

Case Study 27

Active Learning Teaching children to use energy in Greece

Greece



www.energychange.info

 **Changing Behaviour**

Project co-funded by the European Commission within
THE SEVENTH FRAMEWORK PROGRAMME
THEME ENERGY.2007.9.1.2
Energy behavioral changes



Changing Behaviour



Work package 2

Development of the conceptual model: Analysis of success factors,
underlying models and methods in target group interaction

Case Study 27:

Active Learning Teaching children to use energy in Greece

P. Vasilis and C. Malamatenios (CRES)

May, 2009

Grant agreement no: 213217

Project acronym: CHANGING BEHAVIOUR

Project full title: *Contextualising behavioural change in energy programmes involving intermediaries and policymaking organizations working towards changing behaviour*

www.energychange.info

Content

Summary of the case	5
Step 1: Context of DSM programme	6
<i>National and local context</i>	6
Step 2: focus of DSM programme (1A4).....	8
<i>General issues</i>	8
<i>Initiator and partners</i>	8
<i>Goals and objectives</i>	9
<i>The targets and target group</i>	9
Step 3: design of programme.....	11
<i>What knowledge and ideas informed the design of the programme?</i>	11
<i>Project structure</i>	11
Step 4: process of programme	16
Step 5: outcome of process	17
Step 6: analysis and conclusion.....	18
References.....	19

Summary of the case

The aim of the project was to reduce energy use in school buildings and homes by teaching children efficient use of energy, RES and efficiency in transport through hands-on and experimental activities. The project advocates that children can be important resources in their own education rather than passive receivers of information. Expected results were increased knowledge and awareness, behaviour change as well as actual energy savings in participating school buildings and in the homes of the involved actors (children and educators).

The main outcome was the development of an educational package on active learning (AL) and energy monitoring (EM) for use in primary schools. The material was replicated from European best practice experience and was adapted to national conditions. The pedagogical quality was secured through active involvement of educators in all phases of the project. The tool was tested through implementation in 10 schools per participating country and was adjusted according to experiences made. Experiences were discussed and success criteria identified. The results were assessed by an evaluation in the pilot schools. Implementation of AL and EM is estimated to have resulted in 10-14% energy savings where applied.

The project mapped relevant energy curricula and identified, tested and evaluated possible strategies for wide integration of AL and EM activities. The aim was to pave the way for integration of AL and EM with the national energy curricula so as to ensure self-supportive and long-term effects. Involvement of school authorities on a high level was ensured through Letters of Intent. Also the establishment of national and international networks among energy and school actors (Advisory Groups, Educational Network) ensured lasting impacts. Close cooperation and coordination with Kids Corner/ManagEnergy and existing networks like FEE/Eco-Schools and SPARE also ensured widespread dissemination of the educational material and experiences made.

Step 1: Context of DSM programme

National and local context

The project was of a collaborative type and was conducted in 14 EU countries. CRES was the Greek partner and has initially involved 11 primary schools from Attica and Crete Island, one of the schools however has withdrawn from the project at a later stage. In total some 1200 small pupils have been actively participated in the project. The project has been finalized in December 2008. The interactive web-toolkit will be available for further use by the participating schools but also by other interested schools and individuals.

In the context of the project's scope implementation was limited to 10 schools, however it is evident that the project shall be seen under a nationwide, if not European, perspective.

In Greece annual energy consumption in a typical dwelling is around 16 MWh, 25% lower than EU average. However if scaled to EU average climate conditions consumption rises to 25.7 MWh. Almost 70% is used for heating purposes, while consumption of electricity is increasing due to greater use of air-conditioning.

Greece has formally adopted all the relevant EU Directives regarding energy efficiency and, despite the delays, several laws have been issued for the promotion of EE in public buildings and in the residential sector in general. However, only a few steps have been taken so far in order to facilitate the actual implementation of energy conservation measures. Recently a couple of promising programs have been announced by the Ministry of Development regarding the partial funding of energy conservation measures at the municipal level as well as for the residential sector.

Apart from the state authorities and large utilities (mainly PPC) only few intermediaries, NGOs as well as private companies, have been active in the field of DSM and energy efficiency projects of that type. ESCOs are less developed mainly due to lack of legislative framework that will enable third party financing of energy efficiency projects. This gap in legislation is expected to be filled with a recent law, a draft of which is currently under public consultation.

Although there is quite a number of campaigns regarding the promotion of energy efficiency and rational use of energy, and there is certainly sufficient technical capacity, deployment of energy efficiency measures in the residential sector is relatively low compared to other EU countries. The main reasons are lack of awareness and information, inadequate public sensitization coupled with medium energy prices for space heating, and electricity and the lack of fiscal incentives.

