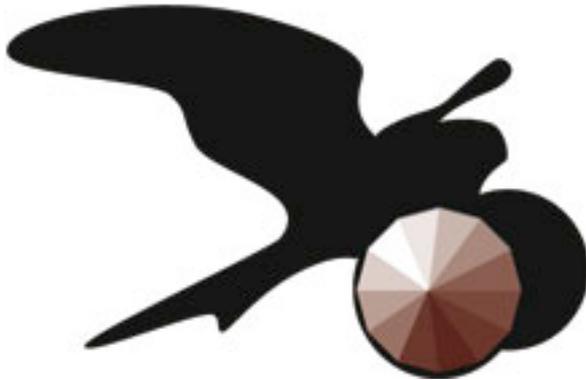




# Lifelong Learning Programme

Project title: **The Inventors**



Final Report

Public Part

## Project information

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Project coordinator telephone number: +31646382777

Project coordinator email address: [chris@chrisvoets.nl](mailto:chris@chrisvoets.nl)

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## Executive Summary

### **The need for a creative method to enthuse children for science technology and innovation**

All over Europe companies as well as Universities have problems recruiting the young for studies and professions in the field of technology, science and innovation. This will have enormous effects on the competitiveness of Europe.

The Inventors foundation has a unique and proven method to bring children into an imaginary world where they are challenged to be innovative. The method stimulates creativity, innovation and entrepreneurship with children and youth. This method is provided to a secondary target group being the teachers of elementary schools. Very often those teachers lack the affinity with beta subjects. This is a serious problem because in the traditional education system knowledge is transferred from teacher to student. Today teachers are expected to familiarize pupils with a wide range of information. The method of the Inventors provides teachers with tools to facilitate, stimulate and offer a context where an appeal is made to the creativity and entrepreneurship of the children.

The method is further developed in cooperation with secondary schools and schools of higher education. These (mainly technical) schools are the first to benefit when more pupils enlist. The Inventors foundation has partners at different levels of education to extend the learning line initiated in the primary schools into secondary education and vocational education.

The LLP Comenius Fund allowed us to adjust the educational material designed for Dutch children to use elsewhere in Europe and even in a developing country. It is successfully disseminated among participating schools in the Netherlands, Belgium, Sweden and Kenya. From the beginning of the Inventors Comenius project approximately six thousand pupils participated in the project. Based on the testimonials received, we can state that a large group of pupils were enthused for science, technology and innovation and that the method is suited for application in other than Dutch countries.

In cooperation with technical universities an additional method for secondary schools is developed generating a long-lasting line within education.

We are partnering with teachers academies to educate teachers in both primary and secondary schools on how to implement science and technology in the curriculum. Furthermore the Inventors presented the project in May 2014 at the Ecsite Conference in The Hague. Ecsite is a European network of science centres and museums, linking science communication professionals from more than 400 institutions in 50 countries. At that event we presented the successful outcome of this LLP Comenius project and the dissemination of its results in Europe.

Entrepreneurship is also a key element of the project. Not only do we stimulate it amongst students and teachers, we also aim to stimulate collaboration with companies and education.

Starting in 2014 ASML will disseminate the project of The Inventors in more than ten countries. ASML is a world leader in the manufacture of advanced technology systems for the semiconductor industry. ASML has more than 70 locations in 16 countries. Thus ASML employees are working all over the world. The Inventors in collaboration with ASML will use this wide network to disseminate the project of the Inventors in schools.

It is instructive to see a short film via the following link:

<http://www.youtube.com/watch?v=hakZfwuU6GA&feature=youtu.be>

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## 1. Project Objectives

The objectives of the Inventors project are:

- **To enthuse children for science, technology and innovation**

Using the unique existing method of the Inventors pupils are provided with open assignments in an adventurous context.

- **To spread an existing regionally developed successful educational method over Europe**

The successful method of the Inventors is integrated in various European educational systems allowing thus to benefit from regionally developed new methods.

- **To apply digital opportunities thus promoting the use of ICT in education**

The method that is developed for ICT use but also available for schools who are not yet using ICT were translated and adjusted for use elsewhere in Europe.

- **To effectuate the progressing process throughout different stages of education starting at elementary school up to higher education.**

Within this project successful methods will be connected thus creating a progressing long-lasting line within education.

**The ultimate goals are to promote creativity, innovation and entrepreneurship with children and youth.**

All over Europe companies as well as Universities have problems recruiting the young for studies and professions in the field of technology, science and innovation. This will have enormous effects on the competitiveness of Europe. The project brings children into an imaginary world where they are challenged to be innovative. The method stimulates creativity, innovation and entrepreneurship with children and youth.

