

Local and national initiatives to motivate young people for engineering & ICT

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Abstract

This paper describes a number of national and local initiatives that are taken to motivate young people to choose for technical education. From the local initiatives we focus on the area where Fontys and Actemium are located; the southeast of the Netherlands. Not only governmental organizations and foundations are active in this field but also (industrial) companies become more aware of the fact that creating interest for professions in technology should start at the earliest possible age. History shows that initiatives become more effective when not only directed to promotion, but accompanied by appropriate projects. We conclude with an example of a technology event and a discussion of the effectiveness of the initiatives.

Keywords: motivation, technology promotion, technical education, technology events

1. INTRODUCTION

In southeast Netherlands a lot of companies are working in the field of technology. This requires good skilled engineers. In the last decades it has been noted that companies and industry have a continuous lack of engineers. This can have been caused by the lack of students choosing for a technical education. Either jobs or study in technology are not attractive enough, probably neither. In this southeast region Fontys University of Applied Sciences and system integrator Actemium are both dealing with the same problem. For this reason, the authors, both involved in activities from their institutes in promotion of technology, wanted to know more about the effectiveness of those activities. As in the Netherlands quite a number of organizations are active in the field of motivating young people to choose technical education, our first step was to make an overview of these initiatives. However, the influence of all those actions on the actual choice for a study is very difficult to measure. An attempt, using surveys and interviews in the first classes of both the

ICT and engineering departments is described in a separate paper [1]. This paper will restrict to the description of a number of national and local initiatives; we will try to give some insight in the history and the present situation of various campaigns for improving participation in technical education. An attempt is made to show some of the interrelations between organizations and events. One of the events is described in more detail and at the conference we will try to demonstrate some of the activities. So the purpose of this paper is to give the reader an overview of the national initiatives in the Netherlands and an impression of (resulting) local initiatives. It might be helpful when considering the possibilities of promotion in one's own country. As may appear from earlier publications, the situation in the Netherlands is not unique, but also counts for other European countries, e.g. Ireland [2], the Czech Republic [3] and Poland [4].

2. OVERVIEW

2.1 National initiatives

In order to give some structure to all the initiatives from the past years, the authors derived a scheme (see fig. 1), in which the most important initiatives are summarized, often with some of the properties. The scheme serves as a reference for the reader, in order not to get too much confused when going through the amount of initiatives; so every time one is mentioned go back to this figure to see the overview.

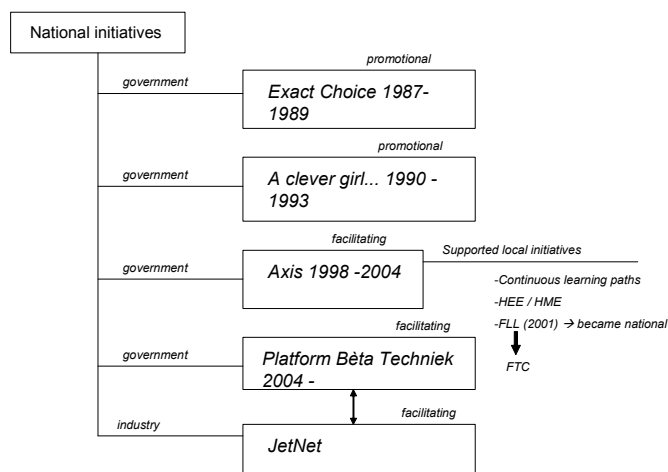


Figure 1. Overview of national initiatives.

From 1987 to 1989, the Dutch government ran a campaign called *Kies Exact* (Exact Choice, see poster in fig. 2) that aimed to stimulate young people and specially girls to choose math and science subjects at secondary education in order to be prepared for technical studies.



Figure 2. Flyer “Kies Exact”

This was based on the continuous signals from industry that there was a shortage in well educated technical employees. Although everyone knew the slogan, this appeared to have little influence on the actual choice of pupils. A governmental evaluation showed that the campaign did have influence on the attitude of young people towards technology, but that there was no influence on the choice for technical studies [5].

