

The Popularisation of Science, Technology, and Innovation in Flanders

1. Background

Belgium has been undergoing a series of state reforms since the 1970's. As a result, it is now a federal state, consisting of three Regions (Flanders, Wallonia and the Brussels-Capital Region) and three Communities (Flemish-speaking, French-speaking and German-speaking). Under the 1993 reform package, competence in the areas of science, technology, and innovation was given mainly - indeed, almost exclusively - to the respective Regions and Communities, leaving them free to determine their own science policy.

2. Policy regarding the popularisation of science and technology

From 1993 onwards, the popularisation of science and technology was considered an essential part of overall science and technology (S&T) policy. Accordingly, it had its own strategic primary and secondary objectives, which were implemented each year in a Science Information and Innovation Action Plan¹. The strategic objective behind the actions taken is to maintain and strengthen support by the general public for science, technology, and innovation in a society that is becoming more and more knowledge-based.

In 1994, the action plan was allocated a budget of around €743,680 (at the time 0.1% of the overall S&T policy budget). By 2006, this figure had increased to more than €8,200,000 (equivalent to around 0.56% of the overall S&T policy budget).

Before competence for S&T policy was transferred to Belgium's Regions and Communities, there were hardly any initiatives in Flanders aimed at raising public awareness of S&T. This changed dramatically in 1993, when the Flemish government recognized the importance of making a sustained effort in this domain as our knowledge-based society grew increasingly important, and took the lead by initiating a fully-fledged program, the above-mentioned action plan.

3. Science Information and Innovation Action Plan

3.1 Objectives and target groups

The action plan is based on the strategic objective set out above, underpinned by the following eight operational objectives:

General objectives:

- To provide information about science and technology in general, and about scientific technological research in particular
- To raise awareness of the importance of scientific and (innovative) technological research and innovation
- To account for the use of the budget that the government allocates to such research and innovation

¹ The website detailing this action plan is available (in Dutch) at www.wetenschapmaaktknep.be.

- To create a culture that welcomes technological innovation

Specific objectives:

- To boost the scientific and technological potential of all citizens through (ongoing) education and hence increase the influx and outflow of S&T students or participants in other S&T-related training courses
- To encourage entrepreneurs to be (technologically) innovative
- To unearth unused potential, especially among girls, and involve them (in the attainment) of the above objectives
- To raise general public awareness of S&T issues.

The general objectives are set out to change the attitude of the public as a whole, whereas the specific objectives are aimed at specific target groups and related to our society's specific needs, which can only become more acute in the future. One such growing need is for people with S&T skills in industry as well as in other parts of the labour market. So far no immediate solution has been found in terms of freeing up potential manpower. The possible decline in young people's interest in S&T studies is a major worry, and could have a devastating effect on attempts to produce a sufficient reservoir of potential to meet the needs of industrialized societies.

Recently, the European Union voiced its concerns in this regard. In addition, the OECD's Global Science Forum found the available data alarming enough to dedicate an international conference to the specific problem of declining interest in S&T studies among youngsters. The OECD recently published a policy report on this activity, entitled "Report on the Evolution of Student Interest in Science and Technology Studies"².

The importance attached by the Flemish government to the popularisation of science, technology, and innovation within its general science and innovation policy is reflected in the (annual) action plan mentioned above, which sets out a whole range of initiatives aimed at different target groups.

It is essential that these initiatives be:

- Well-founded, meaning that scientific research and impact studies must help, both ex-ante and ex-post, to boost the efficiency of these initiatives, make them sustainable, and ensure that they are tailor-made for the relevant target group.
- Interactive, meaning that the target group at which a particular initiative is directed, must be able to learn through active involvement and, if at all possible, gain a different (i.e. not stereotypical) view of scientific and technological research.
- Integrated into educational programs (via attainment levels and curricula) and into teacher training, for those initiatives geared toward education.
- Sustainable and ongoing, meaning that initiatives must be under way at all times, to retain the attention of all the parties concerned. One way of doing this is to stimulate the respective actors through structural and occasional cooperation.
- All-inclusive, meaning that they should cover all scientific domains (including the humanities) and innovation.

