



Project No. 020778

Roberta-EU

Roberta Goes EU

Final Activity Report

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Duration of Project 39 months

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Project Coordinator Organisation: Fraunhofer IAIS

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1 Project Execution

Motivation and idea

Roberta-EU addresses the lack of female engineers by raising girls' interest for technical professions. Roberta-EU uses robotics courses as a creative learning environment to teach knowledge in IT, electrical engineering, and mechanics. The Roberta course concept is especially tailored towards gender related issues, i. e. the didactic approach selects topics and experiments that are more interesting for girls. This learning environment is well suited to create interest and even enthusiasm for technical subjects. Robot construction kits allow for a hands-on introduction to technology by letting children try things out for themselves. By designing, constructing, programming and testing mobile robots, children experience that working with technology is a creative, interesting but not trivial process. This innovative learning environment helps them to gain knowledge in IT, electrical engineering, mechanics and robotics. Additionally, constructing and testing robots in a team work setting is an ideal instrument to train those types of competences and soft skills that are important for technical development processes. The attractiveness of robots helps to overcome inhibitions, because the playful approach reduces scepticism. Children become fascinated by robot development, which encourages their interest in the subject. They learn and experience how technical systems are developed.



Figure 1: Different types of Roberta models

Approach

The Roberta course concept and its didactic material was developed in the German research project “Roberta – girls discover Robots” (2002-2006). Roberta-EU adapted this successful concept to be used on a European level. The approach can be briefly summarized as follows:

1. Providing gendered didactic material to teachers as a resource from which they can design and assemble courses tailored to the individual local needs. For Roberta-EU, the original material was translated and adapted to meet requirements of the project.
2. Teaching and certificate the teachers (also called Roberta course instructors) in special training courses to use robot construction kits as a means to teach interdisciplinary technical contents, especially - but not only - for girls.
3. Teach the Teacher Training. Enable outstanding Roberta teachers to become so called Roberta coaches (also called course directors). Roberta coaches are qualified to teach and certificate other Roberta teachers in close relation with the Roberta headquarters.
4. Setting up a network of Roberta Regional Centres, which promote the ideas behind Roberta and provide teacher trainings, Roberta courses, teaching material and advice. Roberta Regional Centres normally operate in a limited regional area.
5. Assessing, documenting, and evaluating experiences made in courses performed in the new Roberta Regional Centres. This provides essential data and arguments for raising public awareness and promoting the inclusion of Roberta didactic course elements into national curricula.

Gendered didactic material

The Roberta didactic material »Roberta series« documents the Roberta concept. The series in German has been developed by Fraunhofer IAIS and partners and was funded by the German Federal Ministry of Education and Research. All texts and figures of the didactic material (for the RCX Robotics Kit) have been translated to English, Italy and French.



Figure 2: Roberta series

The new and more advanced robot construction kit LEGO Mindstorms NXT has been introduced to the market after the start of the project. Therefore, an adaptation of the original didactic material, which was based on the LEGO Mindstorms RCX system, has to be done first. This caused an unavoidable delay in the translation and adaptation process of the German Roberta material to foreign languages. Especially volume 3 (Programming with Java) and volume 4 (Themes and Experiments) of the Roberta series were delayed. The following list summarizes all available volumes of the Roberta series:

Vol.	Type	Title	Language
1	RCX	Basics	GE, ENG, IT, FR
1a	NXT	Basics	GE, ENG
1b	NXT	NXT Basics and Experiments	GE, ENG
2	RCX	The Simulator RobertaSim	GE, ENG, IT
2	NXT	The Simulator RobertaSim	GE
3	RCX	Programming with C and Java	GE, ENG, IT
3	NXT	Programming with Java	GE
4	RCX	Themes and Experiments	GE, ENG, IT
4	NXT	Themes and Experiments with NXT	GE
5	RCX	Roberta course directors training	GE, ENG, IT
5	NXT	Roberta handout for course directors	GE

Teaching the teachers in special training courses

The Roberta concept demands that the course directors consider gender-specific differences during their course planning and delivery. These differences relate both to the participating girls and boys and to the course directors themselves. In a Roberta teacher training information and recommendations are given concerning gender-sensitive course organization. The recommendations are based on the results, experiences and observations made within the Roberta project and take into consideration relevant educational research. Much of it is based on the results of the study group »Digitale Medien in der Bildung« [Digital media in education] (DiMeB) of the University of Bremen, that have been published, among others, in [Wiesner & Schelhowe, 2004].