The campaign lasted until 1989 and was followed by one specially intended for girls, named *Een slimme meid is op haar toekomst voorbereid* (A clever girl is prepared for her future, 1990 – 1993). Also this campaign did not have the wanted results. In the contrary the choice for technical studies by girls proceeded to decrease. This is illustrated by an announcement on Dutch television in 2006. Here it was shown that while in 2001 still almost 20% of girls in secondary education chose for a technical profile, in 2004 this was not more than 15%. Comparable school levels showed the same decrease [6]! A rough conclusion might be that solely campaigns don’t work.

In 1998 the government started the foundation AXIS, funded by several ministries. This foundation was meant as a platform to promote studies and professions in science and technology. AXIS started and funded a lot of national and local projects; their activities were evaluated in 2003 (see [5]) and it appeared that now more successes had been obtained. In professional education more students were attracted for a technical study and less left their original choice. However this was still too little. It was recognized that it was necessary to accompany campaigns with educational renewal projects and creation of new attractive positions in industry. In 2006 over one hundred primary schools (out of 8000 in the Netherlands) already worked with educational material, developed in cooperation with Axis. One of the earlier projects was *Doorlopende leerwegen* (Continuous paths of learning) already established in 2000. A good example of that is given in [7]. Axis emphasized the fact that finding enough practical placements for secondary technical education students is a huge problem, but there are initiatives supported by Axis. E.g. *Jet-Net*

started as a collaboration of fifteen companies and almost one hundred schools that intends to make technical oriented subjects at secondary schools more attractive and helps to find internships. At this moment 30 companies and about 150 schools are involved [15]. During their existence, besides lots of initiatives and projects, Axis brought about quite a number of publications (over 50 in Dutch, some also in English) [8]. Especially the Axis publication “100 good practices” [9] describes a lot of initiatives, examples of attempts to reduce the problems around the choice for technology. The field is broad: from primary school to university and from traditional to modern and innovative enterprises. Most of those initiatives were encouraged by Axis, e.g. by supporting pilot projects. One of the idea’s that should be mentioned is the Human Technology concept [9. p 100]. On this concept the study Human Technology at the Hanze Hogeschool in Groningen [10] is based, but also the courses Human Electrical Engineering (HEE) and Human Mechanical Engineering (HME) within Fontys University are derived from this. Possibly one of the most well-known initiatives described in [9. p 56] is the FIRST LEGO® League (FLL). FIRST Netherlands started a pilot in March 2001. They followed the initiatives in the US, where in 1998 FIRSTsm (For Inspiration and Recognition of Science and Technology) began contests between robots, which became very popular. Three secondary schools in eastern Netherlands took part in the pilot. FIRST developed an educational module for secondary and vocational schools; teachers followed a workshop and concluding the theory and building of the robots a competition was held at the Twente University. Everyone was positive, more pilots followed and now the FLL is an annual event with 250 teams in the Netherlands.



Figure 3. Regional final of FLL at Fontys Eindhoven, December 2008.

For an impression of the league, see figure 3. World wide over 135,000 children from 45 different countries participate in the contests. See [11] for the Dutch organization, and [12] for the US version. LEGO Mindstorms (basic materials to

build the robots) has been successfully used at primary schools in Germany as a means to introduce young students into science and technology [13]. The approach as started by Axis, is further implemented in succeeding foundations. The *Platform Bèta Techniek* [14] served as the formal successor of Axis. Their aim is to ensure sufficient availability of people who have a background in scientific or technical education. This approach has been formulated in the *Deltaplan Bèta Techniek*, a governmental memorandum on preventing shortages. The ultimate purpose: to achieve an increase of 15% in pupils and students in scientific and technical education by 2010, and to use existing talent more effectively in businesses and research institutes. The aim is not just to make careers in science more appealing, but also to introduce educational innovations that inspire and challenge young people. It is impossible to enumerate all the platform's activities. These can be found on the extended web pages [14]. Only a small summary will be given. The platform's approach corresponds to the stages of education and employment that young people encounter, from primary education until job market. The questions put by the platform are: *What motivates young people? What attracts them to education and what advantages and obstacles they see in choosing science and technology?* We made an attempt to answer a small part of these questions in [1]. For primary and secondary education broadening technology is an important item. The ambition is to structurally embed technology in 2500 primary schools in 2010.