The action plan is aimed essentially at the general public and youngsters at school. Special attention will be paid to girls and promoting their interest in science and technology, since the statistics suggest that they in particular tend to drop the "hard" sciences during education. In

² Available on : http://www.oecd.org/department/0,2688,en_2649_34319_1_1_1_1_1,00.html

Flanders this trend is especially clear-cut in engineering, computer science, chemistry, and physics.

3.2 Realisation of the action plan's objectives

To realize the objectives set out in the action plan, activities are identified using both a bottom-up and top-down approach.

Bottom-up approach:

Bottom-up initiatives are those originated by actors in the field. There are three levels within the bottom-up approach (see section 6):

- Seeding level : these are small initiatives, mostly taken by occasional actors, that have sufficient merit to associate them with the action plan. In most cases only a small amount of funding is needed. Such initiatives can be supported within the framework of the action plan if an opportunity presents itself.
- Maturation level : here, the respective actors compete by responding to an annual call for proposals, from which the best projects are selected. These initiatives are funded on a project basis.
- Consolidation level : at this level, actions - or actors who have proved themselves capable - are retained within the action plan, and funding is organized on a structural basis. All the structural partners responsible for the realisation of the action plan are involved at this level.

Top-down approach:

The initiatives taken here are determined by the Flemish government and are either realized by its administration or by a designated third party, e.g. a suitable actor. One example of such an initiative is Flemish Science Week.

4. Examples of initiatives included in the action plan

4.1 Education:

- Flanders Science Week
A broadly-based S&T information campaign, including a wide range of activities and special projects based in various Flemish universities, colleges of higher education, scientific institutions and associations, museums, observatories, and libraries.
Flanders Science Week has been held bi-annually in October since 1994, and is aimed at schoolchildren and the general public. Around 26,000 youngsters (aged between 16 and 18) participate in activities organized by universities, colleges of higher education, and scientific institutions. All the initiatives fall under the heading "Science in the picture" and try to attract students to scientific and technological research, by allowing them to be researchers for a day.
In 2006, Flemish Science Week will extend from 19 to 29 October.
- Science Festival and Science Happening
A sparkling family event, entailing a wide range of activities and entertainment for young and old alike, including interactive experiments and spectacular demonstrations, science theatre, and a science activity corner. The Science Festival takes place in even years as part of Flanders Science Week. Since 2004 the festival has been three days long and comprised the following elements:
 - a School Day, for students in the fifth and sixth year of primary education and for students in the first stage of secondary education (1st and 2nd year of secondary

education). The program is similar to that of the family event described above, but geared specifically to the target group and incorporated into educational activities.

- The family event for two days for the general public (see above).

The 2006 Science Festival will take place between 27 and 29 October, with the School Day organized on 27 October.

In principle, Science Happenings are organized in odd years and last for 1 day.

- Science kits

A box of 9 exciting scientific experiments for 6 to 12-year-olds for use in the classroom (primary schools), including clear assignment cards and all the necessary materials and equipment (tweezers, lamps, zinc plates, etc.) for up to 25 children working in classroom activity corners (thus enhancing teamwork). Between 1995 and 2001 a new series of kits was made each year, with five being produced in all.

- Science Truck®

The Science Truck is a mobile, custom-built, fully-equipped semi-trailer that has been touring Flanders since 14 October 1998.

Via an exciting story that combines mystery with "mission-impossible-like elements," students in the 1st year of secondary education can gain an introduction to science and technology in an original, entertaining, and interactive way. Working in groups of three, they spend one hour performing a number of experiments and fulfilling assignments geared to final attainment levels. Schools located in the vicinity of the Science Truck are sent relevant information in advance, to enable them to make bookings.

Up until the beginning of 2005, the truck was known as the Experion®. Since then, it has been refurbished and modernized, and a new underlying story has been introduced. Since the beginning of September 2006, the Science Truck travelling through Flanders has been called *MysteriX*®.

