanoBELGIUM?hl=nl#p/f/4/s0_-JALltTI
- Italy: 24 videos submitted, Winner: "Titina Tag" http://www.youtube.com/user/timefornanoITALIA?gl=IT&hl=it#p/c/1B6E0721D4728C53/1/9sngsNmOl9E
- Turkey: 7 videos submitted, Winner: "Gaziantep Sanko College – Nano Fixer" http://vimeo.com/channels/timefornano#12770153
- Poland: 13 videos submitted, Winner: "Nano Phone" by Franciszek Horubała http://www.youtube.com/user/timefornanoPOLAND?gl=PL&hl=pl#p/f/9/TVWr8hDGdOA
- Finland: 21 videos submitted, Winner: "Nanotechnology Gone Wrong (by Mimmi Hautala)" http://www.youtube.com/user/timefornanoFINLAND#p/u/5/4ETJGqNFSgQ
- France: 7 videos submitted, Winner: Nano Textile (by Delphine Gwenaëlle Laure) http://www.youtube.com/user/timefornano#p/c/51C925FDBAE8B91C/4/ruL9em72bVg
- Portugal: 14 videos submitted, Winner: "NanoEye" http://www.youtube.com/user/timefornanoPORTUGAL?hl=pt-PT#p/c/B4B376F009732689/13/Jhs4PzyQwFQ

The second edition of the Time for Nano video contest was held from 1 February 2011 to 30 June 2011. During this period, youngsters from all over Europe submitted 117 videos to the contest.

- Belgium: 1 video submitted. Winner: "It's time for nano!"

http://www.youtube.com/watch?v=n0RsFoXed8M

- Italy: 18 videos submitted. Winner: “Squadra speciale le Nanoarmate” http://www.youtube.com/watch?v=mRcCDzwjWlA
- Turkey: 4 videos submitted. Winner: “Project 1 – Gölmarmara Hulki Sanlitop High School” http://vimeo.com/24510737
- Poland: 6 videos submitted. Winner: “Nanotechnology - for & against” http://www.youtube.com/watch?v=8xKc05UT0zY
- Finland: 14 videos submitted. Winner: “What if there would be nanos in the sand” http://www.youtube.com/watch?v=2aGG7ucik8M
- France: 7 videos submitted. Winner: “Nanolife_ CONCOURS 2011” http://www.youtube.com/watch?v=gFLsowmBCMs
- Portugal: 5 videos submitted. Winner: “nano & food” http://www.youtube.com/watch?v=9gycdbSe9s8
- Germany: 15 videos submitted. Winner: “Nano Games” http://www.youtube.com/watch?v=9PEtaSHBocc
- UK: 47 videos submitted. Winner: “The Divide Movie” http://www.youtube.com/watch?v=m3qKcIdn6FY

In the second year the participation in the video contest increased by 25% in comparison to the first year; the number of videos submitted rose from 92 to 117. This positive result was due to several factors. During the course of the project, the staff of the partner institutions of Time for Nano acquired more skills for mentoring the students in their video projects, and were able to improve their work through the experience gained in the first year. BridA organized more video workshops in collaboration with the partners and produced a broad variety of videos to support and inspire the participants. There was also a more intensive communication and promotion of the contest among schools.

The videos submitted in the second year of the competition present many different approaches to the “nano dilemmas” which the students were asked to consider. An analysis of the content of the video is included in the evaluation report of Time for Nano, deliverable 6.3.

The 7 winners of the national contest entered the European competition; a jury formed by Alessandra Drioli, Jennifer Palumbo, BridA and Matteo Bonazzi cast their votes on the 7 videos according to the following criteria:

- Scientific and educational quality of the work
- Originality from the artistic point of view
- Clarity of the message
- Consideration of the societal implications of nanotechnology and connection with the killer questions

They selected “"Nano Games" by Janis Pongratz, Georg Klein, Nikolas Galensowske & Maximilian Benner from Germany as the European winner for the second edition of the contest.

Dialogue: Impact

The Nanokit impact was twofold. The Nanoday events described in the “Outreach” chapter of this report centred around activities from the Nanokit. Nanoday events therefore served as a key opportunity for dialogue activities involving the Nanokit. What is more, 1000 editions of the kit were produced and distributed to schools and science centres across Europe where Nanokit activities were subsequently integrated into the day-to-day programme of those institutions. As such, the dialogue-based results of the Nanokit had a broad impact across these institutions, further multiplied when we consider the network of schools working with each science centre, for example.

		Nanokits used during Nanodays	Number of web contest entries	Others (specify)
ITALY				
	Adults	270		

	Youngsters	2148	42	
	Professionals			
	Teachers	19		
PORTUGAL		**Nanokits used during Nanodays**	**Number of web contest entries**	**Others (specify)**
	Adults	969		
	Youngsters	3690	19	
	Professionals			
	Teachers			
FRANCE		**Nanokits used during Nanodays**	**Number of web contest entries**	**Others (specify)**
	Adults	292		
	Youngsters	1156	14	
	Professionals			
	Teachers	48		
GERMANY		**Nanokits used during Nanodays**	**Number of web contest entries**	**Others (specify)**
	Adults	400		
	Youngsters	1937	15	
	Professionals			
	Teachers	35		
UK		**Nanokits used during Nanodays**	**Number of web contest entries**	**Others (specify)**
	Adults	1459		
	Youngsters	2249	47	
	Professionals	9		
	Teachers			
BELGIUM		**Nanokits used during Nanodays**	**Number of web contest entries**	**Others (specify)**
	Adults	500		
	Youngsters	4734	6	
	Professionals			
	Teachers	20		
TURKEY		**Nanokits used during Nanodays**	**Number of web contest entries**	**Others (specify)**
	Adults	211		
	Youngsters	1661	11	
	Professionals			
	Teachers	35		
POLAND		**Nanokits used during Nanodays**	**Number of web contest entries**	**Others (specify)**
	Adults	900		
	Youngsters	3220	20	
	Professionals			
	Teachers	10		
FINLAND		**Nano Days**	**Number of web contest entries**	**Others (specify)**
	Adults	300		
	Youngsters	2181	35	
	Professionals	13		
	Teachers	82		
ALL LOCATIONS	**TOTALS over entire project**	28.548	207	

C3 Education: Multipliers' training

Education: target audience

Education activities were primarily targeted at two key groups: teachers, and science centre and museum professionals.

Young people: Young people were an indirect target audience for education activities, targeted through teachers and science centre and museum professionals.
Teachers: Teachers were one of two primary targets for education activities. Teachers were trained to work with the Nanokit and to cooperate with science museums in engaging young people in nanotechnology. This ensured a lasting impact for the project on young people, as teachers serve as multipliers, engaging young people throughout their career. The project targeted specifically secondary and primary school teachers.
Professionals: Science centre and museum professionals were also primary targets for education activities. Explainers, in particular, were targeted, as their day-to-day role consists of engaging young people in science. They were also trained to work with the Nanokit and to cooperate with schools, working with young people on nanotechnology and serving as multipliers for many years to come. Other professionals targeted include graduate and post-grad students in science communication, researchers, headteachers and other non-teaching professionals in education.

Education: Actions

The key actions for education in Time for Nano were the Multipliers' Training activities, to which an entire workpackage of the project was dedicated. This took place on a national and European level.

Multipliers' Training: National Level

One objective of Time for Nano was to create a growing community of people interested in nanoscale research, engineering and technology, starting from the community of researchers, science communicators and informal science educators represented by the project consortium. Specific strategy of training and dissemination were implemented during the project to ensure the sustainability of the products after the project is over.

The aims of the training sessions were, more specifically:

- To give basics knowledge on nanoscale and applications especially for teachers who are often not up-to-date with this science as their initial training may be outdated;
- To introduce five key debates around nanotechnologies so as to encourage the teachers to involve their students in the competition and project activities;
- To allocate resources for helping the organisation of debates among young people which is often lacking in schools;
- To help the teachers link nanosciences to the school curriculum so as to allow them to use it with their classes.

Training course structure

The training sessions included:

- Meeting with expert and laboratories' visits
- Practice of the Nano-kit
- Play Decide to learn how to organise a debate with young people and
- students
- Encouraging to work with local artists and academic institutions
- Optional: visit of science centres
- The teachers were also given guidelines, resources and links between the school curriculum and the experiments in the Nano Kit.