At the public local and regional sector (e.g. municipalities) there is still lack of both awareness and capacity. There are only few regional energy offices and agencies and there is usually limited funding. By law each municipality is obliged to allocate responsibilities regarding energy use to specific staff members. The same law foresees the development of municipal energy plans. However, only few municipalities have complied with this due to low awareness, lack of information, capacity problems and low funding. The situation however is expected to change through the implementation of nationwide funding programs for EE measures in buildings, transport and other energy consuming facilities at the municipal level that include a wide range of awareness campaigns and informative seminars.

In parallel there are several ongoing campaigns and awareness raising programmes organized and implemented both from the state and from NGOs. These may be seen as complementary rather than competing and overlapping to the Active Learning project as the later was the only one focusing on primary schools. On the other hand there is certainly need for a comprehensive and centrally designed campaign program that will clearly identify the needs and set the priorities, so as to optimize allocation of funds and increase the effectiveness of such programs.

Step 2: focus of DSM programme (1A4)

General issues

The program lasted from January 2006 until December 2008 and the budget allocation for Greece was **102970 €**. The project was mostly (50%) financed by the EU under the framework of the IEE program the rest representing national contribution.

The program had an innovative character for Greece since it was the first time that an energy efficiency awareness program involving AL and EM was applied to primary school children. In addition the interactive character of the learning process via the internet based toolkit and the use of modern technologies is another important aspect of the program's design since it advocates that the effectiveness of learning process is greatly enhanced when children are active part of that process rather than passive receivers of information.

The program covered both rational use of energy (energy efficiency), renewable energy source, and transport and aimed not only at increasing awareness and knowledge but also at bringing actual and measurable energy savings to the participated schools, monitored by the project, as well as to children's homes.

Initiator and partners

The consortium consisted of 16 organisations from 14 countries. The partners were both energy and educational experts with significant previous experience and references representing a large geographical area, a mix of Eastern and Western European countries as well as both private and public sector. The following table gives a list of the project partners.

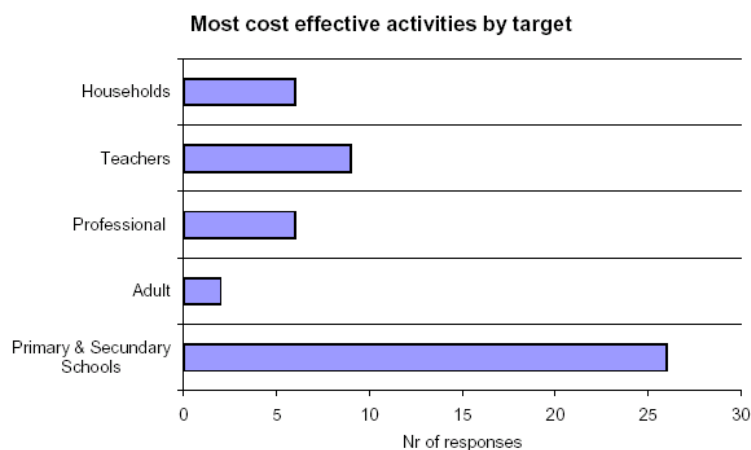
No	Partner	Country
1	Norwegian Energy Efficiency Inc (NEE)	Norway
2	The Centre for Renewable Energy Sources (CRES)	Greece
3	Le Centre Urbain / Stadswinkel asbl (ABEA)	Belgium
4	The French Environment and Energy Management Agency (ADEME)	France
5	Eliante	Italy
6	Newark & Sherwood Energy Agency (NSEA)	UK
7	MOTIVA Oy	Finland
8	The Swedish Energy Agency (STEM)	Sweden
9	The Directorate For Primary and Secondary Education (DPSE)	Norway
10	Lithuanian Energy Institute (LEI)	Lithuania
11	EC Baltic Institute for Renewable Energy (EC BREC)	Poland
12	INNOTERM Energetics Environmental Protection & Development Ltd	Hungary
13	Agencija za prestrukturiranje Energetike (ApE)	Slovenia
14	European Association of Ecologists (ESE)	Poland
15	Energy Agency of Plovdiv (EAP)	Bulgaria
16	Stredisko pro efektivni vyuzivani energie, o.p.s. (SEVEN)	Czech Republic

Goals and objectives

The project aim was to reduce energy use in school buildings and homes by teaching children efficient use of energy, RES and transport through hands-on and experimental activities. The expected results were increased knowledge and behaviour change as well as reduced energy use in participating school buildings and in the homes of involved actors (children and educators). The overall goals and objectives were clearly indicated right from the beginning and the roles for each specific performance indicators were properly identified.

The targets and target group

The ManagEnergy initiative, created by DG TREN, conducted a survey¹ on the characteristics of the sustainable energy education, based on extensive questionnaires addressed to European energy agencies. The survey concluded that the most cost effective target group is school children (primary and secondary schools) as shown in the graph below. Teachers are considered a privileged multiplier to reach students.