Experion was selected from 150 entries to be presented at the international conference entitled "**Communicating the Future: Best Practices for Communication of Science and Technology to the Public,**" organized by the National Institute of Standard and Technology (USA).

- Technical education project in primary and secondary education (TOS21³)

Technological education (*Technologische opvoeding* in Dutch, TO for short) is part of the final attainment levels for primary education and the first stage of secondary education. In higher stages of secondary education, attention is focused more on the sciences, but TO remains an important element, especially for forging a link between science and its practical uses (in technological applications⁴).

Hence in primary education and later on, technological education is an important subject in which science and its applications can be brought to students' attention to make them more aware of such subjects and hopefully induce them to choose S&T related subjects and studies later on.

The ultimate aim of the project is to provide existing and would-be teachers (and the whole school environment) with the skills, equipment, and tools they require to make them as comfortable as possible with technological education and thus teach it better. The project is directed at the intermediary level (i.e. the actors involved, both in the field of education as in the field of the popularisation of science, technology and innovation) and

³ TOS21 stands for *Technologische Opvoeding op School voor de 21ste Eeuw* (Technological Education at School for the 21st Century)

⁴ Of course, technological education involves more than just "applied sciences" and it is this specific identity in particular that will be highlighted in the TOS21 project.

will endeavour to provide a framework for technological education and provide the necessary, essential building blocks for working out a curriculum for the subject. By involving the intermediary level (some of whom are responsible for implementing the curriculum in the classroom) greater support will be elicited in the field, raising the prospect of more effective implementation.

The framework established in this way will also be used to screen and validate (new) projects within the action plan, applying the principles behind TOS21 to a broader area of and using them as leverage to enhance the plan's structure, to improve the coordination of the activities within it, and to promote more cooperation between the actors. (See also section 4.6. Supporting measures).

- **Technology Day:**

The second edition of this event was held on 14 March 2004. The aim here is to showcase Flemish expertise in new technologies to the general public and to highlight the full range of activities involved in technological innovation, ranging from conceptualization to the design and realisation of new products or services. There were 112,000 participants in 2004 (compared with 75,000 in 2003).

This project will not be continued, but a larger one will be initiated at the end of 2006, bringing innovation and its benefits to the attention of the general public. This larger project is Flemish Innovation Week.

- **Chip, Chip, Chip Hurray!** is a project for children in primary education that introduces the chip technology on which ICT is based in the classroom in an interactive way. The project entails problem solving, experimentation, and teamwork as well as teaching children how to communicate their findings.

4.2 Media :

- TV series "*Over Leven*" (meaning About Life)

A co production by VRT (Flemish Radio and Television) and the Flemish Community. The broadcasts, screened on Sunday evenings, feature exciting documentaries about recent scientific achievements that are closely related to the everyday experiences of most citizens. Each edition of the program is built around a prominent scientist behind an important scientific breakthrough in their specialist field.

Over Leven earned the "Boy Trip Award" for the episode entitled "*De ware Lodewijk*" (The Real Louis XVII) at the 2000 Film Festival in the Netherlands and earned feature billing in the New York Festival of TV's programming and promotion competition with "*Het Zout der aarde*" (Salt of the Earth). *Over Leven* also won the Flemish science and technology minister's prize for science communication and was awarded the EU's Descartes Science Communication Prize in 2005.

- The TV series "*Curieuzeneuze*"

"*Curieuzeneuze*" (the title is an amalgam of the Dutch words for curious and nose) is a science program in which children aged 10 through 12 try to answer a scientific or technological question, resulting in a series of short, 5-minute TV reports which were broadcast on Ketnet (a separate channel for children) on Sunday mornings. In addition, a *Curieuzeneuze* competition was also held to give youngsters from the 5th and 6th year of primary school the chance to find their own answers to a question that particularly interested them. In that competition, the manner in which the answer is found is even more important than the answer itself. At present, the series is not scheduled, but it may well be broadcast again at some stage.