Figure 4. Girls playing with material from “Technology Towers”

Additionally it can be stated, that technology is already an obligatory subject in many primary schools in the Netherlands. In secondary and higher education e.g. experiments in science fairs are carried out. For vocational education a number of pilot projects were redesigned. Also attention is paid to fundamental innovation emphasising continuous education. One of the outcomes is the so-called “Fast lane” route, also mentioned in [1]. This implies that students from secondary vocational education can already follow lectures and practical assignments at a higher professional education institute in the last year of their study. Also in other ways (like doing a combined internship for both institutes) the total duration of the two

studies is shortened. Finally for the Job Market public and private mobility for innovation and employability is highly encouraged. Cooperating with the Platform is “*Jet-Net*”, with the intention to help the *Platform Bèta Techniek* achieving their targets by stimulating companies to set up interesting educational programmes for secondary schools. On the one hand these activities must result in the introduction of realistic industrial examples in the educational programme and on the other hand in giving a clear view of the future prospective of a scientific or industrial career. The web site of *Jet-Net* can be addressed via the *Platform Bèta Techniek* or at [15]. The Platform is still existing and very active in promotion (see the sponsor logo for this SEFI conference!) Many organizations are now part of the platform or allied to it.

2.2 Local initiatives

Since around 2000 a lot of local foundations were started. The information in this paper will be limited roughly to the southeast part of the Netherlands. For that particular part, again a scheme is given (figure 5). It is far from complete, but serves as a hold.

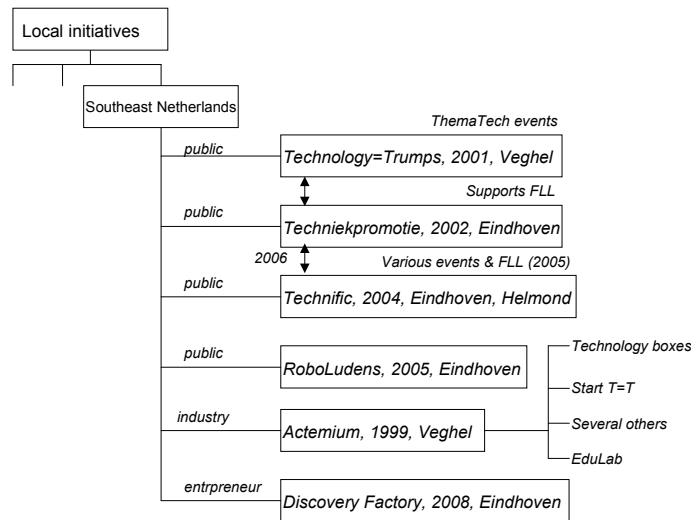


Figure 5. Scheme of local initiatives.

In 2002 the foundation *Techniekpromotie* (technology promotion) was established [16]. First activities implied the so called Circus of Physics and the Chemicals Show, both initiatives of Eindhoven University of Technology students. At this moment the foundation is a professional organization that displays various activities for children from 4 to 15. Their aim is to show that a career in science and technology is a realistic perspective. Main partners in the foundation are Eindhoven University of Technology, Delft University of Technology and University of Twente. Fontys University of Applied Sciences is their educational partner and

almost 20 regional, national and international companies take part in the foundation. Also the Utrecht University is involved, concerning the activities for the FIRST LEGO® League Benelux. Developments show, that local initiatives, like FLL become national. Actually, nowadays both the coordination and the organization of FLL in the Benelux are carried out by *Techniekpromotie*. The winning team in the Benelux may participate in the world wide final in Atlanta (US). FLL is meant for children from 8 to 14, but when children in the Netherlands have to make a choice for a study they are 17 or 18. So it is important that interest in science and technology that e.g. is created by events like FLL is maintained until they actually have to choose (preferably longer). With this argument in mind the FIRST Tech Challenge recently was introduced in the Netherlands [24], the first country outside the US where this has been organized.