Another crucial component of the project is The Inventors competition. Children think up inventions that they then present on a digital stage on The Inventors website. There they can canvas for votes for their entries. That generally takes place among friends and family. In this way, the child's immediate environment becomes involved in the project.

## 2. Project Approach

It is very important that children at a young age will have a positive experience with science and technology. It determines their future decision to choose an education or profession in this field of expertise (see report Roebroek & Snijders, 2003).

Unfortunately children's creativity, in the current education system, seems to decrease as they age. Luckily schools are looking for methods to promote creativity in the field of science and technology. Already prior to the start of the project, Stichting De Uitvindere had developed a unique but proven method (the Inventors method) to bring children into an imaginary world where they are challenged to be innovative. The Inventors method teaches children at young age to cherish their creativity. It allows them to research scientific solutions presented in an adventurous context. It enthralls them to create their own innovations and encourages them to promote their products.

### **Innovative use of an existing method**

Starting in 2005 Stichting De Uitvindere has created a method with several educational programs for primary schools. A method consisting of written stories that teachers read to the pupils. The pupils investigate the scientific and technological topics that are introduced in the stories. They make use of course materials and tools provided by the foundation. At the end of the story the inventors contest is introduced. Pupils have to invent and present a solution for a technical or social challenge described in the story. The pupils present their work on a public website where they can canvas votes for the competition. The entries that have managed to get the highest number of votes are invited to present their work to a jury during the finals that are organized in different countries. During the finals a jury elects the winners.

Finally the pupils will get to see a film in which the plot of the story is revealed. These films show special film props that have been created by students of vocational education, often in co-creation with technical industry. The purpose of the films is to showcase science and technology in a matter that appeals to the target group. Each story provides a programme for a specific school year / age group. Prior to the start of the project Stichting De Uitvindere had developed adventures for three different age groups:

- 1 The Inventors...The Drowned River (age 9-10)
- 2 The Inventors...The Hidden Eye (age 10-11)
- 3 The Inventors...The Wheel of the Sun (age 11-12)

When children reach the age over ten, they start to exclude studies and professions. It is important to start early with raising enthusiasm and after that retain that enthusiasm until they actually choose their definite study. This means the method of the Inventors has to be expanded to both younger age groups as well as elder age groups. In this way we achieved in the Comenius project a continuous learning line within education. This line starts in primary education, progresses to secondary education; this line was developed in co creation with vocational education and the technical industry.

The method now consists of in total five adventures:

- 1 The Inventors...In Africa (age 8-9)
- 2 The Inventors...The Drowned River (age 9-10)
- 3 The Inventors...The Hidden Eye (age 10-11)
- 4 The Inventors...The Wheel of the Sun (age 11-12)
- 5 Invented By... Livia (age 12-14)

The method of the Inventors perfectly satisfies future demands for ICT based education. It is developed for the Internet making use of multi-media (movies, etc.). The method provides content for interactive whiteboards and has interactive tools such as a forum for teachers. The pupils have personal accounts to present their projects to family and friends thus expanding the community of people involved.

### **A method progressing through different levels of education**

When children reach the age over ten, they start to exclude studies and professions. It is important to retain their enthusiasm until they actually choose their definite study. This means the method of the Inventors has to be continued during secondary education.

In collaboration with Stedelijk College Eindhoven (NL), Fontys University of Applied Sciences (NL) and The Technical Institute Sint Jansberg Maaseik (BE) the project has developed a method in line with The Inventors that is specific for secondary education. A new adventure was created in which a technical

company is introduced as an inspiring environment for pupils. Thus professional companies are portrayed as an inspiring and thrilling environment to work.

Within the Comenius project we created a new film with the title 'Invented By...Livia'. A feature film of about 20 minutes long. The story is about Livia, a 14 year old girl, who writes an essay for school. Livia has an older brother who has had a bicycle accident and therefore can no longer walk. Therefore Livia devises a plan to build a special bicycle for her brother. Together with fiends she will build it at her father's work. An engineering company with workshops.

The pedals of the bicycle are propelled by the hands while the steering is done with the legs. To compensate for the lack of strength in the brother's legs, the bike will be equipped with a electric motor that controls the bike. The driver wears a tilt-sensor on his body. When the driver is inclined to the left, this is measured by the tilt sensor that provides a signal to the electric motor. The electric motor subsequently steers the bike to the left.

The film displays that technology can play a significant role in our daily lives. The story particularly showcases that everyone is capable to come up with creative solutions regardless of age. The film is shown as introduction of hand-outs and workshops that challenge students to come up with their creative solutions. Various modular hand-outs were developed within the context of the story titled: "Invented by... Livia". The target group is first stage of secondary education. The hand-outs are modular so that teachers are able to choose which topics they want to include in their curriculum. The material will be widely offered to secondary education in the Netherlands and Flanders (Secondary Education).