Four training modules were proposed, which could be organised independently or grouped together. Each module is a halfday training session. Thus, each partner in the project organised sessions in relation to the schedule of their institutions or schools.

Module 1: Introduction to nanotechnologies

- *Part 1: Welcome and presentation of Time for Nano project.*
- *Part 2: Introduction to nanoscale and nanotechnologies made by a nanoscientist.*

This module aims to deliver a general background to teachers or explainers. After an introduction to nanotechnologies, the scientist (or science centre senior explainer) will give information about applications and research fields, and participate to a Q/A session.

Module 2: Practice of the Nano Kit.

Part 1: Welcome and presentation of Time for Nano project.
Part 2: Practice of the activities of the Nano Kit in working groups.
Part 3: How to use the Nano kit with my class? Questions, problems encountered… This module aims to help the teachers to get a good knowledge of the activities available in the kit. Thus, they will be able to use it in their schools and to disseminate to other teachers.

Module 3: Nano-dilemmas, PlayDecide, How to run a debate?

- *Part 1: Welcome and presentation of Time for Nano project.*
- *Part 2: Introduction to the nano dilemmas by a social scientist or a science communicator. How to balance the benefits of NT research and development against the risks for health and the environment?*
- *Part 3: Play Decide Senior session*
- *Part 4: Discussion: how to debate with teenagers? Tips and tricks to engage and conduct a fruitful debate*

This module aims to give a practical experience of organizing a debate with a group or a class.

Module 4: NANODAYS and the web contest: How to engage young people?

NB: one session for teachers and one for explainers.

Session for teachers

- *Part 1: Welcome and presentation of Time for Nano project.*
- *Part 2: How to engage my pupils/students ?*
- *Part 3: How to use the web? How to use the resources? How to make a short video?*

Session for explainers

- *Part 1: Welcome and presentation of Time for Nano project.*
- *Part 2: How to engage young public in a science centre ?*
- *Part 3: How to use the web? How to use the resources ? How to make a short video?*

This module aims to help teachers and explainers to engage young people in the nanodays and the web contest.

Evaluation

Each participant filled in a grid at the end of the training in which they were asked to answer the following questions:

- When are you going to use the Nano-kit and how?
- Will you organise a debate on nanotechnologies?
- How are you going to link the Nano-Kit activities to your school curriculum?

CCSTI-Grenoble as workpackage leader worked hand-in-hand with OBSERVA to define the best tools for the evaluation of the training session. OBSERVA collected and analysed the data from the partners.

The trainees were teachers and explainers or staff members of the museums and science centers. They were all given a general introduction about nanoscience and nanotechnologies and instructions on how to use the kit in their classrooms or in workshops. They were strongly encouraged to promote the video contest for their class or groups. They were also informed about Nanodays organised by each partner.

Each partner organised its training session on the basis of the programme described above. The schedule and programme were adapted so as to be individualised to the programme of the museums, their own schedule, and the teachers involved. The programmes were validated by CCSTI Grenoble, the workpackage leader.

In total, local training sessions were organised across Europe reached 1375 participants. Considering that each of these participants is a multiplier and can therefore reach hundreds of young people through their work, this represents a considerable impact.

European Training

The general aims of the European training and outreach activities were the following:

- Train professionals from countries not involved in the project in the use of Time for Nano's tools for creating engagement with nanosciences and nanotechnology
- Provide training for 25 science communication professionals and explainers from science centres and museums.

Therefore, the European training activity was complementary to the teacher trainings organised by the consortium for school teachers on a national level.
The strategy followed for the activities linked to EU training and dissemination aimed to enhance the European added value of the project, heighten its impact and promote the exchange of experiences and knowledge among members of the community of science communication professionals. This also ensures the sustainability of the products after the project is over by distributing 100 copies of the nano-kits all over Europe and beyond.

The training courses included the following sessions:

- Introductory explanation about the Time for Nano project objectives
- Play Decide demonstration in order to learn how to organise a debate with young
- people and students
- Presentation of best practices in communicating nanotechnology and nanoscience in
- science centres and museum
- NanoKit: Practice of the nano-kit with tips and examples on how to use the experiments
- www.timefornano.eu: stimulate participation in the Time for Nano video contest
- Teacher Training: tips for interacting with teachers and educators to prepare them for work on nano
- Nanodays: examples and best practice from science centres to involve schools and youngsters in N&N

The European training and outreach activities in Time for Nano were supported through the following four different tools:

- Training for science communication professionals

- Demonstration of the nanokit and introduction to the project activities and goals
- Nanokit distribution
- Travel support for trainees.

In order to facilitate the creation of a community of users on a European level, Ecsite organised training and outreach events in connection with international events and conferences where the target audience was assembled. Since the target of these activities was European professionals in science communication and education, the events chosen for the training and outreach activities were among the most important in the field. Shorter, more informal sessions were also set up in order to familiarise the science communication community with the field of nanosciences and nanotechnology and introduce them to the tools developed within Time for Nano, namely the video competition and the nanokit.
The European training and outreach activity has proven extremely successful in reaching out to the project's target groups, familiarising them with the objectives of the project and providing in-depth information about the communication tools developed to reach young people in Europe and beyond. The structured training sessions have provided in-depth knowledge and first-hand examples and expertise to more than 50 multipliers from science centres and museums. Since each science centre works with hundreds of school groups locally, this activity is considered to indirectly impact about 5000 teachers throughout Europe, raising the number of countries informed about the Time for Nano instruments significantly.
Demonstrations were carried out in major events relating to science communication to reach the following target audiences:

- More than 800 multipliers from the science communication community, including explainers, education managers and other communicators in the Ecsite Annual Conference
- 50 science centre and museum professionals highly specialised in the field of transmitting scientific content to visitors and school groups
- 20 master students in science communication benefited from the Time for Nano project as an example of means of communication and discussion
- About 500 professionals from the academic and industrial sectors in the major international conference organised by the Belgian authorities in the framework of the EU presidency.
- 85 Nanokits were distributed in 26 countries, in the EU and outside, giving preference to the countries that are not benefited directly from the project. The materials in each kit can be used about 5 times for a group of 20 people, therefore each kit can be considered to directly reach at least 100 young people, for a total of 8500 young people reached so far. However, this number increases greatly when we consider that some of the activities in the kit, such as the card games and the nano-measuring tape, can be easily reproduced at a very small cost, this number increases significantly. Moreover, the nanokit has proven to be a very successful instrument with young adults and children, with a high appeal connected to interactivity, ease of understanding and graphic appeal.

Education: Impact

		Multipliers training events	**Others (specify)**
ITALY			
	Adults		
	Youngsters		
	Professionals	35	
	Teachers	83	
PORTUGAL		**Multipliers training events**	**Others (specify)**
	Adults		
	Youngsters		
	Professionals	24	
	Teachers	258	

FRANCE		**Multipliers training events**	**Others (specify)**
	Adults		
	Youngsters		
	Professionals	20	
	Teachers	83	
GERMANY		**Multipliers training events**	**Others (specify)**
	Adults		
	Youngsters		
	Professionals	30	
	Teachers	90	
UK		**Multipliers training events**	**Others (specify)**
	Adults		
	Youngsters		
	Professionals	50	
	Teachers	237	
BELGIUM		**Multipliers training events**	**Others (specify)**
	Adults		
	Youngsters		
	Professionals		
	Teachers	169	
TURKEY		**Multipliers training events**	**Others (specify)**
	Adults		
	Youngsters		
	Professionals	3	
	Teachers	49	
POLAND		**Multipliers training events**	**Others (specify)**
	Adults		
	Youngsters		
	Professionals	33	
	Teachers	114	
FINLAND		**Multipliers training events**	**Others (specify)**
	Adults		
	Youngsters		
	Professionals	18	
	Teachers	79	
EUROPEAN TRAINING COURSES		**Multipliers training events**	**Others (specify)**
	Adults		
	Youngsters		
	Professionals	217	
	Teachers		

