Contract Number 021028

WasteWaterResource

Play with Water: Introducing Ecological Engineering to Primary Schools to Increase Interest and Understanding of Natural Science

Instrument: Coordination Action (CA)

Thematic priority: Science and Society; Science education and careers 2004; FP6-2004-Science-and-society-11

Executive Summary of Final Activity Report

Period covered from 1.11.2005 to 30.6.2008

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Project co-funded be the European Commission within the Sixth Framework Programme		
Dissemination Level		
PU	**Public**	X
PP	Restricted to other programme participants (including the Commission Services)	
RE	Restricted to a group specified by the consortium (including the Commission Services)	
CO	Confidential, only for members of the consortium (including the Commission Services)	

Executive summary

Summary description of the project objectives

The aim of this Coordination-Action was to assemble and assess teaching and demonstration material based on ecotechnological research and methods. The material consists of four different biological systems that were adapted in order to work in a classroom and enable pupils aged 10 to 13 years to discover basic concepts of ecology and obtain hands-on experience in the cycle of elements in nature, and thus the potential of wastewater as a resource.

These classroom systems result from the project contractor's research in nature-based systems, and reflect today's state of the art ecotechnology. The systems developed by the partners represent not only a way to handle waste and wastewater or to reuse nutrients; they are also highly suitable to demonstrate the paths of waste in nature and its influence on the ecosystem.

The classroom systems are designed to be low cost and easy to assemble and maintain by the children. They serve as motivation tools to ask questions about nature, to experiment with ecosystems, measure and interpret data and thus explore the natural processes and even, in a first moderate step, to experience hypothesis driven research.

Due to the universal appeal of nature to children these systems have a great potential to integrate both sexes as well as "disadvantaged and underperforming" groups such as immigrant children.

Contractors involved

The consortium consists of Zurich University of Applied Sciences (HSW/ZHAW), Switzerland, Aarhus University (UA), Denmark, Mid-Sweden University (MIUN), Sweden, Norwegian University of Life Sciences (UMB), Norway, Training and Demonstration Centre for Decentralised Sewage Treatment (BDZ), Germany and LIMNOS, a private company specialized in applied ecology, Slovenia.

The members of the consortium are experts in the development of some of the latest concepts in the management of waste and wastewater through ecological and environmentally friendly techniques. They have proposed innovative solutions for the ecological engineering of wastewater and residues, recycling of nutrients for both aquaculture and agriculture and the restoration of deteriorated environments. The network disseminated experience, knowledge and environmental awareness among pupils and teachers.

Co-ordinator contact details

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Team meeting in Piran. From left to right: Carlos Arias, Geert Holger Bilander, Manfred van Afferden, Ranka Junge, Nils Ekelund, Andreas Schönborn, Martina Kunz-Wyrsch, Stephan Goes, Maja Zupancic-Justin, Roland Müller, Petter Jenssen, Tjasa G. Bulc, Daniel Todt, Danijel Vrhovšek.

Work performed, results achieved

WP1 – Methodology and stakeholders

The participants and stakeholders defined the appropriate methodology for the implementation of teaching units, and for the ensuing assessment of the effects of teaching. The D1 contains summaries of teaching units of all partners as existent at the outset of the project, and also already incorporates some comments from the stakeholders. The D2 contains the report of the Workshop I. in Sweden.

WP2 – Overview of ecological engineering teaching units

In WP2 a common paedagogical framework was developed (Figure 1). For each teaching unit a detailed description was made and additional teachers' instructions were provided to facilitate the implementation in schools (D3). For the dissemination on the webpage (D4) the central four teaching units were given more attractive names ("Compost factory", "From fish to tomato", "Secrets of rivers" and "Cleaning water with plants") and the model described in Figure 1 was simplified accordingly. The teachers' instructions and all supplementary material are freely available on the www.play-with-water.ch.

The necessity of pragmatic checklist for designing the teaching units for gender equity was recognised at the early stage of the project. The Report of the Task Group "Gender Issues" (D6) contains recommendations for designing the teaching units for gender equity, and an assessment of the Gender Dimension of existing teaching packages of *WasteWaterResource*-Project. The results provided guidelines for improving the material which was then published on website (D4).