To continue the method of The Inventors up to higher education Fontys University of Applied Sciences has integrated an existing activity titled "De uitvinding" into this Comenius project. Fontys has executed this activity successfully for several years for 1st year students of Fontys Engineering. The assignment to the students is to think of, evaluate and carry out their own inventions and finally present them to an assembly of teachers, representatives of industrial companies and the student's parents.

#### **A method to teach the teacher**

In addition to the development and implementation of new methods for different levels of education, it is important that those methods are embedded in an educational system. In the old system knowledge is often transferred from teacher to student. Today teachers should familiarize pupils to a wide range of information. The method of the Inventors gives teachers the tools to facilitate, stimulate and offer a context where an appeal is made to the creativity and entrepreneurship of the children. Often teachers find it to be a relief that they don't have to transfer knowledge and skills in science and technology. This is because teachers very often lack the affinity with beta subjects. For them science and technology are sometimes even frightening. Requesting them to be facilitators eases their personal insecurity.

#### **To spread a regionally developed successful educational method over Europe**

One of the main goals of this project is to investigate whether the method of the Inventors- to enthuse children for technology, science and innovation- is suited for implementation all over Europe.

After the successful start of the project in three countries we could already state that the method is indeed suited for application in other European countries. We participated to the Ecsite Conference (May, 2014 in The Hague, Netherlands). Ecsite is the European network of science centres and museums, linking science communication professionals in more than 400 institutions in 50 countries. Ecsite connects member institutions through projects and activities and facilitates the exchange of ideas and best practice on current issues. At the Ecsite conference we presented the findings of our project and promoted the use in other countries.

In the Netherlands the dissemination is a progressive process successfully continuing since the Inventors started in 2005. In Belgium the teachers of the technical institution Maaseik started to disseminate the method and will continue to do so after the end of this Comenius project. The partners in Sweden will continue to implement the method and disseminate it.

Starting in 2014 ASML will disseminate the method of the Inventors in more than 10 countries. ASML is a world leader in the manufacture of advanced technology systems for the semiconductor industry. ASML has more than 70 locations in 16 countries. Thus ASML employees are working all over the world. Stichting De Uitvinders in collaboration with ASML will use this wide network to disseminate the method of the Inventors in various schools.

## **Learning by doing**

The Inventors method applied in this project is based on adventures. Such an adventure introduces scientific and technical themes that appeal to the children's perception world. Gradually the pupils investigate their own knowledge of subjects related to science and technique that arise in the story. Using supplementary teaching letters, the pupils can research the material provided in an investigative way. The adventures challenge them to think up and implement solutions of problems provided. The programme is concluded with an inventors competition in which the children exhibit their own inventions on a website and then canvas friends and family to vote for them.

During the project reports from participating schools were gathered. This information was used to improve the project (by making practical adjustments to the educational material and logistics) and to get insight on different forms of education within different countries. All this helped us to apply adjustments needed to make the method applicable in additional countries.

### 3. Project Outcomes & Results

- **To enthuse children for science, technology and innovation**

From the beginning of the project until now approximately six thousand pupils participated in the Inventors project. Given the testimonials that we received from the teachers we are confident to state that a large group of pupils were enthused for science, technology and innovation.

- **To spread a regionally developed successful educational method over Europe**

The method of the Inventors was successfully disseminated over participating schools in the Netherlands, Belgium, Sweden and Kenya. In the near future the number of European countries to be reached will expand due to the collaboration and funding of ASML. Partners in both Belgium and Sweden will continue to implement the project into their curricula.

- **To apply digital opportunities thus promoting the use of ICT in education**

The method developed for ICT use is translated and adjusted for use elsewhere in Europe. Translations in other languages can easily be achieved.

- **To effectuate the progressing process throughout different stages of education starting at elementary school up to higher education.**

In cooperation with secondary schools an additional adventure/educational method is created thus extending a long-lasting line within education.

#### **Implementation of the method in primary schools**

Twenty-two Dutch, five Belgian, three Swedish and two Kenyan primary schools have implemented the method of The Inventors. In order to exchange experiences teacher gatherings were organized. There have been meetings in The Netherlands, Belgium and Sweden.

#### **Preparations second school year**

In the first year we intended to implement the adventure of The Inventors in Africa. In the second year of the project (School year 2013-2014) we were to expand this with the adventure of The Inventors and the wheel of the Sun. This meant we needed to translate this last adventure during the summer holidays in 2013.

In the Netherlands, two additional existing adventures were available (The Inventors and the Drowned River and the adventure of The Inventor and The Hidden Eye). The participating schools in the Netherlands, Flanders and Kenya felt the need for this additional material. That is why Stichting De Uitvindere made this material available to the project (this material was only available in Dutch).