ALL LOCATIONS	**TOTALS over the entire duration of the project**	**1.592**

Section D: Collaborations and impacts

Time for Nano worked closely with a number of related European projects, sharing dissemination opportunities, both online and through events in order to make the most of shared target audiences and thematic content. For projects like NANOTOTOUCH and NANOYOU, this consisted of cross-promotion and collaboration among project partners. Deutsches Museum, for example, were coordinators of NANOTOTOUCH and Time for Nano partners, and IDIS, Technopolis and Ecsite were all partners in NANOTOTOUCH, allowing sharing of project information. CCSTI Grenoble were partners in both NANOYOU and Time for Nano.
Examples of cross-project collaboration include the following:

- For the project Pilots, Ecsite, as coordinator, made the most of the opportunity to reach a key target audience of the project: science centre and museum explainers, by organising European training events at Pilots workshops. Ciência Viva and Technopolis, as Pilots partners, were also instrumental in ensuring good collaboration.
- Nanokits were distributed to all Nanoyou and NANOTOTOUCH partners for use in their project events.
- Project coordinators of the various projects related to nanotechnology worked closely together to ensure that the projects were complementary. Thanks also to the work of the Project Officer, care was taken to ensure that work done was not repeated between projects, and that the results would feed into each other.
- Elements of other projects were used to enrich Time for Nano activities. For example, the Open Lab that IDIS developed in NANOTOTOUCH was an excellent feature of the IDIS Nanodays which took place thanks to Time for Nano.
- The projects came together for dissemination and collaboration opportunities such as the EuroNanoForum, 30th May 2011 in Budapest, Hungary at which Time for Nano, Nanoyou and NANOTOTOUCH all presented in an insightful conference session with 70 participants.

Time for Nano was promoted on the websites of each of these related projects:

- http://nanoyou.eu/en/component/content/article/18-workshops/133-time-for-nano-nanotechnology-education-resources.html
- http://www.nanototouch.eu/resources-on-nano/
- http://pilots-hub.ning.com/xn/detail/2993086:Event:16155

NANOTOTOUCH

NANOTOTOUCH is a project aimed at communicating nanotechnology through a completely new methodology, which is aimed at pushing science communication to its extreme. In fact, the revolutionary concept behind this project stands in the re-collocation of science from the standard perspective of a top-down communication, to a more active involvement of the public; thus science will no longer exist as a separated apparatus from the rest of society.
The role of the museum in this idea is quite central: it is able to concentrate a broad and variegated public towards which communication has to be shaped and delivered. Under the project, the museum becomes a space for experimentation and active learning, which stems into a constant dialogue among the scientists and between the scientists and public.
The main instrument for knowledge sharing is the Open Nano Lab: implemented by the Deutsches Museum already in 2006, it represents a space in which researchers can carry on their projects and conduct measurements, sharing with the public their results through an environment shaped to provide the most meaningful educational experience for all. The Open Nano Lab will be also implemented in the science museums of Gothenburg and Milan, partners in the project.
Parallel to the Open Nano Lab is another key communicative feature: the Nano Researcher Live. In science centers in Mechelen, Naples and Tartu there will be an opportunity for the broad public to

meet a researcher in the field of nanotechnology, and to increase their awareness over the progresses and challenges being encountered.
NANOTOTOUCH encompasses both instruments, and has seven main objectives:

- Create a sustainable infrastructure of public sites, in which to establish the Open Nano Lab or the Nano Researcher Live
- Allow the public to experience live day-to-day practices and processes of nano research, allowing for public understanding and engagement
- Create a peer-to-peer dialogue of the lay public with nano researchers
- Admit the public to a discourse over ethical issues and societal implications of nanotechnology
- Bring in the museum an interested public, through the collaboration with teachers and school programs
- Establish new role models and possible careers for young scientists and researchers, fostering also a larger endowment in space for sustainable feedback within the scientific community
- Provide research and educational institution with a model for strong linking and collaboration. This shall converge into an handbook which will be useful for the next generations of nanoscientists and science communicators.

All this shall also be acquired through two workshops, in which the parties involved shall meet and establish a dialogue sharing their best practices, so as to achieve a real alternative to top-down science communication. Also a huge focus will be put on the researchers involved: ideally they should be young PhD students, rotating each three months so as to learn from the experience and be able to share it as much as possible.
Through NANOTOTOUCH a progressive integration of scientists within the local and international community will be possible, so as to achieve a constant and bilateral dialogue over nanotechnology and science at large.

NANOYOU

NANOYOU (Nano for Youth) is a project funded by the European Commission's Seventh Framework Programme that aims to increase young people’s basic understanding of nanotechnologies (NT) and to engage in the dialogue about its ethical, legal and social aspects (ELSA).
Nanotechnologies are the design, characterisation, production and application of structures, devices and systems by controlling shape and size at nanometer scale - the scale of individual molecules, where properties differ significantly from those at a larger scale. NTs will impact the life of every citizen. They are already revolutionising different disciplines in science, such as medicine, computing sciences and energy production.

Although NTs are being developed to provide benefits, some of these new applications may have harmful effects under certain circumstances. Therefore, citizens need to be informed in order to weigh benefits versus hypothetical risks so that they can make a real contribution to future decision-making. Moreover, at this early stage of development, when just a few applications have reached the market, it is a critical moment for potential communication on NTs.
Nanoyou's target audience is composed of young people in the 11-25 age group. At least 400 schools are meant to participate, with programmes reaching more than 25,000 students. The science centres programme is expected to reach an initial 4,000 young adults, followed by many more as more science centres adopt the programme.
Nanoyou will carry out a strong educational curriculum for young people aged 11-18 and a wide range of activities in science centres for those in the 18-25 age group. As effective programming needs to be tailored to the educational capabilities and interests of the target population, specialized syllabi will be provided for subgroups within this youth population.

The Web Portal will also serve as a tool for information dissemination. A range of virtual activities are available, as well as a communication space with virtual forums where students can engage in different dialogues. Moreover, a strong network allows different institutions and schools to share experiences and resources.
Activities and materials include:

- Video and posters with information about nanoscience and nanotechnologies and their fields of application
- Online animations, simulations and virtual experiments based on current research
- NTs time machine game invites students to travel through human needs, looking at past, present and possible future solutions
- "What are nanotechnologies?" workshop, where nanotechnologies will be introduced through games such as a nano-memory game and nano jigsaw puzzle.
- A role play workshop that will present dilemmas where students will choose different stakeholder roles.
- Virtual dialogues that will enhance students' discussion on different nanotechnologies topics and will allow them to communicate with each other through a forum on the project website.

Pilots

The Pilots project, coordinated by Ecsite, worked towards the professionalisation of the role of explainers in science centres and museums both through developing European training courses and through research on the role of explainers, with a focus on adult learning.
Explainers are the people working in a science centre or museum who come into face-to-face contact with the public. They often have different names depending on their exact role in the institution – animators, guides, edutainers, facilitators or pilots, among others.
Main project outcomes include:

- Four training courses, with over 150 European explainers participating;
- A complete Resource Pack of pedagogical materials, in four modules, available free to download online, for use in training explainers;
- An online community with over 500 users, the Pilots Hub, where project outcomes and information are freely exchanged;
- The results of a qualitative and quantitative survey based on detailed focus group interviews and a full survey of the explainers' community on the role and training needs of explainers;
- Over forty multiplying events, called Co-Pilots events, carried out by explainers having participated in the Pilots training courses, with over 560 participants across Europe.

Section E: Conclusions

Overall conclusions from the project evaluation

Observa's monitoring and evaluation process showed the project Time for Nano is a successful platform for communicating and engaging young people with nanotechnologies and nanoscience (N&N). The quantitative and qualitative data coming from the evaluation tools demonstrate the following key findings:

1) Science centres are important interfaces between science institutions and the general public;
2) A significant number of young people have participated in the various activities of the project;
3) Young people participating in Time for Nano have become more informed on N&N;
4) Young people have engaged creatively with N&N;

5) Young people participating in Time for Nano show a greater awareness of the socio-ethical impact of N&N.