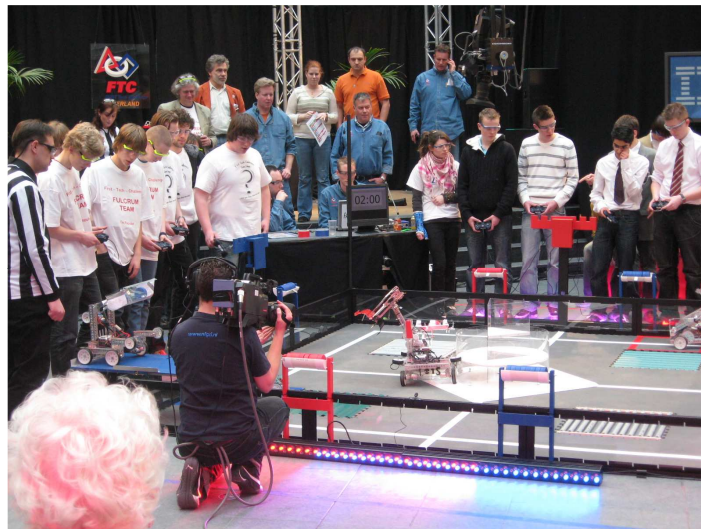


Figure 6. FTC Final in The Hague.

The FIRST Tech Challenge (FTC) is one of the robot competitions of the American non-profit organization FIRST, intended for pupils from 15 to 20. In the US FTC is running already for a number of years. About five different leagues, including FLL and FTC are organized there [25]. For participants in the contest a kit is available containing a set of mechanical components, motors and sensors, the LEGO NXT processor (same as used in FLL) as well as a choice from three software packages. Young people in the last year of secondary schools (including technical schools) form the target group. March 7th, 2009 the organization '*FTC-Nederland*' held their first challenge competition. Eight teams from four different regions in the Netherlands were present (see fig. 6). As the games were successful, now effort will be put in spreading the contests all over the country.

In September 2001 already, in Veghel a platform was established to consolidate technology as well as in education and in trade & industry in the east region of North-Brabant (southeast Netherlands). It was called *Techniek=Troef* (Technology

= Trumps) [17] and aims to interest (young) people for technology and so improve the offer of technical skilled personal at the labour market. The platform co-operates with many organizations and organizes several events each year. An example of this cooperation is that since a couple of years the foundation *Techniekpromotie* carries out activities at schools and organizes events for *Techniek=Troef* in the region Uden-Veghel in the southeast of the Netherlands.

In June 2004 *Technific* was established as a project office for the foundation *STEP; Stichting Techniek Educatie & Promotie* (Foundation for Promotion of Technology Education) in the region Eindhoven-Helmond, with partners as the community councils and Fontys [18]. They were aware of the fact that already lots of initiatives for this aim existed, but wanted to combine these activities and each other's promotion. Besides it organizes and coordinates events, in which young people from 4 to 20 can experience and discover technology. *Technific* is not only directed to the already mentioned target groups, but also to parents or guardians of the children. Whether they are aware or not, parents have large influence on the choices of their children. *Technific* was involved in many activities, e.g. *Waaninnige Karavaan* (insane caravan; see further). Besides they compose educational material for (primary) schools and were involved in organizing FLL in 2005. Since 2006 also the *Stichting Techniekpromotie* (mentioned before) is one of their partners. The three mentioned foundations are still organizing events, often in close cooperation. Another local initiative is RoboLudens [26], which is the name of the festival with which the *Robot festival Eindhoven foundation* wants to improve the level of innovation in the Eindhoven region. This is done by a playful combination of acting, seeing and informing. Not all robotic events are intended to attract young people to choose for science or technology, but in fact lots of young people in the region were involved in some way. In 2006 the RoboCup Dutch Open, a European robot soccer tournament was the central activity. See fig. 7.



Figure 7. RoboCup team preparing their robots for RoboLudens.

In the years after that, the RoboLudens festival intended to grow to a general Robot activity including culture, industry and art. Unfortunately this ambition did not come true. In 2007 the festival was organized on a smaller scale. April 2009 a modest event has been organized, mainly intended to interest future participants and possible sponsors for the big event to be held in 2010. Interesting detail is that two of the teams that participated in FTC in March showed their robots and competed with each other here.

A last interesting initiative to mention is the so-called *Ontdekfabriek* (Discovery Factory). [27] The *Ontdekfabriek* originated from *De Uitvinders* (The Inventors). Their intention is to get pupils acquainted with technology in an adventurous way. The website [28] is in Dutch but mainly consists of English subtitled video clips, showing what they are doing. One of the events organized by them was *Waanzinige karavaan*. Children had to build all kinds of vehicles with various traction systems. The products were exhibited in the Eindhoven town hall (fig. 8).



Figure 8. One of the creations for “Waanzinige karavaan”.