#### **Inventors finals in Sweden**

The first finals in Sweden were organised by Pallettskolan-malarevagen in Lund on 28 May 2013. The pupils of Internationella Skolan Stockholm arrived the day before by train from Stockholm. The pupils of the International School of Lund-katedralskolan also participated in the finals. All participating groups presented their inventions in turn in a full gymnasium. There were wonderful inventions, presented with total conviction and bravura in a great setting provided by the host school. The exchange of experiences proved extremely valuable for both the teachers and the organisation. In the second school year the Internationella Skolan Stockholm invited the other schools to attend the finals. On 15 May 2014 the International School of Stockholm Region hosted a great final with participants from 3 different schools. The setup was that all the kids were able displaying their inventions in a mini exhibition, followed by presentations in the impressive auditorium of the school. In Sweden the schools chose to not really have a competition. All inventions are equally valuable.

#### **Inventors finals in the Netherlands**

The first Dutch finals in the Netherlands were organised on 4 June 2013 in the Ontdekfabriek in Eindhoven. Five finalists and their classmates were invited to attend. In the Netherlands, schools other than the participating LLP schools also took part in the competition. In addition, a Flemish school was invited to present its inventions. It appears that the Inventors Contest, thanks to its size and history, has considerable appeal for the children. The Flemish children of Primary School Opoeteren considered it a great honour to present their invention on an international stage. They won the second prize in these finals.

In the second school year the Ontdekfabriek in Eindhoven again hosted the finals on 17 June 2014. This was a great success as well.

### **Closing event of the Inventors in Belgium**

In Belgium, the secondary educational K.S.G. Harindis and Relindis was the host of a wonderful closing event. It took place on June 5 June 2013. The partners in Flanders decided to hold a closing event instead of a contest. This was because some schools had participated in the project but had not submitted entries in the competition. Also, not all schools had the opportunity to visit the event. Thus a genuine final could not be held. Despite all this, the closing event was a great success. Children could do experiments in a laboratory, could make pieces of work in the wood department, and take workshops in the electrical and metal departments. It offered Harindis and Relindis secondary educational institution a unique opportunity for profiling itself to children and parents in primary education.

And thus the project contributed to an important aim, namely developing an on-going teaching line. The secondary education host was seen by the primary schools as an important supplier of educative material relating to science and technique. The children in primary education became acquainted with a number of further education courses in a pleasant way.

Due to the successful event of 2013 Flanders organised the finals of 2014 in a similar way. Pupils together with their parents and teachers were given a tour through the technical school. The school that had just finished building bicycles that play an important role in the film called 'Invented By...:Livia'. The bicycles were assembled by the visiting students and tested by their teachers in view of all children. This was a hilarious closing of the 2014 Flemish finals.

Before we continue to describe what other activities we organized we suggest to watch a short film compiling the Inventors finals in The Netherlands, Belgium and Sweden. The film is digitally available as a deliverable and also on the Internet via the following link:

<http://youtu.be/HXih5v4whTM>

### **Other activities**

Next we describe what educational materials were developed for the film Invented By... Livia.

#### ***1 Think of an invention or tool for a disabled person***

Design assignment: Think of an invention or tool for a disabled person.

The idea is that the students choose a disability and think and develop a tool for this person. The workshop was developed, tested and implemented in secondary education in Eindhoven.

#### ***2 Invented by... De Theater-fabriek (The factory of theatre)***

The Theater Fabriek is a department of the Stedelijk College in Eindhoven. Students develop their own show based on the script of "Invented by... Livia". In addition, they may bring their own technical subject to the table or they can choose their own special effect that they want to use.

The goal is to let the students think interdisciplinary. Students who have affinity with theatre and expression will experience the role of technology in everyday life. In the ultimate case, it even provides collaboration between two disciplines when students as part of their theatre performance go ask for information or help with the teachers and students of the engineering department. The Stedelijk College has developed the modular hand-outs and will implement it in the curriculum.

#### ***3 Tilt sensor steering Handbike***

With the bicycle in the feature film "Invented by... Livia", the driver uses his hands to propel the bike and his legs for steering the bike. But because the driver mobility is poor, it is assisted by an electric motor. This auxiliary motor is controlled by a tilt-sensor. The driver wears this tilt-sensor on his body. When the driver is inclined to the left, the tilt sensor that provides a signal to the electric motor measures this.

To explain how such a tilt sensor works, a special workshop was developed in co-creation with the industrial company Neways. The materials to be used for this workshop will be made available in the future by Neways.