The quantitative data coming from the entry and exit questionnaires show that there has been a significant **cognitive output** for young people involved in the activities scheduled within the Nanodays. The majority of young people who stated they knew little or nothing at all about N&N before the visit, later answered that they learnt something about science in general and about N&N.
The data shows that the majority of young people involved in the project trust N&N research and believe that it is useful for improving quality of life.
Most participants became particularly interested in the activities conducted thanks to the **Nanokit** or the **experiments** designed by each science centre. The quantitative data collected and the reports prepared by the project partners point to the effectiveness of Time for Nano as a platform that stimulates young people's awareness of N&N-related social, environmental and ethical issues.
Participants in the discussion groups and the **PlayDecide** game valued the opportunity to engage with their peers and with experts in a **discussion** on N&N, with a particular attention given to the **nano dilemmas**, especially those related to health and enhancement (which are closely related in young people's perception) and environment.
Young people understand the impact science has on our lives. They seem to be aware of the risks and benefits associated to N&N and they are willing to engage first-hand with science either by using the tools made available (the Nanokit, the web contest) or by conducting further research.
The **videos** and the reports of the **discussion groups** show that participants paid great attention to the application of N&N that have a direct impact on the human body. Health is one of the most discussed issues in the groups and among the most represented in the videos.
The possibility that partners had to use some or all tools in their planned activities, guaranteed the production of a context-dependent communication strategy on N&N, a strategy that preserves and enriches **cultural and local differences.**
The target group of 8-12 year old young people was particularly difficult to reach via the web contest, whereas the Nanokit and the other activities in each science centre were more successful.
The **Web platform** was a successful tool from which to launch the **web contest**. However, the possibility to engage with N&N products and experts in science centres/museums through the Nanokit and the Play Decide game encouraged young people to work on the creation and submission of videos: less significant, in comparison, was the role of social networks and peer-to-peer communication via the web. In light of the results obtained and the goals accomplished during the first and the second year of Time for Nano, the web platform become stronger as a resource centre, attracting the wider community of N&N communicators and the general public and, in particular, young people aged 8-12. The second year of the contest and the new layout for the web platform achieved more in-depth promotion of the site. The role of social networks was enhanced but there is still room for improvement. In this direction goes also the proposal made by IDIS to adopt a special format during the Nanoday, that is, the possibility to run video workshops to assist participants in creating the videos for the contest without relying exclusively on teachers.
A close examination of the videos submitted to the online video contest demonstrates that **creative engagement** with N&N is clearly a new dimension of the Time for Nano project which deserves close attention under evaluation. Being the most experimental part of the project as a whole, since the beginning it was clear that the webplatform would present some challenges. However, those challenges have been promptly tackled by project partners in the second year of activities and, in particular, by those in charge of the webplatform. In the second, all partners have contributed to implement and to improve the new release of the webplatform and the section devoted to the contest.
Participants in the Time for Nano project activities had the chance to acquire and use **expressive communication skills** to address N&N research (scientific content as well as social and ethical issues related to nanotechnologies). Participants learnt to use the following communication skills:

- video making,
- dialogue (sustaining an argument, formulating questions using a suitable language, etc.),

- hands-on practice with the Nanokit objects/activities.

An important result coming from the videos submitted to the contest is the **inventiveness and the collaborative spirit** of young people's video productions. Participants very often worked together with their peers (classmates in most cases) in order to make the video. Even when credited to only one person, therefore, the videos submitted by young people show the collaborative nature of their enterprise.

The evaluation shows evidence of having reached **inclusiveness** and fostered **participation** of diversified audiences. The tools of Time for Nano allowed to target different audiences (participants to the Nanodays, children and young people, museum visitors, teachers) even beyond those outlined in the original project. The web community is still under-represented and is an objective that the consortium will be concentrating in the future activities. By "inclusion" we mean here ensuring that communities such as disabled children, young people living in suburbs and "difficult" areas were involved in the web contest and in the Nanoday activities. So, these interesting results indicate that it is possible to reach a wide range of young population. Some videos, for example, were made thanks to the participation of peripheral or disadvantaged communities (i. e. in Italy, Portugal and Turkey).

For evaluators, the possibility to make use of **visual materials** such as the videos prepared by contest participants and the photographs or video excerpts made by partners during the Nanodays, is extremely helpful, although there are no shared guidelines for evaluating images (and their cognitive meaning) rather than words.

In the study carried out as part of Time for Nano, Observa found that, generally speaking, there is a positive feeling towards nanotechnology and nanosciences (N&N) among young people. In particular, youngsters involved in the project underlined the relevance of N&N used in the domains of security and information. Most participants showed interest in the applications of nanotech, and the desire to understand N&N better.

As for the negative perceptions of N&N, young people are particularly concerned about health issues, especially those related to the biomedical sector, privacy and the use of nano-robots.

The project found that young people are relatively uninformed about N&N. Participants in the Nanodays highlighted uncertainties about the sector.

Thanks to Time for Nano's practical activities, Observa saw that young people were able to recognise the ways in which N&N are closely related to everyday life. In many cases, participants maintain that N&N are useful. The young people were often surprised and had positive reactions to the more creative activities.

The project demonstrated novel ways of representing nanotechnologies to young people. The Nanokit and science centres' hands-on activities serve both as a useful source of information and an immediate and exciting practical experience. However, it also became clear that there is still work to be done in successfully communicating the complexities of N&N. Experiences offered are, at the moment, limited. Young people sometimes had difficulty understanding the process of N&N, and often expressed concern about unpredictable effects in the sector.

The Nanokit and other activities proposed during the Nanodays are useful tools for teachers, taking into consideration that N&N rarely feature in the standard school curriculum, currently. From an ethical point of view, we understood from participants in the Nanodays that there is not a clear awareness about nano issues. There is also an increase in skeptical attitudes towards nanotechnologies.

The project's various activities have invited new questions from youngsters, and this potentiality could be used in the future for preparing hands-on and instruments of information on N&N. The most engaging activities were also the most difficult to achieve. It is difficult to deal with ethical

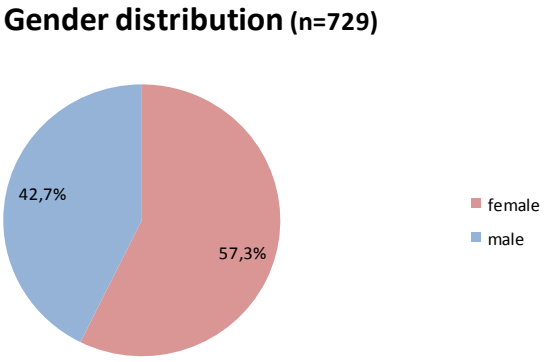
dilemmas and the safety demands of young people. But these are some of the greatest challenges for the future development of nanotechnology.

Conclusions on the online video contest

The Time for Nano website provides the entry point to the second year web-based video contest which ran from January 2011 to June 2011 at the national level in nine countries (Italy, France, Belgium, Finland, United Kingdom, Portugal, Poland, Germany and Turkey). A total of 117 videos were posted at the time of the evaluation. As we shall see, the numbers are encouraging considered that the conception and implementation of the web platform took more time and effort than foreseen on the side of project partners. Despite the number of videos submitted to the contest which was not always high, with significant differences between countries, the web-based video contest demonstrated the importance of letting young people use a creative language to express their perceptions on N&N. It seems that in order to properly work, the web platform and the video contest need to be more strongly implemented within the Nanodays activities, partially because the topic of N&N is still new and its impact is not hugely present in societal debates, partially because school teachers often do not have the technical skills nor the time to assist young people in video making. The web contest, in summary, needs constant attention from each project partner.

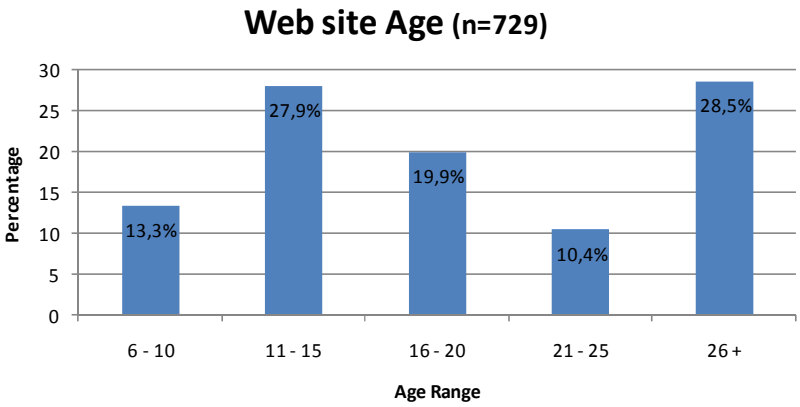
Conclusions on the webplatform

The webplatform had a total of 729 active contacts[2] from January 2010 to June 2011. The online quiz was a useful tool for getting quantitative and qualitative data from the web community. Here we briefly summarize the main results obtained thanks to the online quiz.