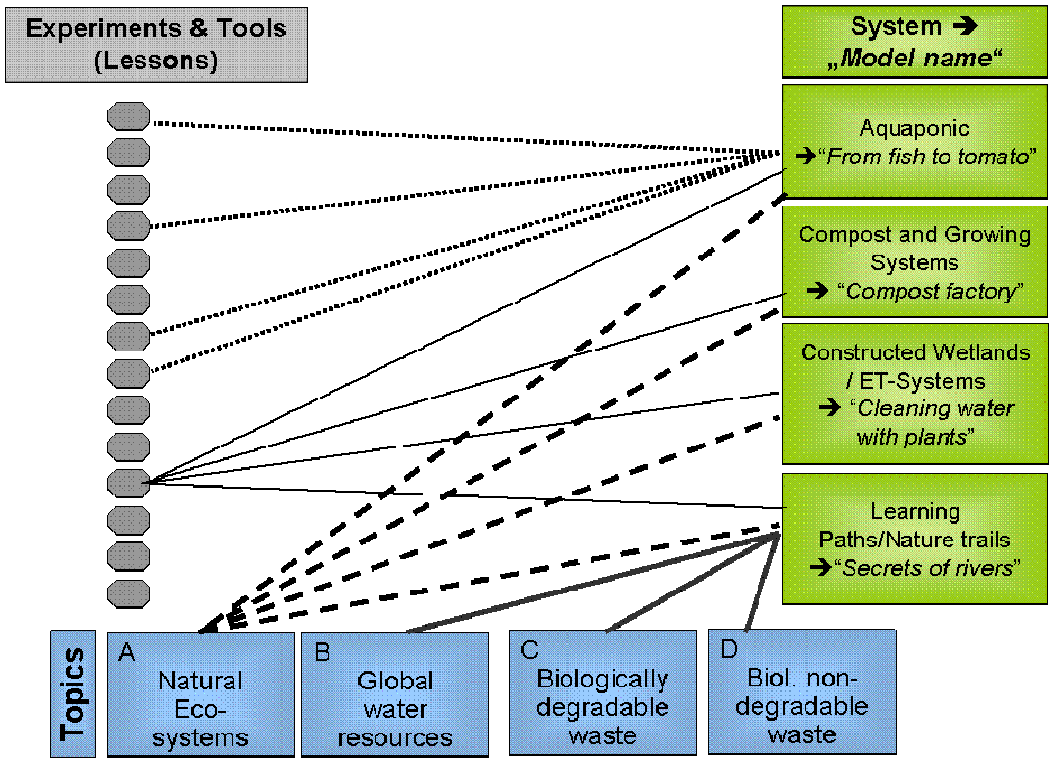

Figure 1 Common pedagogical framework: Interconnection and hierarchy of elements of tuition.

The four basic classroom models and learning paths (Systems/Models, green squares) represent the central element of the tuition. We defined four important topics (blue squares) and a large number of „Lessons“: building blocks consisting of experiments, tools and classroom activities. Each topic can be introduced by several Systems/Models. Each Systems/Models can be used to present / discuss any of the four central topics. This happens through „Lessons“, which can take form of classroom activities or excursions. Lessons are designed to be used either with one model only (dotted lines), or can be used as buildings blocks in conjunction with several models (grey lines).

The Report of the task group "Ethnic minorities and Immigrant Children” contains recommendations for designing teaching units to include appropriately the “disadvantaged or underperforming” groups, an analysis of the language sensitivity of the learning goals of the *WasteWaterResource*-Project, as well as recommendations for teaching pupils with different cultural background.

WP3 – Translations and assessment

The four teaching units were translated in other partner’s languages and implemented successfully at several schools, in different age groups, classes and levels. Limitations existed due to time of the year and academic requirements (curricular activities must comply with national objectives).

UMB was responsible for the publication of the data and reports on the restricted area of the website. Using the content management tool of the website the partners revised the four teaching systems (Classroom compost box, From fish to tomato, Secrets of rivers, Cleaning water with plants) according the teachers feedback. A glossary with scientific and technical terms was established. The database on the website offers downloadable documents with supplemental information to the experiments, posters and leaflets with detailed information on the project results, presentations of the conference in Wädenswil, and press articles that were released on “*WasteWaterResource*”. In the assessment section, answers of 12 collaborating teachers to the online feedback are submitted to the database (D8).