#### ***4 The ASML Lightwriter***

Chip technology is required for controlling the bike. But how is such a chip produced? Together with the companies ASML and the company BKL a demonstration workshop was developed where pupils in a game format discover that light transmitted through lenses and mirrors form the basis of the chip manufacturing process.

### **5 Invented by... Braintrigger**

Youngsters are innovating for real businesses. With Brain Trigger engage children and youngsters to work with challenges from real companies. They come up with innovative solutions that contribute to the goals of sustainability, mobility, safety and health. With Brain Trigger youngsters explore future opportunities in business, develop their analytical skills and experience the role of innovation in our society. The knife cuts both ways: Companies take advantage of the new, fresh perspective of youth on their innovation challenges. Moreover, they raise interest in future workers for their industries.

### **6 Invented by... Brainport Industries**

A group of 11 Brainport Industries companies have contributed a wind car to the Inventors project. This wind car was developed by a student of the Eindhoven University of Technology. This wind car is made up of several components that are produced by various companies. Companies can use multiple wind cars as gifts while Stichting De Uitvinders may incorporate this wind car as a modular workshop. The first presentation was during the High Tech Discovery route on 24 May 2014, which was a great success.

### **Kenya**

The cooperation with a number of Kenyan partners was of great value to the project. To start with there was the input of the Kenyan artist Cyrus Kabiru who makes art from residual materials. He does this with respect for the Kenyan traditions in which children make their own toys from an early age. Cyrus conceived a number of workshops for the project in which children in Europe make their own toys in a similar way. To test whether these workshops would actually catch on, for example with the Dutch children, a number of projects were executed at the Dutch school in Nairobi. These projects were carried out by social workers from Jukumu Letu which is an organisation that provides child care for the children of single mothers so that the mothers can go to work and make a living for themselves. The child care is organised in such a way that the mothers share tasks with each other. The staff of Jukumu Letu grew up in the slums themselves. In turn, their working with the Dutch children in Nairobi led to new workshops that later became part of The Inventors teaching pack.

The cooperation with the Swedish and Dutch schools in Nairobi also provided us with new insights. This is because "Africa" is an important theme in the project and it is very valuable to be able to produce knowledge and skills from the continent itself. One example we can give is an assignment in which the children were given the task to come up with a house for the desert. The children in Flanders, the Netherlands and Sweden had to rely on their imagination, but the Dutch school in Nairobi decided to spend the night in the desert with the children to give them experience.

In August 2014 Jukumu Letu introduced 'The inventors club of Jukumu Letu' in Nairobi. JLO established two inventors groups. One group comprises of the older siblings of the Jukumu Children from seven to fifteen years, that usually have holiday activities in the month of April and August, and, the second group was for the children at Jukumu Letu aged six to ten years. The first group met during the August school break and the other group met once a week to do activities in the course of the school term. The young inventor activities have helped the children become innovative and creative. Further, the program helped the children to become aware that they can recycle some of the materials considered as waste.

During the launch the children had the opportunity to watch the video of Jabali, the young African boy, who made his own toys in his workshop. After watching the video the children were very motivated and excited and as a result, they were aware of the main idea behind the "The Inventors in Africa" program.

The facilitators took the children through the instructions as per the guideline notes provided by de Uitvinders. The children were so excited by the idea that they could create their own toys.

After implementing the Inventors project within Comenius, Jukumu has future plans to continue the project. Jukumu Letu is grateful for the great opportunity that De Uitvinders has given them. They believe that their children have benefitted from the project and will continue to do so.

To summarize we are very confident to state that all targeted outcomes have been reached, all targeted products have been delivered and the results are promising given the fact that the majority of partners wish to continue the project and industrial companies have joined to further disseminate the method of The Inventors. Partnerships

The composition of the partnership is rather unusual for a European funded project. This partnership contains more than 20 schools for elementary education from a single country. Moreover the total number of project partners is unusual high (35).

There was good cooperation amongst the partners. They were very willing to make a success of the project. This above all applies for the partners in secondary and higher education. In primary schools we saw that a large degree of involvement mainly occurred after the start-up of the implementation of the method. The enthusiasm of the children seemed to inspire the teachers.

We will describe the efforts made by each partner.