The countries with the majority of online hits are Portugal, in first position, followed by Turkey, Poland, Slovenia and Italy. Females accounted for 57,3 % of online users, while males accounted for 42,7% of users. The data revealed that users accounted for the largest share of visitors are young adults up to age 26 and between the ages 11-15 accounting for 27,9% of the online visitors, while online users between the ages 21-25 accounted for 10,4% of visitors.

[2] Students who complete the web form.



Conclusions on the online video contest entries

Looking at the videos entered by contest participants, it becomes clear that N&N is perceived as a difficult topic to represent visually. Therefore in some cases, young people chose to speak in front of the camera through demonstrations of a Nano application, for instance some British students play the rule of scientists[3] or reporters[4] to describe what N&N are and how they work. The videos described above (among others) make use of objects present in the Nanokit, for instance the bucky ball or the magic sand, thus linking more explicitly the connection between the Nanokit and the web contest. By doing so, we can easily deduce that the students of those videos made use of the Nanokit either during a Nanoday or in their classroom. Therefore, videos can provide evidence of the use of the Nanokit and, even more, they can show the effective behalf of using the Nanokit as a tool to engage young people in N&N. Other participants preferred to use their imaginations to present nanotechnologies by means of fictional stories with puppets or cartoons. Thanks to young people's vivid imaginations, some videos use speech bubbles to tell a story and give characters a voice.

The majority of videos submitted to the contest contain a forward-looking perspective on nanotechnologies. In particular, some "cartoon-like" videos represent N&N in a futuristic scenario in which nanotechnologies are able to solve problems. For example the video "La centrale nucleare di Spingfileld" [5] depicts a situation in which people eat special apples made by nano research to cure cancer. Other highly creative videos focus on fantasy scenarios in which a giant panda thinks about nanomedicine to became smaller and not be marginalised from other animals[6] or a pirate who is able to get treasure by means of nanotechnologies.
In other cases, some videos, despite keeping a futuristic development, show the actual application of nanotechnologies more carefully, through a dichotomic view (paradise/evil) of the world with or without nanotechnologies.

Videos such as the one before mentioned that do not deal with any nanodilemmas give a more detailed account than others of the actual functioning of nanotechnologies and how they will make our lives more comfortable.

The majority of videos submitted to the contest show the N&N effects on the body and environment, and discuss the impact of N&N research on everyday life. These are the most represented topics by young people. Issues of privacy, conversely, are less dealt with by contest participants. Within the category of videos dealing with N&N and the human body, we see that those videos either focus on

[3] http://www.youtube.com/watch?v=STXKfV06HSA, http://www.youtube.com/watch?v=W_Eo_kqrH-M
[4] http://www.youtube.com/watch?v=fa-zuYrFVJI
[5] http://www.youtube.com/watch?v=6BkdC7_4pzE
[6] http://www.youtube.com/watch?v=1ajPSyZiQLk

pros and cons associated to nanomaterials and their unexpected risks for people, or they present viewers with an unproblematic, positive view of N&N.

The national participants of the video web contest were interviewed using the interview grid prepared in advance by Observa. Those interviewed are between 14 and 19 years old. These interviews let us know some challenges of the web contest, according to some participants.
In order to overcome the eventual technical difficulties related to the making of a video dealing with N&N, some partners organised specific workshops, sometimes collaborating with professionals and experts in video composition and editing, because school teachers often did not feel comfortable enough in handling the medium of video. Even so, the challenges highlighted by participants in the web contest were mainly related to technical aspects.

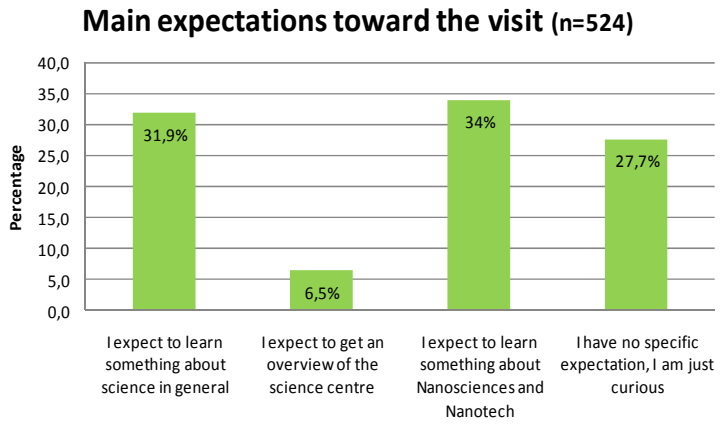
The latest update of the webplatform, however, has probably ensured more online participation/feedback as well as ensuring the consistent number of videos submitted. This will guarantee the presence of a growing community of people interested in N&N and in the related benefits and risks, even after the end of the Time for Nano project, a community that interacts not only during the Nanoday activities but also through the webplatform.

Analysing young people's interviews, it seems that the opportunity to ask questions on N&N to teachers or explainers at a science centre is fundamental to make young people aware of N&N research and its impact. The webplatform works well to provide contest participants with in-depth information on N&N. School plays a big role in stimulating interest in the topic of N&N. Nevertheless, a lot of information on N&N has been taken on students' own initiative, according to web contest participants.
Some of our proposals to increase the impact of the web-based video contest were implemented in the second edition. There was a better connection between schools and teachers and Nanoday activities, and increased participation via the web platform (the role of social networks as Facebook should be improved). In this perspective, it will be important to plan future cooperation with non-scientific actors/institutions (for example science festivals) and students' training in video making.

Conclusions on the Nanodays

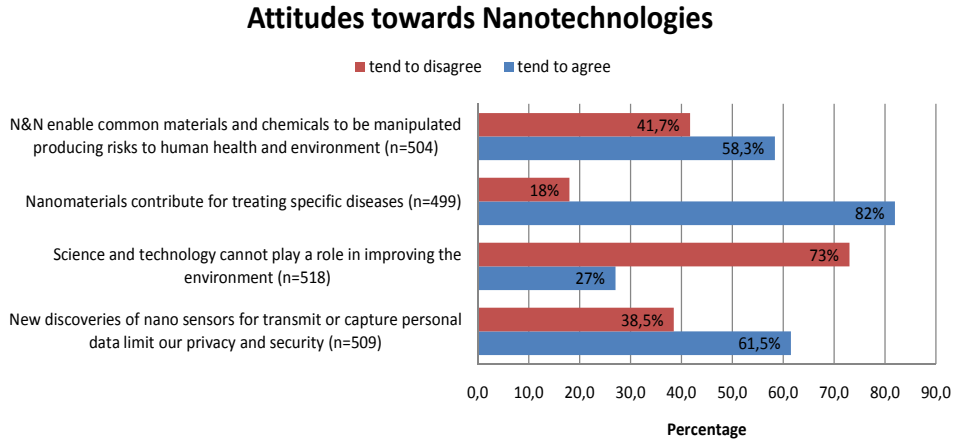
Between October 2010 and June 2011, science centres in nine different countries organised at least five Nanodays (for some more than five) during which the different products and activities of the Time for Nano project were used (Nanokit, Time for Nano Web-based video contest, PlayDecide, conferences, discussion groups).
The general format of the Nanoday foresaw the use of products and the design of activities to communicate N&N to young people, stimulating their creative engagement on the topic. Most Nanodays entailed a moment of introduction to N&N research by means of a lecture or short presentations by experts, a moment of discussion and debate and a moment of creative engagement through the hands-on activities contained in the Nanokit which comprises also the PlayDecide game adapted for this project.
Pre- and post-questionnaires were distributed to a minimum of 50 students aged 14-19 during Nanodays by project partners. A total of 586 questionnaires were filled in by participants in the Nanodays. We consider in our analysis 530 valid participants to the Nanoday between 8 and 21 years old**.** Although the sample is not representative of the whole population of young Europeans, it can still be used in an explorative way to get a first insight on some young people's knowledge and attitudes towards nanotechnologies.
Before beginning the Nanoday, the majority of respondents state that they are interested in scientific issues (69,2%) or, more specifically, in the area of N&N research (16,9%). The majority of participants expect to learn something on N&N (34,0%) or on scientific research in general (31,9%).