Figure 3: Roberta teacher training

Self-confidence is of central importance, confidence in a subject contributes more to success than interest in it. Girls, however, tend to have less confidence in their technical abilities than boys. Hence this lack of confidence must be the focus of the teaching.



Figure 4: Roberta course at the Hannover Fair 2008

Roberta Network Structure

The Roberta headquarters (Fraunhofer IAIS) trains and certifies Roberta course directors. The Roberta course directors train and certify together with the Roberta headquarters each Roberta course instructor. Usually, together with the installation of a Roberta Regional Centre a certain number of Roberta teachers has been trained and certificated. These Roberta teachers are connected to their Regional Centre. Only certificated Roberta teacher are allowed to deliver Roberta courses to ensure the quality of the courses.

The Roberta Regional Centres coordinate and support the Roberta teachers in their area. Furthermore, on request they support Roberta teacher by lending robot construction kits from their pool for use in the Roberta courses. It is intended to promote both the regional and the supra-regional exchange of experiences and in the long term Roberta Regional Centres lead to a concentration of individual activities (e.g. setting up and coaching Roberta Teams to participate at Robotics competitions).

During the project 12 Roberta Regional Centres have been established in 5 European countries:

- United Kingdom
- Italy
- Sweden
- Austria
- Switzerland

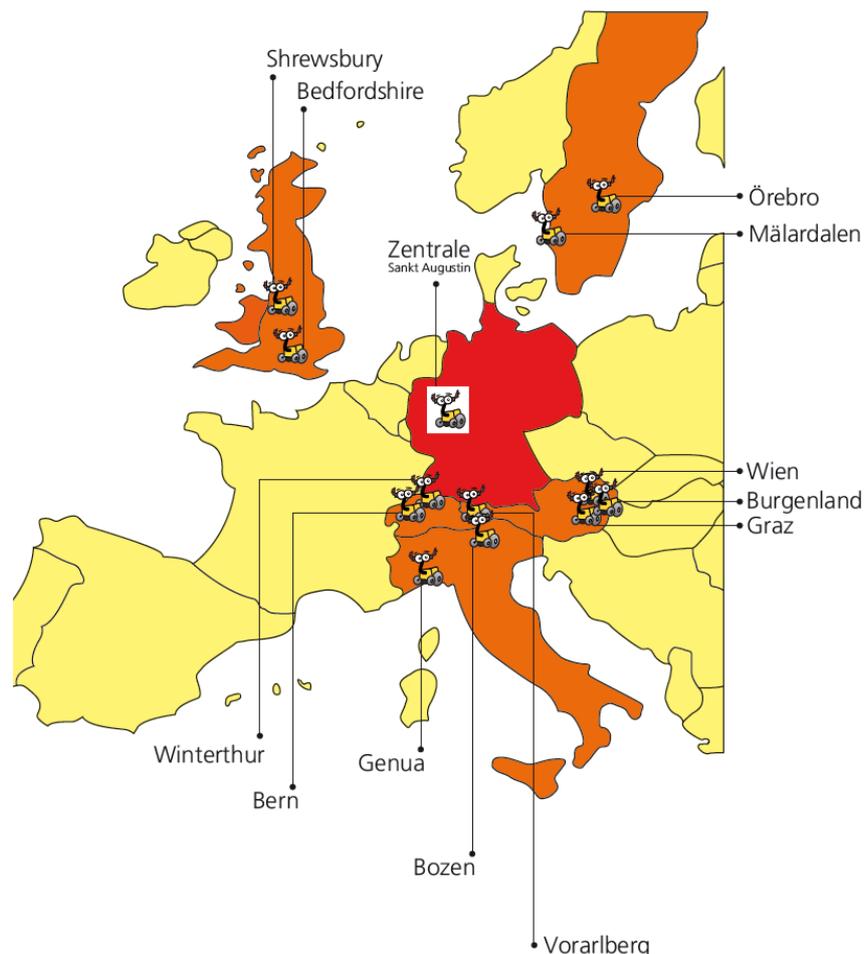


Figure 5: Roberta Regional Centres

No.	Roberta Regional Centre	Country	Date
1	Burgenländisches Schulungszentrum, Neutal	AT	17 May 2006
2	Pädagogische Hochschule, Bern	CH	17 May 2006
3	FH Winterthur, Zürich	CH	17 May 2006
4	Pädagogisches Institut, Bolzano	IT	17 May 2006
5	FH Joanneum, Graz	AT	18 July 2006
6	Zentrum für Interaktive Medien und Diversity (ZIMD), Wien	AT	09 November 2006
7	Belvidere School (A Training and Technology College), Shrewsbury	UK	23 October 2007
8	University of Örebro, Örebro	SE	29 October 2007
9	Scuola di Robotica, Genova	IT	28 February 2008
10	Lernlabor, Vorarlberg	AT	11 April 2008
11	University of Mälardalen, Västerås	SE	22 May 2008
12	SETPOINT Bedfordshire & Luton, Ampthill	UK	17 October 2008
13	Ecole Polytechnique Fédérale de Lausanne (EPFL)	CH	05. March 2009

The additional Roberta Regional Centre at the Ecole Polytechnique Fédérale de Lausanne (EPFL), Switzerland has been founded shortly after the end of the project. Fraunhofer IAIS plans to extend the Roberta network of Roberta Regional Centres in future. The following figures from the Roberta Regional Centres founded during the project document the strong interest in the Roberta concept.

- A total of 234 teachers have been trained to be certified Roberta teachers. The actual number is higher, since the Roberta Regional Centres train additional persons to become Roberta teacher after the end of the project.