- Enter21

A series of short, 5-minute films explaining examples of technological innovation to the general public in readily comprehensible language. These films have been broadcast every weekend on all Flemish regional TV stations (except TV Brussels).

- *Innoveer!* (Innovate!)

This series started in early February 2004 and is aimed specifically at companies, providing a look at specific innovations for corporate use. Each film is around 26 minutes long and is broadcasted on a channel targeting mainly companies. Innovate! was broadcast in 2004 and 2005.

4.3 Call for proposals for projects on science information

The aim is to increase the number of science information actors via project-type cooperation by stimulating (scientific) creativity and ideas in the field and – subject to the necessary streamlining (the preconditions for which are set out in the outreach appeal) – implementing them as science information projects. In principle, a call for the submission of science information project proposals is made annually. The allocated budget varies, but has been increasing since the first call was made in 1999, due to the success of the initiative.

In 1999, 19 projects were selected (out of 40 entries), but this figure subsequently rose as follows; 2000: 25 out of 61, 2001: 33 out of 65, 2002: 32 out of 71 entries. During these years the budget was around €800,000.

In 2003, a fresh call was made with a larger budget (€1,170,000) and 41 projects were selected out of 90 entries. In 2005, 8 additional projects (from the 2003 call) were awarded a total budget of almost €500,000 euro.

In 2005, a call was launched specifically for projects targeting the general public, and 9 projects were selected out of 51 proposals. Five extra projects specifically aimed at girls were awarded funding recently.

In 2006, a specific call was launched on 30 June, aimed at projects for education, involving both industry and the actors involved in popularizing science, technology, and technological innovation, and promoting strong cooperation between them and industry. Special attention will be paid to projects targeting girls and technology. This call will also introduce the principles of the TOS21 project, since these will be one of the main elements binding projects and activities.

4.4 Science centres

- The Flemish science centre Technopolis offers a delightful, exciting and richly informative discovery experience for enthusiasts of all ages, whether 6 or 96.

Technopolis has more than 259 interactive exhibits to help visitors (re)discover the science and technology behind familiar objects: they can print out a newspaper page with their own name and photo on it, use electricity to make their hair stand on end, ride a bike along a high-wire 5 meters above the ground, or stand in the middle of a soap bubble. And there's something new to experience every time visitors return. The centre also houses rotating exhibitions on specific themes. Some of these exhibitions developed by Technopolis are subsequently hired out to other centres in Europe.

- Recently another science centre, called Hidrodoe, was set up, where visitors can enjoy an interactive experience centred around water.
- In spring 2004, another interactive centre, called Earth Explorer was opened. After being given an introduction to planetary events (earthquakes, storms, etc.), an interactive exhibition allows visitors to learn more about the processes behind all these phenomena and how science helps us understand, describe, and predict some natural events.

4.5 "Science and Society in interaction" project

At the end of 2002, a new project, called "Science and Society in interaction" was introduced under the action plan. The project was divided into two main parts:

- A "science shop" providing scientific information and/or conducting research at (groups of) citizens' request
- WeCom: scientific information provided to citizens by scientists, i.e. tailored to the public's requirements.

This project was an initiative of the Free University of Brussels and the University of Antwerp and terminated at the end of 2005. The 2005-2006 action plan included measures to introduce science shops at all 6 Flemish universities, and embed them in a specific unit devoted to the popularisation of science, technology, and technological innovation. (See also section 6).

4.6 Partners

Implementation of the action plan is a combined effort involving many different actors:

The Science Division of the department of Economy, Science and Innovation, the Department of Education, Technopolis, universities, colleges of higher education, scientific institutes, organizers of Science Olympiads, (public) observatories, VRT, the Roger Van Overstraeten Society, and many others.

4.7 Supporting measures

All the actors in Flanders, meaning those mentioned above and others active in the field, and all the stakeholders involved in the popularisation of science, technology, and innovation, are linked together within a network called WIN⁵ in a bid to improve both policymaking and the coordination of the action plan and the actions taken in the field. This network was initiated by the Flemish administration and was set up in late November 2003. The network was supported by an electronic, extranet-like tool to facilitate the sharing of expertise and information between the members of the network.