Before the Nanoday, the majority of participants say they know a little about issues related to N&N (55,7%). The number of who say do not know anything about N&N participants has decreased, passing from 41,7% in 2010 to 27,5% in 2011.

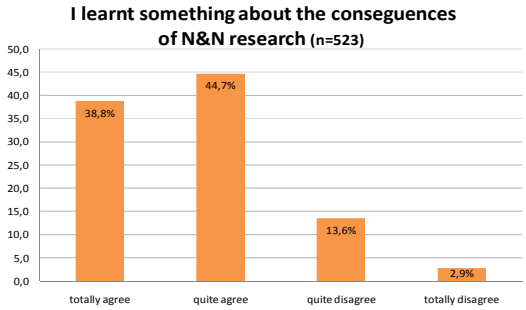


After the visit, the largest group states they have learnt something about N&N (48,2% totally agree, 43,2% quite agree).

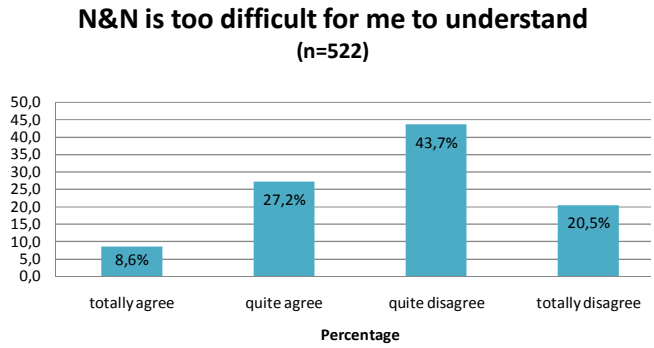
Before beginning the visit, half the participants tend to agree that science and technology can sort out any problem (49,6%), whereas 50,4 % tend to disagree. The majority of participants express trust in science and technology improving quality of life. Furthermore, 82% of participants agreed that issues of health and disease can expect to benefit most from nanotechnology, especially the diagnosis and treatment of spinal cord injuries, diabetes, heart disease and Parkinson's.



After taking part in the Nanoday, more than 80% agreed that they had learnt about the consequences of N&N on everyday life. These data show that there has been a significant learning output in terms of raising awareness about the implications of nanotechnology: the activities performed during the Nanoday allowed participants to learn more about N&N and its effects.

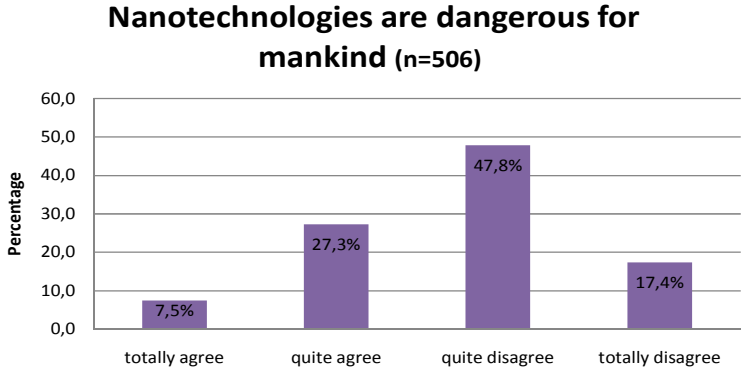


The activities at the science centre were shown to be successful for participants' awareness on N&N. After taking part in the Nanoday, having tried the activities/objects of the Nanokit, most students consider N&N technologies as a topic that is not too difficult to understand: only 8,6% agree that N&N is a subject too difficult for them to understand, while 43,7% rather disagree and 20,5% totally disagree.



Furthermore, 37,2% rather disagree and 27,8% totally disagree with the proposition that "because N&N are invisible, scientists should focus on topics with more practical implications." This confirms that the Nanoday had a cognitive impact on participants, despite the complexity of the topic treated and that N&N are perceived as a scientific area capable of having an impact on everyday life.

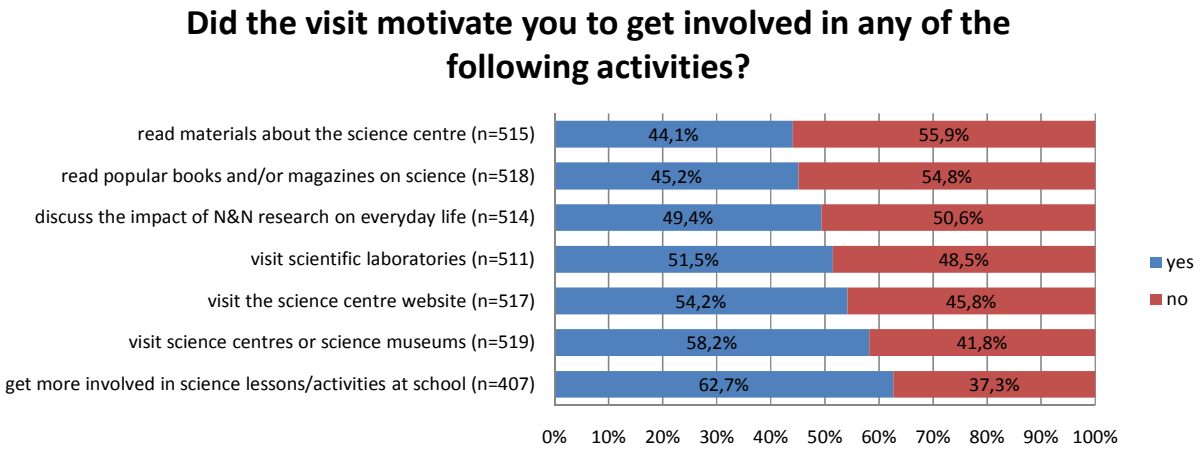
After the visit, more than half participants agree that the study of N&N will be finally able to solve the mystery of our origin (totally agree 20,3%, quite agree 39,5%). This shows not only a general optimistic attitude towards N&N research, but also show positive expectations and trust concerning nanotechnologies when it comes to stronger statements that depict futuristic scenarios like those aforementioned. As for the statement "nanotechnologies are dangerous for mankind," participants again feel confident on N&N about the future.



In relation to the interest raised by the experiments during the Nanoday, it needs to be highlighted that the majority of young people do not have the chance to use a scientific laboratory at school (45,7%) or if so only 2 or 3 times in the school year (15,1%). On the other hand, there is a reliable number of participants who affirm to have attended a scientific laboratory several times (33%).This trend increased significantly and it means that teachers chose to organise some labs or scientific activities even though nanotechnology is not on the school curriculum.

Visiting the science centre and taking part in the Nanoday motivated young people to visit the science centre's website (53,9%), to visit science centres or science museums (57,6%) and to get more interested in science lessons at school (60,8%).

The visit seems to be less successful when it comes to motivating visitors to read materials about the science centre they visited (43,7%), to read materials about science centres (43,7%) and to read popular books/magazines on science (44,1%).



Almost half of visitors (48.2%) are motivated to discuss the impact of N&N studies on everyday life and are motivated to visit a scientific laboratory (50,6%). This means that there is a strong interest and curiosity on nanotechnology issues: Nanodays have increased awareness of nanotechnologies, as confirmed in the discussion groups' observations reported by each science centre.