The quality and impact of the different teaching units were assessed with questionnaires, interviews and observations and compiled into D9 which contains results of pupils’ assessment, a general summary of the assessment by 12 collaborating teachers, and conclusions regarding specific teaching units.

HSW/ZHAW tested the Aquaponic Classroom System in three schools, the Compost System in two schools and the "Secrets of Rivers" in a workshop with 30 teachers. With the support of **UA**, the teaching units "Cleaning water with plants" and "Compost factory" were applied and assessed at the Syddjurs Friskole. It transpired that the units had additional teaching use in different class related topics. **LIMNOS** assessed the teaching unit "Secrets of Rivers", and implemented the Constructed Wetland teaching unit. **BDZ** provided results of assessment of "Constructed Wetland", "Willow System", and "Wastewater Rally". The teachers agreed that the teaching unit itself has very useful ideas, and is characterized by its simplicity but effectiveness, whereas pupils show great interest in the unexpected activities. **MIUN** published the Aquaponic classroom system both on the project website, and also on the websites in the schools. The teachers thought the work gave natural opportunities to talk about cycling of matter and that it attracted the pupils' interest.

In a project meeting in Slovenia, the task groups "Gender Issues" and "Ethnic Minorities" visited the collaborating school. The minutes of the Meeting were submitted to the EU in January 2008.

WP4 – Internet platform

The Internet platform www.play-with-water.ch is online since Jan 20th 2006, and is continuously updated and improved. The visually attractive project website provides a wide public with information about the teaching units and the project idea. A document archive was established in order to facilitate the access to the detailed descriptions, teacher instructions and other documents. The project partners have access to a restricted area where it is possible to assess the different teaching units with online questionnaires.

The website www.play-with-water.ch has a user-friendly design.

WP–5 Dissemination

The results and conclusions of the project were disseminated through different routes. Several partners contributed to national and international conferences with presentations about the project. The project idea was promoted to a wider public by the means of newsletters, leaflets and articles in newspapers. A public conference on Ecological Engineering for Science Education in Primary Schools was organised on 25th April 2008 in Wädenswil, Switzerland.

The video material produced within this project includes a video clip for the European Union, presented in Euro News in spring 2008 (http://www.euronews.net/futuris/), a video clip "Spielen mit Wasser" about aquatic circular flows and the concept of "WasteWaterResearch", and a video about the Water Learning Path, produced by children of the primary school Anton Ukmar.

The official project brochure was published in English. Partners contributed to the design, translated the original version into their respective languages, and distributed the brochures to their stakeholders. The brochures can also be found on the database on www.play-with-water.ch.

Two proposed follow up projects were submitted under the FP7 "Science in Society", Activity 5.2.2 Young People and Science:

1) SiS-2007-2.2.1.1 Links between science education and research, "Teachers Play with Water", Proposal acronym: *WaterTeach*, Type of funding scheme: Coordination and support actions (Coordinating). Submitted on 23.5.2007

2) SIS-2008-2.2.1.1 Innovative methods in science education, "The Gates to Science: Inquiry based learning between kitchen and river", Proposal acronym: *ScienceGate*, Type of funding scheme: Coordination and support actions (Supporting). Submitted on 24.7.2008.

In the WP5 task groups "Gender Issues" and "Ethnic Minorities and Immigrant Children" concluded their work. The final report of the task group "Gender Issues" contains the data of the assessment of students' acceptance of the teaching units according to gender and was discussed on the Workshop III, where all partners contributed to discussion.

Even though the Task Group "Ethnic Minorities and Immigrant Children" developed strategies and awareness to improve the material that is focussed on the needs and inclusion of minorities, the actual situation in participating schools did not give the opportunity to test the material with respect of minorities. The pupil's universe presented in some of the participating countries did not have language or cultural minorities in the class. The hypothesis tested in assessments was: Inquiry based teaching, offers an opportunity for pupils, who are not native speakers, or are otherwise weak, to show their strengths. In schools where such assessment was possible, no evidence for differences between native speakers vs. minority speakers was found.

Aquaponic model suitable for permanent exposition in the school.

Evapotranspiration experiment in the classroom.

Pupils participating in "Secrets of rivers" activities in the Dragonia River.

Pupils examining constructed wetland in Slovenia.