### **Katholiek Secundair Onderwijs Maaseik-Kinrooi**

Cooperation with the The Technical Institute St. Jansberg Maaseik (part of the Catholic School Maaseik - Kinrooi) was particularly successful. The time invested by the staff went far beyond the amount of time estimated by the original application. When it became clear in the first year that a very valuable tool was being created with which the school could present itself to prospective pupils and their families, we saw increasing support growing for The Inventors projects internally. Most of the teachers of this school are aware of the need to attract future pupils. Above all for the technical subjects, which have a very good international reputation but amongst other things due to forced reorganisations see a drop in the number of pupils registering. Whereas in the past a lot of pupils found their way to this comprehensive school almost automatically, the institution now has to strengthen its contact with pupils in primary education. Thanks to the way in which The Inventors project is organised, it is an excellent project to use as an outreach programme. The primary school teachers are supported by the secondary education lecturers. The primary schools carry out the projects autonomously, but by organising the finals in secondary schools in a playful way, this creates intrinsic cooperation between primary and secondary education; cooperation that involves not only teachers but also parents closely. Teachers often ask parents for help to implement the projects at the primary school. In some cases we saw very fanatical parents who wanted to support their children during The Inventors competition. They were very involved and well represented during the finals of the competition. Those finals are organised in such a way that the parents are given a guided tour of the comprehensive school. In this way the institution gets a unique opportunity to present itself to parents who play a very important role in the choice of studies after primary school.

We saw that the pupils involved from the Technical Institute St. Janbsberg Maaseik proudly presented their work to the children of the primary schools. During the second finals, the projects on which they had worked were finished. The pupils were asked to present their work to the primary school children themselves. They were immensely proud to show their projects that are almost never shown in public to the children. And thus the project succeeds very well in the idea of the learning-teaching trajectory that transfers a passion for technology and innovation to future technicians.

### **Flemish Primary schools**

The Flemish primary schools were very closely involved in the projects. The fact that many Flemish primary schools want to continue the project reaffirms this. The feedback that we received from Flemish teachers was very valuable. To start with we saw that the lack of technical instruction in primary education is a major problem. One of the headmasters involved indicated that this is largely due to the feminization of education. However, the way that The Inventors project is set up means that even teachers with little knowledge of technology feel completely at home. As a result of the major cross-subject nature of the project, teachers can concentrate on facilitating the children. The children themselves go on a journey of discovery and on the way in a rich cultural context learn how technology and innovation play a role in the adventure.

We also heard, just like in schools in the Netherlands and Sweden, that the social nature of the project is very strong. Pupils work together on the assignments in teams. Pupils learn

from and about each other. For example there are pupils who have certain technical or creative abilities that normally do not get a chance. In The Inventors projects it is precisely these skills that are applied to and strengthened. Children whose talents lie in these domains discover this thanks to The Inventors projects. And not only those children themselves, but also their classmates discover this. So the pupils gain appreciation from their classmates thus increasing their sense of self-worth or as one of the teachers put it: "Thanks to The Inventors projects, the wallflowers come to life".

### **The Swedish schools**

We also saw great involvement in the projects in the Swedish schools. During the first visit by the project managers to one of the Swedish schools the project's impact was immediately visible. For example, the pieces of work made in The Inventors projects could be seen everywhere in the schools. They had clearly been worked on with a lot of love and attention. The way in which the finals were organised was also proof of the great degree of involvement. The teachers of the organising school had put a lot of time and attention into turning it into one big party for its own pupils and the guest pupils and teachers. When writing the initial plan, the project management had not realised that travel times in Sweden between the various schools can be enormous. Nevertheless, the teachers and pupils sometimes travelled more than eight hours to visit each other for the finals. There is a very amicable ambience amongst the teachers involved. That is partly why the teachers themselves decided to take over the role of host school from each other: to lighten the workload and offer the pupils the opportunity to also visit the other school. In the Swedish teachers we saw a determination and willingness to continue The Inventors project in the future.

### **The Dutch primary schools**

The Dutch teachers really appreciate the project. Dutch teachers have a strong opinion of their own and are less susceptible to hierarchical structures than their Belgian colleagues for example. The teachers have to appreciate the project in order for them to adopt it. Only then does it have a chance of succeeding and are they prepared to implement it in the curriculum with the right motivation.

The enthusiastic teachers were extremely willing to share their knowledge of and experience with the project with their colleagues from other schools. Unfortunately, Dutch teachers generally have a major lack of time. That is why it is very difficult to organise meetings within a network. Initially we thought that a good digital network would offer a solution. The advance of a digital network is that the teachers themselves can decide when they use the information and that no time is lost travelling. However, in practice it was difficult to set up such a network. Schools often protect their computer systems against social media so that it is sometimes even difficult for teachers to use them.

However we may nevertheless say that the project was very successful because there is apparently a need for good technical education projects. A major condition is that they are offered for free and that the teacher can reserve time in the curriculum to implement the projects. At the moment that is very difficult since teachers already have the greatest difficulty in executing the compulsory subjects. We expect this to change in the future when technology becomes a compulsory subject in primary education in 2020. In the run-up to this, but certainly also when Technology has become compulsory, the knowledge and experience of The Inventors project will be of great value.