Conclusions on the Nanokit

The Nanokit was designed and created for the project Time for Nano in order to be used as a tool for the Nanodays and increase the involvement of young people in the online video contest. The PlayDecide game for Time for Nano is also part of the Nanokit and has been created in two versions: Senior and Junior for young people and children, respectively. The Nanokit includes several hands-on activities that will introduce nanotechnologies and potential applications. All products/activities were tested by project partners before the Nanodays. These products are:

- Activity 1: How tall are you in nanometres? How big is your hand in nanometres?
- Activity 2: Dilution
- Activity 3: Magnetic probe
- Activity 4: Make your own buckyball
- Activity 5: Ferrofluid
- Activity 6: Magic sand
- Activity 7: Hydrophobic textile
- Activity 8: Anti fog

- Activity 9: Memory metal

The exit questionnaires shed light on how the Nanokit was a great source of information on N&N and engagement with this topic for those who took part in the Nanoday. More than 80% of participants found the visit pleasant and interesting. For some of the participants in the web contest, the Nanokit offered the chance to see and try first-hand some applications of N&N, and to get inspired for their own creative practice.

However, more than 60% of participants (rather, or totally) disagree that the Nanokit inspired them to participate in the web contest. Participants to the Nanoday would have liked more experiments to help them better understand the scientific principles of N&N. During the visit, 39% asked the guide some questions, 22,5% asked the teachers some questions.

Conclusions on PlayDecide

In total, about 120 students were engaged in the PlayDecide game organised by each project partner. PlayDecide takes about 50-80 minutes to play.

PlayDecide was useful for fostering discussion and debate around the impact of N&N and for discussing the nanodilemmas. However, the game was less successful for engaging some young people because of their lack of initial knowledge. The objects/activities proposed with the Nanokit were used by the majority of participants to the Nanoday.

On the whole, there was an agreement to refuse consent to use nanotechnology in order to allow people to live longer, while there was a positive attitude to extending nanotechnological materials concerning health cure for instance to destroy cancer cells. On the other hand, some participants stressed that many of the potential risks remain uninvestigated, due to a severe lack of knowledge about nanotechnology. This group rejected the medical applications of nanotechnology.
Participants in the game considered regulations on nanotechnology, and took political positions during the game about government directives. Participants questioned the role of political guidelines as to whether and how we give people the choice to make use of nanotechnologies. These considerations also address related ethical issues: according to some students, the use of N&N will increase the gap between rich and poor in the world.

On the whole, interaction between participants took place in a positive atmosphere despite moments when some parts of the game were too difficult and the explainer had to interrupt play to clarify concepts. PlayDecide fosters interaction among participants as stated by the project partners' reports, especially when it comes to discussing content rather than knowledge. Thanks to PlayDecide, most students were fully engaged in the topic of nanotechnology and the constructive discussion produced a clear emotional engagement.

For players it is crucial to be more informed about the science of nanotechnology: it seems that people will be empowered and able to take positions and decisions only by acquiring knowledge on the topic. The socio-ethical dilemmas remain a motivating topic but cannot be easily solved by participants.

Conclusions from the discussion group

The evaluation tool used for the discussion group aimed at observing the way discussion and interaction among participants started, proceeded and ended. In total, 833 students were engaged in the discussion groups organised by each project partner.

The main areas of discussion were:

- Environment

- Health
- Privacy
- Human enhancements

Overall, participants seemed impressed by the opportunity to find connection to their own everyday lives. They were keen to explore some of the complex social and ethical issues related to the practical innovations on N&Ns, with such questions as: what are the necessary compromises to adopt to save human lives? Or, what kind of nanoparticles can be used and who is responsible for regulation on this matter?

In several cases, the discussion and/or the activities ended in advance because of time limitations: the participants were very engaged throughout the discussion and were reluctant to end the talk at the planned time. They are likely to have continued to consider the issues after the debate.

Nanodilemmas are the hottest topics discussed and, in particular, the dilemmas related to environment, health, privacy and human enhancements, with a discussion relating to familiar cases. It must be noted that in some cases the most debated nanodilemma was the one that directly concerns one's own body (health nanodilemma), whereas in other cases it is the environment or security.
Young people are eager to get more information on N&N, as if only by being thoroughly informed they could express opinions and take positions. Sometimes, a lack of participation is not motivated by boredom or by disinterest, rather by the feeling of not being competent enough to lead a discussion on such challenging issues.

One of the recommendations put forth by project partners is that the discussion on the Nanodilemmas needs to be enriched by using additional informative materials on N&N and on the outcomes of nano applications. In this respect, additional materials have already been used by IDIS.

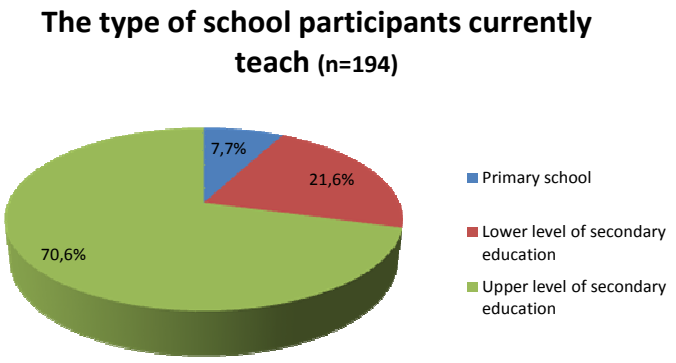
Conclusions on the multipliers' training

The aims of the training sessions were:

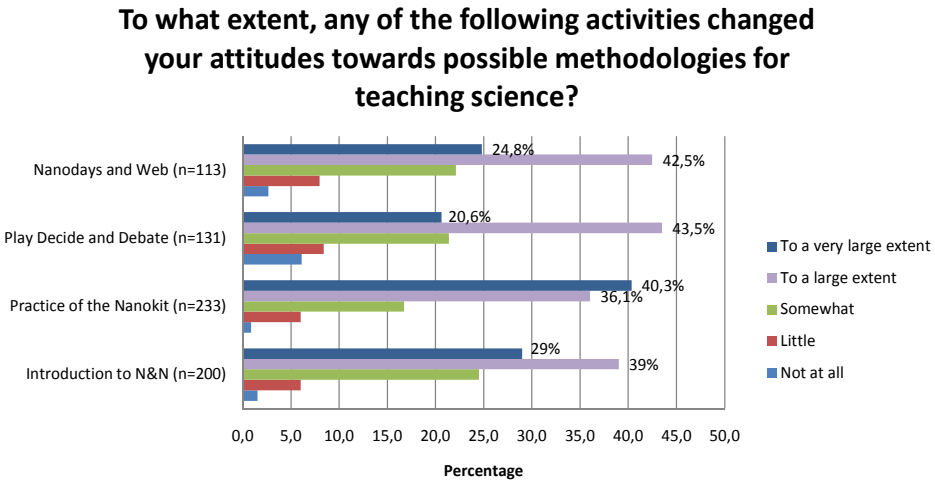
- to provide trainees with a basic knowledge on nanoscale and applications;
- to introduce discussion on the dilemmas around N&N;
- to allocate resources for fostering debate among young people;
- to assist teachers willing to implement nano in their school curriculum.

With the data obtained from the survey, we provide feedback on this year's training sessions through the 252 questionnaires filled out by explainers and teachers. Below, we briefly summarise the main questions included in the questionnaires.

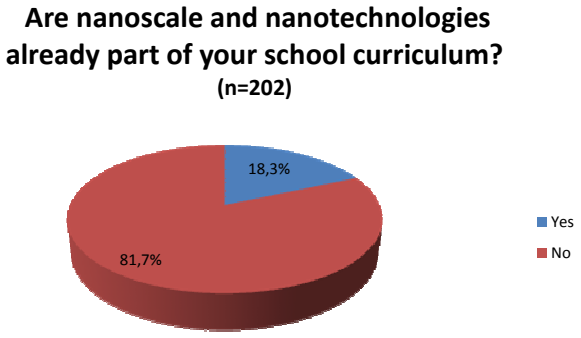
Most participants teach at upper level of secondary education (70,6%), while a few participants teach at lower level of secondary education (21,6%) and at primary school (7,7%).



All kinds of activities proposed at science centres appear to have some effects on teachers' attitudes towards methodologies of teaching. Respondents were particularly satisfied with the use of the Nanokit: most teachers agree to a very large extent (40,3%) and to a large extent (36,1%) that the Nanokit activities have changed the teaching method in their science class.



The responses to the questionnaire show a general enthusiasm for using the Nanokit. Results indicate that most participants are willing to propose Nanokit object/activities at school or at science centres.
Despite the interest towards training sessions expressed by participants, data collected reveal that N&N still remains difficult to grasp because it is not present in the majority of school curricula: only just under 20% of respondents say they teach a nanotechnology subject as part of their science curriculum.