As mentioned before, *Technific* was one of the co-organizers of this event. During the same exhibition a number of “art & technology” products was shown. These were the results of IPD (Integrated Product Development) en KHS (Know how sharing) projects, created by Fontys and secondary technical education (ROC) students for *De Uitvinders*. For more information on these combined projects see [29]. The *Ontdekfabriek* is located in one of the abandoned Philips Factory buildings. The idea is supported by the Eindhoven community, the Chamber of Commerce and local companies. Several educational institutes are involved. Their concept: children discover a deserted factory and develop plans to re-use it. In the factory students, companies, artists, technicians and all kinds of inventors will experiment together with children; they will design and really build their inventions. Actions are now going on to develop a network of friends for the factory, so hopefully there will be funds to realize all the ideas.

2.3 Companies

Not only foundations or public organizations are active in the field of technology promotion, but also a lot of companies started initiatives. It is far beyond the scope of this article to mention them all, or even a number of them. Besides earlier mentioned *Jet-Net*, we will concentrate on one company that is also involved in learning activities within Fontys; Actemium in Veghel. Actemium (part of the VINCI concern) is a fast growing network of companies, directed to development and optimizing of industrial processes. Already in 1999 their first technology promotion projects took a start with sponsoring *Techniekkisten* (Technology Boxes) for primary schools. Since then they have been involved in projects for learning and working in technology, especially for primary schools and technical education institutes. An example is *Maak 't samen* (Make it Together) projects, so successful that it resulted in founding *Techniek=Troef* (described before) with Actemium as one of the founders. Activities were extended to more types of education, several excursions were organized and events as *Ingenieur voor de Klas* (Engineer in the Class room), later adopted by *Jet-Net* (see [19]) and *Girls in Control*, an event of *Girlsday* (see [20], with a summary in English [21]). Besides there have been many projects, more focussed on the exchange of knowledge. Actemium built some industrial systems that can be used for company courses, but also for training students of technical education (from basic to university), called *EduLab*. It is used for demonstrations to pupils from primary schools as well [22]. Around the systems a lot of projects and other activities (e.g. development of educational material, distance learning etc.) took place. An extensive description of the system and the use of it, also by the Fontys University is given in [23]. Finally it can be mentioned that Actemium is actively supporting events that are organized by *Techniek=Troef*, e.g. the *BodyTech* event that will be described in short in section 3.

3. A TECHNOLOGY EVENT EXAMPLE

Besides all the examples already given, some attention will be paid to The *BodyTech* event. As mentioned earlier *Techniek=Troef* yearly organizes technology events since 2001. They are called *ThemeTech*, having a different theme each year. The actual name of the project is determined by the theme of that year. In 2008 the theme addressed the human body in relation to technology, so the event was called *BodyTech*. For many weeks children were busy with the theme in their primary schools. In cooperation with local companies, secondary schools and technical universities, the theme was translated into workshops and demonstrations held in the public libraries of Veghel, Uden and two more places, where the children did much of the work on their own. In the workshops the children could do a lot by themselves. There were e.g. possibilities to measure one's own blood pressure, possibilities to practise on home trainers and a contest in making a body and technology related work piece. A workshop with Lego® Mindstorms was available for the winning classes. As every year, also this year a lot of children were attracted to participate or just to have a look.



Figure 7. Measuring blood pressure at BodyTech.

4. DISCUSSION

An interesting question is: will the ultimate purpose of the *Platform Bèta Techniek* be fulfilled by 2010? Next year we will know.

Without any scientific evidence yet, the authors believe that almost all of these actions do contribute to attract young people to technology and that they contribute to influence the choice for technical education. Still the effects of all the campaigns and platform activities are difficult to measure. We see that nowadays children are confronted with science and technology in a way adapted to their age, from primary education until the moment where they really have to choose. Existing gaps in this promotion have been filled by new initiatives. Local initiatives often result in national projects and there is a tendency of combining more initiatives. Being complete in this mash of initiatives, activities, platforms and companies involved with stimulating technology is impossible, even in a small country as the Netherlands.

However, an extendable overview of these initiatives (restricted to the Netherlands and mainly in Dutch) is available from the authors. We hope that it will grow the coming years. In addition, we would like to learn about the effects of comparable actions in other countries and hope others will have advantage from our experiences.

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