### **The Stedelijk College**

Just like its Flemish counterpart, the Stedelijk College really is aware of the importance of technical education and promotion in secondary education. Not only must a link be made with primary schools but internally more attention must also be paid to the technical subjects. This is because pupils do not choose their definitive subject until after the first orientating years. We see that the Technology department within the Stedelijk College is looking for

ways to create a distinctive positive profile for itself within its own institution. It does this amongst others by reacting to contemporary developments such as for example 3D printing. This topic was given a role to play in the latest adventure of The Inventors which was developed especially for secondary education. For this a sponsor was collaborated with who specialises in this technology. When it became apparent that both in Flanders and the Netherlands there is a need for knowledge amongst project partners in secondary education, we held a meeting to exchange this specific project knowledge. This also provided the sponsor with great insight in schools' wishes to implement this new technology.

Another way in which the Stedelijk College is internally creating a distinct profile for itself with technology is with the cross-subject activity "Invented By..." This activity was part of The Inventors Comenius project in cooperation with the lecturers of the Theatre department. Here we let pupils discover the role technology plays in film and theatre. In this way we challenge pupils to find connections within the discipline of theatre with other disciplines, in this case technology.

The Inventors projects coincided with the Stedelijk College moving to a new building. One of the goals of this move was to let technology present itself more clearly internally within a transparent organisation of the newly constructed building, a structure in which pupils naturally come into contact with the various disciplines. These internal developments at the Stedelijk College really correspond very well with the project targets of The Inventors. Partly as a result of this, there was great involvement by the management and the lecturers. On the other hand, we saw that the redevelopment and actual move were accompanied by a lot of extra work so that the staff sometimes had to work against the clock. In the meantime the move has been completed and the fact that the cooperation with The Inventors is being continued indicates that it is a fruitful cooperation. Within this continuation of the cooperation with The Inventors, a work of art is being made for the new atrium. This work of art, a Pegasus that thanks to technology will be able to move, will be the eye catcher of the atrium. In mythology the Pegasus symbolises creative art. But in the execution we will emphasise the technical aspects and explicitly show the drive mechanism. In the spirit of The Inventors projects, the Stedelijk College is receiving pupils from primary education and giving them the assignment to write a story inspired by the Pegasus project. In this way, the Stedelijk College hopes to make children enthusiastic about both creative and technical subjects from an early age. In the latter project, cooperation is being sought with the Summa College in Eindhoven. The Summa College is a technical school such as the technical institute in Maaseik (Flanders). Within the framework of the learning-teaching trajectory, pupils of the Summa College create this work of art whilst the technical business sector is also cooperated with. With this cooperation, that is the result of The Inventors Comenius project, the creative and technical competencies of pupils are appealed to at an early age so that technical schools such as the Summa College and project partner Fontys can later reap the benefits. To this end it is very important that these technical schools create a distinctive profile for themselves in the process and are involved and remain so.

### **Fontys**

The cooperation with Departments of the Fontys University of Applied Sciences within the project was very successful. Two of the board members of Stichting De Uitvinders are affiliated with Fontys, so that within the project management we were constantly kept informed of the progress of the project.

The cooperation with Fontys also offers a valuable link to trade and industry. Trade and industry often looks for cooperation with engineering schools for reasons of Human Resource Management.. For example with "The Invention" method students present their own invention to representatives of trade and industrial companies.. We also involve trade and industry in the cooperation of The Inventors with technical schools. And this is bearing fruit. For example after The Inventors Comenius project we witness a very valuable project for cooperation with companies and sponsors which we will describe in more details below. In addition to a number of technical and engineering courses, Fontys also offer a teacher training course. This course anticipates that Technology will become a compulsory part of

the primary education curriculum in the future. The primary schoolteachers, who are now being trained with the Fontys PABO course, will have to teach Technology in the future. This is partly why the Fontys PABO (teacher training course) cooperates closely with The Inventors. Within this cooperation, a student of the course was given the assignment to carry out the evaluation of The Inventors Comenius project.

### **Third Country Participation**

The cooperation with a number of Kenyan partners was of great value to the project. The Inventors method was implemented at the Dutch and Swedish schools in Kenya. It proved more difficult to implement the project at the Swedish School during the second year of the project. The reason for this is that the headmaster who had initiated the project moved back to Sweden for family reasons. Thus the project management no longer had a direct link with the person responsible for the project. Then it became apparent that it is very difficult to manage a project remotely at such a great distance.

Luckily the organisation of Jukumu Letu was very happy to take over the partnership which itself was an enrichment of the project since we now get the experiences of children who themselves grew up in the slums. In turn, this special feedback is of great value to the aforementioned project of The Inventors in cooperation with ASML. This new joint venture with this large technical company is entirely inspired by the cooperation with the Kenyan partners. The fact that a former trainee successfully executed the project called 'The Inventors in Africa' in Kathmandu, Nepal has strengthened us in our resolve to further internationalise the project.