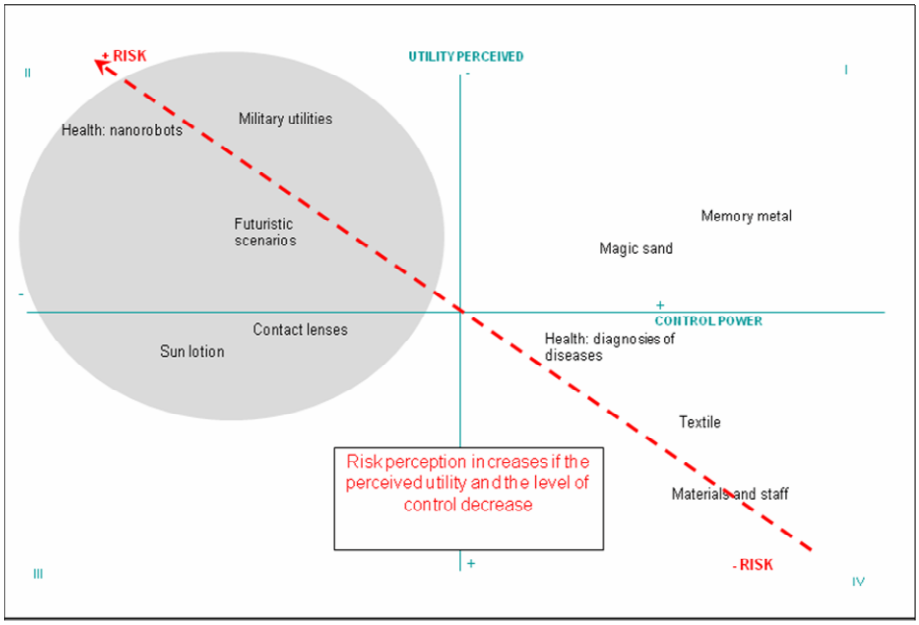


The training sessions play a crucial role in implementing N&N in school curricula by teachers and schools and in increasing interest in science and technology among students. Furthermore, the

training sessions organised by each project partner secure a bottom-up approach to N&N, capable of fostering a continuing debate and exchange among the different stakeholders as recommended by the European Commission.

Conclusions on nanotechnology and the perception of risk

As the intense debate about new technologies in Europe and elsewhere shows, the public has become increasingly wary of new technologies that could create new risks. Usually, citizens are not willing to accept some applications of new technologies without previous and thorough debate on their implications and potential risks. Although some of the earlier resistance has not appeared in the case of nanotechnology, there are some doubts regarding possible risks as shown in the figure below, based on the data collected during the evaluation phase. There are two opposite themes: utility perceived and control power. In the figure below, we see that if the perceived utility and the level of control decrease, the risk perception increases.



"Silver" actions

The **Nanodays** implemented by the project were diverse in their formats. The activities ranged from week-long festivals to thematic days; from nano picnics to nano experiments in shopping centres. The way the project was structured positively encouraged this diversity, allowing project partners to use their existing expertise in adapting activities to their public, while simultaneously giving them the chance to make the most of the existing best practice within the consortium and try out new activities.

This was achieved by maximizing the opportunities for partners to document their Nanoday events, and share their experiences with the consortium. Certain partners had very specialized areas of expertise which were particularly valuable to the group – for example, Ciência Viva have a strong focus on accessibility, and as such were able to share ideas with the group on how to ensure the inclusion of people with disabilities.

As a result, many partners had a lot of success with new and innovative activities that they tried out. Warsaw University, for example, made the most of the Nanodays in order to foster an intense collaboration with their local science museum, Copernicus Science Centre. They carried out activities in shopping centres, invited young children into the university for Nanoday activities and were involved in a Polish TV programme on nanotechnology, with great success. In Grenoble the CCSTI made a national partnership with other nanotech research centres across Toulouse, Grenoble

and Paris, coorganising training sessions, creating café scientifiques in schools with philosophers, and the Nanokit was a very popular tool with the other members of the partnership.
The project therefore does not provide a fixed model for future Nanoday events to be organised. On the contrary – the project points to the fact that this type of event should remain organic and open, adapting itself to the context and expertise of the organisers, while maximizing collaboration and cooperation among local networks.
The **multipliers' training** was the key to ensuring the project's lasting impact. These training courses shared best practice in public engagement activities on the topic of nanotechnology and nanosciences. They ensured that teachers and science communication professionals knew how to work with the Nanokit itself, but more importantly how to address controversial ethical, legal and social aspects like the five nanodilemmas.
The result is a European network of nano communicators, in contact with each other both on a local level and a European level. The multiplying effect of this type of activity is difficult to measure, since by its nature it fosters the development of collaboration between professionals in an organic and spontaneous way. What is certain is that each of these professionals will come into contact with many hundreds of young people, using the expertise from the training course to engage them in nanotechnology and nanosciences.

"Gold" actions

The **Nanokit** was clearly one of the project's great successes. The feedback on the kit, from project partners, from users of the kit, from teachers and other professionals being trained and from the young people taking part in the Nanokit was virtually universal acclaim for the quality and innovative nature of the kit. Many more Nanokits were requested than it was possible to produce within the limitations of the project; a testimony to the usefulness of this tool.
It was apparent from this feedback that the kit allowed schools to conduct experiments which would not otherwise have been possible, and as such served as a good incentive for schools to engage with the topic. Each kit acted as a stimulus – upon receiving a kit, the teachers felt committed and engaged in the project. This sense of commitment led to schools collaborating more closely with the school's local science centre. In this way, the Nanokit as an object fostered long-term collaboration and strengthened local networks.
The **online video contest** was an innovative and creative means by which to engage young people in nanotechnology and nanosciences. The impact of the video contest is felt not just in the significant number of entries into the contest Europewide, but also in the numbers of views the videos have received on YouTube, and in the positive feedback the contest received from schools and young people.

The consortium rose to the challenge of how to engage young people in the contest. The choice to focus on five key areas, or "nanodilemmas", ensured that young people engaged directly with five topics which are particularly relevant to their daily lives, and which raise interesting ethical, legal and social questions. In the second year, the decision to use video interviews with nano researchers allowed young people to put a face to nanoscience and nanotechnology, and to go into greater depth with each of the five issues. For many of the science centres and museums involved in the project, video production was a new medium with which to engage young people. BridA worked closely with project partners on the video production, and the result was therefore a new skillset for science communication professionals. Collaboration with an artistic collective like BridA imbued the public engagement activity with a creative edge which can only be achieved with this type of close cooperation. Many of the science museums made links with local artists and filmmakers in order to feed into the video contest. In schools, the contest even encouraged collaboration between art teachers and science teachers. In museums, it gave education staff a chance to think differently about how they develop their activities.

The result of the video contest is not just the deep engagement and dialogue that took place during the project. This workpackage has also produced a set of resources that can be used by educators and science communicators on the long term. The videos produced by BridA are of a particularly high quality, and serve as excellent, thought-provoking catalysts with which to engage young people in N&N. And many of the competition entries are of an extremely high quality as well, often humorous, or touching on social fears, showing the imagination and creativity that the topic of nanotechnology can inspire in young people.

Section F: Recommendations

As part of the Evaluation workpackage, Time for Nano identified the following four key recommendations for engaging young people on nanotechnologies:

1. There is an urgent need to engage young people on the ethical, legal and social aspects of N&N. We must train or recruit study support personnel with sensitivity to prudence, precaution and system of application. There is a particularly compelling need regarding issues of energy and environment, in particular.
2. It is important to show the practical uses of nano innovations: water, surgical devices, textiles and cosmetics, for example. The public must be reassured on medical applications of N&N, in particular.
3. The communication of N&N needs new “languages” with which to engage the public: media, arts and games, expecially when the target is young people. The nanotechnology sector should be proactive in collecting suggestions for nanotech development from the public.
4. There is a need for more popular experiments on nanotech, in order to strengthen connections with schools, and the development of public engagement activities, exhibitions and other products. There is a compelling need for public debate on particular case studies. The role of media is essential in order to define the agenda about nanotech innovations.