- A total of 206 Roberta courses have been delivered during the project. The actual number is higher, since the Roberta Regional Centres continue to perform courses.
- More than 2800 children have participated in Roberta courses during the evaluation phase of the project. We estimate the actual number of reached children and especially girls to be several thousands.

Assessing, documenting, and evaluating experiences

The evaluation of the Roberta Regional Centres was performed by two assessments one for the German-speaking Roberta Regional Centres and one for the non German-speaking Roberta Regional Centres. The assessments were performed by the University of Bremen.

Findings of the assessment of German-speaking Regional Centres

On the whole, the project course is reflected positively. The establishment of Regional Centres in the participating European countries and the Roberta courses conducted so far can be deemed a success. Practically all the participants enjoyed the Roberta courses and developed more self-confidence by participating in them. Almost all the participants got interested in technology and acquired some programming knowledge. This refers without exception to each age and to participants with different social backgrounds. As far as the influence on the choice of a profession is concerned, many of the Regional Centres involved find it important to bring the children in contact with Roberta already before they reach puberty.

Most of the Roberta courses were offered as optional or as elective mandatory subjects within or outside schools (e. g. in institutions of higher education). Possibilities of implementing Roberta in schools are e. g. the interdisciplinary integration in elementary schools or the integration into the optional or elective mandatory subjects offered in secondary schools in the fields of technology, mathematics, natural sciences or choice of profession. Especially the connection with ICT guidelines in curricula and the general open-mindedness of the teachers to undergo training and further training in this field are decisive for the sustained integration of Roberta into the curricula.

The Roberta teaching material has generally been judged positively. A culture-specific demand for modification could not be established so far. The majority of the course directors consider LEGO Mindstorms a suitable technology and RIS a suitable programming language to arouse a programming and technology interest particularly in girls.

The assessed Regional Centres have a well working network with cooperating schools on a regional level. In addition, the majority of the Regional Centres directors wish to establish an international network under the prerequisite that the additional network stresses the already scarce time and money resources as little as possible. Several sides expressed the wish to think together about continuing the evaluation. This would ensure the course quality on the one hand, and on the other hand increase the commitment of politicians and potential sponsors.