The African element is also of great value to the European teachers. It gives them the opportunity to also work on the project within the subjects of Geography and World Studies. This cross-subject aspect is very important for The Inventors.

### **Technical Industries**

An important collaboration involves about a dozen companies that cooperate in an association called Brainport Industries. This association has adopted a project of the Inventors to promote their association and enthuse children for technology at the same time. This was successfully presented in May 2014 and will be continued in 2015. Thanks to the method of The Inventors this association will seek ways to incorporate promotional activities in education because they are aware that in order to recruit future employees they have to work together and take part in education.

#### 4. Plans for the Future

In addition to the organisations' knowledge of education demands on the topics addressed we will research markets in other countries. Each country has its own demands, targets and requirements to which all schools adjust their curriculum. To provide a new method for these new markets requires knowledge and insight. In the final phase of the project, the recommendations are described to ensure further successful use in other countries. We will use input from the survey among participating teachers for these recommendations. Besides expanding and thus investigating whether the method is suitable for other countries, we also seek connection with preschool and secondary school. It is very important to generate a line of development starting in preschool, perpetuated through elementary school, on to professional education. In the future the project can spread over Europe. In Belgium, collaboration has been initiated with the Catholic High School Limburg which is interested in using The Inventors project for refresher courses for teachers. This seems a good possibility for continuing The Inventors project in the future.

As mentioned earlier in collaboration with ASML we will disseminate the method of the Inventors globally. ASML is the world's leading provider of lithography systems for the semiconductor industry, manufacturing complex machines that are critical to the production of integrated circuits or chips. ASML's corporate headquarters is in Veldhoven, the Netherlands. Manufacturing sites and research and development facilities are located in Connecticut, California, Taiwan and the Netherlands. Technology development centres and training facilities are located in Japan, Korea, the Netherlands, Taiwan and the United States. Overall, ASML has more than 70 locations in 16 countries.

ASML employees are working all over the world. We use this wide network to disseminate the project of the Inventors and make it an ASML project to strengthen the bond between colleagues and their families and advertise ASML's core values.

As the method of The Inventors has proven to be easily spread in Europe we are confident, once translated, it can be used in education all over the world.

ASML is a company that depends on the knowledge, innovation and creativity of its employees. Those values allowed ASML to grow to a global company so innovative it drains talent from all over the world. With this project we internationally enthuse children for science and technology and train the next generation of inventors. Inventors that help develop their local society and come up with technologies that solve environmental problems. Or they might become future ASML colleagues.

Via the network of associating science centres (VSC) The Inventors promote their projects. In some cases Science Centres have their own programs to stimulate science and technology. We will seek ways to combine these projects so children can benefit from the Inventors method via other channels.

Typically we see that science centres have outreach programs to offer to neighbouring schools. Thanks to the presentation on the international Ecsite conference European science centres learned of The Inventors proposition. Parts of the Inventors program are also very suitable for the leisure component of science centres. This benefits the goals of the project. Not only will students via schools be involved but also children and their parents during their leisure time. Contribution to EU policies

#### **The project contributes in the following ways to key EU policies:**

The project cooperates with teachers academies to educate teachers in both primary and secondary schools on how to implement science and technology in the curriculum, thus it contributes to the policy concerning initial and continuous training of teachers, trainers and education.

The project has a unique and proven method to bring children into an imaginary world where they are challenged to be innovative. The method stimulates creativity, innovation and entrepreneurship with children and youth, thus it contributes to the policy concerning the acquisition of key competences throughout the education and training system.

#### **Allow Europe to benefit from regionally developed methods**

The method of The Inventors and Invented By... is regionally developed using both regional and European funds. Further developing and disseminating the project will allow the whole of Europe to benefit from these initial investments.

#### **Different European cultures unite in a world-oriented theme**

The Inventors Foundation has experienced that there are still large cultural differences between European countries making it hard to cooperate. In this project we unite European cultures. We came up with the solution of placing a new adventure outside of Europe. Obvious cultural differences within Europe vanish when Europeans meet in other parts of the world. Unity emerges on other continents when Europeans recognize themselves in their mutual cultural heritage. Children all over Europe can identify with a western girl growing up in Africa.

#### **Creating an international podium**

Now the method is used in several European countries the project is even more appealing to pupils, teachers and companies. This international podium makes it more appealing for the pupils to participate in the project. This is very important for one of the reasons why science and technology are not popular in education is because children and most of all parents think of these subjects as being 'non sexy'. Using successful methods of the popular media will help change this negative stigma.