5 Screening the effect and impact of the action plan

Science information study

Once a series of action plans and measures had been taken, it was deemed necessary to evaluate the policy with respect to the popularisation of science, technology and technological innovation in terms of its impact and efficiency. In 2001 an analysis of this kind (called the "Science Information Study") was duly carried out. That document compared the policy of Flanders with its counterpart in the Netherlands, benchmarked several actions, and set out recommendations with respect to future action plans⁶. The study, which covered the period 1994-2000, also took account of impact studies carried out during various Flemish Science Weeks (among participants and non-participants) in 1998, 2000, and 2002.

The main results of the analysis were as follows:

Targeting the timing and environment of actions:

⁵ WIN = *WetenschapsInformatieNetwerk* (Science Information Network).

⁶ The title of the study is "*Startonderzoek Wetenschapsinformatie*" and is available (in Dutch) on our website at http://awi.vlaanderen.be/wetenschap_en_samenleving/index.php?id=170#startonderzoek.

An English translation can be provided for interested parties.

- The educational paths students follow at school were mapped and crucial moments for choosing or dropping S&T subjects were identified
- All the factors influencing educational choices were identified and should be used to target specific actions at these key moments.

Monitoring the progress made:

- Annual zero measurement of flows in S&T subjects, providing a snapshot. The monitoring of students throughout their education was only recently enabled and should make it possible to monitor trends in S&T subjects on an ongoing basis (follow-up system for educational paths from 2002 onwards)
- A permanent instrument specifically for monitoring the impact of the action plan and providing research to underpin policy governing it will be set up this year.
- Indicators should be developed and identified by the monitoring body

The monitoring body will be established during 2006, once a second analysis – covering the period 2000-2004 – has been completed, and also taking account of international developments most of which have transpired since the completion of the first study referred to above.

Supporting measures:

- Establishment of networks of teachers: since teachers are important intermediaries with the children they teach, they can support the policy by helping to implement certain aspects of S&T within the school curriculum. To support teachers, it was decided to set up networks of experts (most of whom were also teachers).

Such networks were set up at both primary and secondary level. However, since they operated too much on the micro level and enjoyed little or no support from the educational networks, the concept of networks of teachers was subsequently abandoned, in favour of the TOS21 project described above.

Organizational aspects:

- It was decided that the coordinating and structuring role played by the government needed to be strengthened. The immediate result of this was the WIN network
- Stronger, structural cooperation with the Department of Education had to be established. This was initially implemented by the teachers' networks, but is currently being done within the TOS21 project.
- The goals of the action plan were reworded and made "smart" based on the findings of the study.
- The preparation and implementation of the action plan was reorganized.
- The results of the study were taken on board as far as possible and incorporated into the framework of the overall S&T policy governing future action plan measures.

Five activities within the action plan were benchmarked: science kits (primary level), science in the picture (part of Flemish Science Week and for secondary level (16-18 years)), science theatre (primary level), science centres, and a communication campaign (the final year of secondary school) aimed at stressing the importance of S&T to students in their last year at secondary school, to help them determine their future and (hopefully) choose a career in S&T.

Summary of the findings of the impact study regarding Flemish Science Week 2004

- 57% of participants (students 16 through 18 years old) had already been interested in the subject of their chosen activity. 88% had learned something new by participating.