Findings of the assessment of non German-speaking Regional Centres

In summary, a successful tenor and a positive attitude towards the implementation of and work with Roberta can be recorded. As could be shown, the Regional Centres concentrate on different aspects - like e. g. the conduct of courses or the integration of Roberta into the teachers' training. Clearly visible are in any of the Roberta Regional Centre directors questioned a good understanding of the objectives pursued with Roberta and a personal identification with the project. As had been determined in the evaluation report of the German speaking Regional Centres, long-term studies in some selected Regional Centres would be required to make the tenor and effect of Roberta traceable by means of the biographies of individual participants, to further observe them and to be able to comment on the

sustainability of the project objective i. e. to pave the way to technical and scientific studies for more girls.

Taking into consideration the didactic material, it can be noted that the objective was achieved to make girls enjoy technology. It must also be highlighted that all in all, a few more girls than boys participated in the Roberta courses and that - according to the Roberta Regional Centre directors - part of the participants can imagine to take up a technical profession later. Whether this goal is actually realized should be the key question of a long-term study.

According to Regional Centres, the restriction of the Roberta courses exclusively to female participants can principally not be advocated since the related exclusion mechanisms don't seem to be conducive. Suggestions for the extension of Roberta to younger age groups or to courses for all generations were expressed.

The integration of Roberta into the curricula is felt to be very desirable by 80% of the Roberta Regional Centres, the actual practicability within the existing school systems, however, is considered as critical. The didactic material is used enthusiastically and found to be very good and helpful.

Web Portal, Presentations, Awards

During the project several means have been taken to promote Roberta within Europe. As consequence Fraunhofer IAIS has to cope with very good interest in Roberta even after the end of the project.

- The Roberta web portal is online at www.roberta-home.eu. Several mailing lists for internal and external communication with collaborators and partners have been set up and maintained.
- The Roberta idea has been promoted by presenting talks and demonstrations at conferences, exhibiting Roberta at scientific fairs, and motivating girls to participate in robot competitions like RoboCupJunior.
- The Roberta Regional Centre established in Vienna received the “Award for Equal Opportunities in IT”
- The Roberta Regional Centre in Rome received the “Women & Technology Award”



Figure 6: Roberta internet portal - www.roberta-home.eu

2 Dissemination and use

To ensure the quality of the developed Roberta courses, the Roberta teacher training and the Roberta network, Fraunhofer IAIS has set-up quality rules and regulations. Gender-specific robotics courses have to fulfil the Roberta principals which are based on the results of the German research project “Roberta – girls discover robots” and the evaluations done in this project. These rules apply to Roberta teacher trainings, Roberta teachers (course instructors) and Roberta courses. Roberta coaches (course directors) which are eligible to give Roberta teacher trainings are selected and trained by Fraunhofer IAIS only.

On the basis of the results of the project Roberta-Goes-EU new didactic material, dissemination instruments and projects are under consideration.

- Extending the Roberta didactic material by adding new volumes in the Roberta series covering new experiments and topics.
- Extending the Roberta network by establishing new Roberta Regional Centres to disseminate the results of the project to more European countries. Fraunhofer IAIS got requests for Roberta form additional European countries and from countries outside Europe. After the end of the funded project, the start of a new Regional Centres requires a license contract with Fraunhofer IAIS.
- Roberta Academies and Roberta Ambassadors have been started recently in Germany to promote the Roberta concept. Roberta Academies offer Roberta starter courses on a regular basis in their workshop program for schools. Roberta Ambassadors are well-known people from science, industry or politics who help to disseminate the information on Roberta in their region or sphere of influence.

Further development and research

The assessment of the University of Bremen has shown, there are two major recommendations concerning the project Roberta-EU:

- Bring the children in contact with Roberta already before they reach puberty (Suggestions for the extension of Roberta to younger age groups or extension of Roberta courses for all generations were expressed).
- The integration of Roberta into the curricula is felt to be very desirable but have to be done on a national basis within the European countries.

The project Roberta-EU was the first major step to bring Roberta to Europe. The positive feed-back from the now larger network and the results of the independent assessments by the University of Bremen motivate Fraunhofer IAIS to further invest in an extension of the Roberta network and the didactic material. Fraunhofer IAIS will concentrate on theses issues in future and will take care on the quality assessment of the Roberta teachers, courses and materials.