- 42% of participants had not been interested before, but 37% of them said their interest had been aroused by participating.
- Of the 58% whose ideas about science as a subject changed after participating in the activity, 89% claimed their view had been altered in a (very) positive way.
- 86% of the participants said they intended to go into higher education. Of these, 5% said they were considering an S&T course and were now convinced that this was the right choice for them, and 22% said they had never previously considered an education in S&T, but were now regarding it as an option.
- Of the general public, 44% claimed to be (very) interested in S&T, and 41% only vaguely interested. 15% claimed not to be in the least bit interested. (These figures stem from data collected on Technology Day 2004).
- These statistics change dramatically among those members of the general public who participated in the Science Festival: 87% claimed to be (very) interested, only 12% said they were vaguely interested, and just 1% said they were not in the least bit interested. 49% of the participants said they had become even (or far) more interested after participating. This figure rises to 53% among those who said they were only vaguely interested. Thus, we can conclude that this activity raises interest in S&T among the participants.
- More than two-thirds of the general public said they hoped that S&T would deliver the following benefits in their daily life: better health, a cleaner environment, a higher level of knowledge.
- Support for S&T among the general public was found to be high:
 - 100% said that S&T was important for society and its future development
 - 99% said it is sensible that the Flemish government invests in S&T-research
 - 99% said it was useful that the Flemish government was providing information about S&T and research by organizing activities like the Science Festival.

Other reports and studies

- Euroscene⁷ 2003 report for Flanders. This report resulted from Flanders' participation in an EU project, along with 6 other countries and/or regions⁸. This report analyzed the Flemish educational system (and included statistical data and a survey of the key actors in education) and provided an overview of both policy and associated activities. The report is available in English.
- Online survey on the natural sciences. This survey was carried out at the end of 2005. The questionnaire was based on the ROSE survey and a survey conducted by UK Science Year. It was aimed at students in secondary education. The results of the survey became available at the end of April 2006. A number of findings overlapped with comparable surveys abroad, for instance re the phenomenon that girls' and boys' interests in a number of natural science topics differ substantially. Some policy measures have been put forward based on that report. The report (in Dutch) can be consulted on the action plan website.

6 Outlook for the period 2005-2010

⁷ Euroscene = European Union Science Education Network

⁸ The other participants were Norway, Slovakia (promoter), Lithuania, the Czech Republic, and Cyprus. The project was a result of the third "science education" cluster was formed after the European Commission's initiation of its Science and Society Action Plan.

1994-1999 can be described as a "Seeding" period: as more financial support gradually became available for the action plan, more actions were implemented.

2000-2004 can be categorized as a period of maturation: an instrument devised to stimulate competition among the respective actors (the call for proposals) encouraged the latter to propose projects and thereby gain expertise and produce interesting material for a wide range of target groups. This increased the number of active players set up and an impressive array of interesting projects.

2005-2010 can be considered a period of consolidation: projects or actors that have attained a high level of expertise and produced useful, high-quality material, will be integrated into the action plan on a long term basis via partnerships formed with the government. Extensive attention will also be paid to structuring and coordinating the field of actors. To achieve this, the government will use its established network (WIN) and try to foster more communication and greater cooperation between the actors. Under the 2005-2006 action plan, steps have already been taken to involve the universities and the colleges of higher education structurally in the popularisation of science, technology, and technological innovation. This will be done by pooling the expertise that has been built up in these institutions in a permanent structure called an expertise cell for the popularisation of science, technology and technological innovation. This will allow the institutions involved to meet their obligation to society by bringing their research closer to the public.

Measures will also be implemented to boost S&T coverage in the media and to take the results of successful projects on to a higher level, by following up on them and thereby enabling any findings to be validated for a larger audience.

At the same time, companies and sectors of industry will be encouraged to participate by extending the call for proposals for projects to them as well, provided that they work in cooperation with a "regular" actor. The aim of this provision is to make the expertise of such regular actors available to companies and industrial sectors, both in a bid to avoid implementing projects that are incompatible with the action plan, and to spread the effort required to draw up proposals.

A status questionnaire covering the period 1999-2004 will also be drawn up (comparable with the initial study mentioned above) with a view to making recommendations on future policy and the analysis of specified actions.

The international dimension will also be more prominently incorporated into the action plan during this period. Some actions have already been taken in this respect, for instance by actively participating in the EU's Science and Society Action Plan, e.g. within the Euroscene project - a specific support action (SSA) in preparation for a future European Research Area (ERA) network, and being represented in the OECD's Steering and Working Group "Declining Interest in S&T Studies Among Young People." The experience gained from these international projects will be taken on board within the action plan.

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