In the project there were two general categories of target groups, one primary and one secondary, explained hereafter:

- Primary project target groups. These were target groups addressed directly by the project and involved the educators (teachers, school management and local/regional/national school authorities) and the pupils/children in primary schools (age between 6-12 years old).
- Secondary project target groups. These were addressed indirectly during the project merely through the social interaction with the members of the primary target groups. It included families and friends of the targeted children and the educators as well as consumers generally involved in the project (school personnel, building owners, local authorities etc).

As children are effective watchdogs they can learn to be conscious energy citizens. Using the children as a resource can have impacts on the local societies as well as boost the children's confidence and sense of importance. Moreover school children can implement research and experiments to uncover important issues and help put these on the agenda and influence decision makers.

¹ Managenergy, Reflection Document on a EU-wide Co-operation of Local Actors on Sustainable Energy Education, Aug 2004

The toolkit covered a whole range of energy utilization namely heating and air conditioning, hot water, lighting, electric appliances and transport. The toolkit was implemented in 10 schools and nearly 1200 pupils were involved. A specific non mandatory target for 10% direct energy savings at the participated schools was set.

Step 3: design of programme

What knowledge and ideas informed the design of the programme?

The project's conception was mainly founded on the report “**Reflection Document on a EU-wide Co-operation of Local Actors on Sustainable Energy Education**” prepared by ManageEnergy in August 2004.

According to the study, education is an effective means of achieving energy sustainability. Apart from the fact that children are the consumers and decision makers of the future, they are more receptive to new concepts and new behaviours and can introduce new habits at their homes and to their friends. In that respect the younger the target group is the more chances for successful behavioural formulation are.

However, the project did not consider children as passive information receivers but rather as active carriers of knowledge that could be used as resource. Using the children as a resource can have multiple impacts on the local societies as well as boost the children's confidence and sense of importance. By undertaking various tasks such as small research activities and experiments school children are able to even highlight important uncovered issues and help put these on the agenda of decision makers.

Schools on the other hand may easily serve as leader by example in promoting the sustainable utilization of energy. The ManagEnergy survey¹ recommends that efficient use of energy should be integrated into the school curriculum to ensure effective activities. In that respect the project aimed at integrating active learning and energy monitoring with national curriculum as far as possible. This would ensure lasting and broad effects on all target groups.

Also the establishment of national and international networks among energy and school actors (Advisory Groups, Educational Network) was expected to ensure lasting impacts and improve cooperation between actors. Close cooperation with Kids Corner/ManagEnergy and existing networks like FEE/Eco-Schools, SPARE and ESEEF will ensure widespread dissemination of the educational material and experiences gained.

Project structure

The project was structured in work packages that are described briefly hereafter.

Work Package 1 - Integration with national curricula

This WP included an overview of existing active learning and energy monitoring projects in participating countries along with an evaluation of the most relevant programmes and description of success elements regarding curriculum adaptation/integration. Consequently mapping of national school systems, relevant energy curriculum and main concerns of the actors in participating countries (how, why and where active learning can fit into the curriculum) was undertaken and the possible strategies for integration of active learning and energy monitoring with national school curricula in participating countries were identified, tested and evaluated.

The Greek educational system provides limited flexibility to schools and teachers to introduce new topics to the curricula. There is only one “free topic - module” per month that provides the opportunity to the teachers to choose a topic from an approved list and make it part of a teaching

session. This flexible mechanism was used by the schools that participated in the program and the material and AL tools were provided by the project team.

Promotional efforts for the integration of the educational package within the national curriculum were also conducted but despite the positive welcome from the Ministry of Education no official commitments were taken. Finally the success criteria for integration and exchange of experiences were identified.

Work Package 2 - Development of teaching material (“toolkit”) for active learning

The WP activities started with the establishment of the international advisory group (IAG) to provide input and feedback during the whole project as well as of the national advisory groups (NAGs) to provide feedback on existing and developed material, needs and requirements throughout the project. At a next step a brief mapping and evaluation of energy and pedagogical content/approach of existing tools was conducted. The main target of the WP however was the development of the teaching material (“toolkit”) for active learning and energy monitoring based on the adaptation of established material, to national curriculum and languages. The material was made available on the Kids Corner ManagEnergy web site and other relevant energy and environmental web-pages for children and as hard copies if needed.

Work Package 3 - Implementation of EM and AL

The focus of this WP is on the implementation of the educational material developed in WP2 to schools. At first the key actors in each partner country were identified and the formal commitment process of school authorities (LOI) and schools/teachers that already started during the proposal design phase was concluded. Implementation included training of the involved teachers of the predefined 10 preliminary schools in each country to use the material. Based on the implementation and a brief analysis/comparison of data from the energy monitoring the developed teaching material was evaluated at a national level. Consequently exchange of experiences of all partners and identification of success criteria took place.

Work Package 4 - Dissemination/Networking

This WP included initial dissemination activities of the project targets and content to the key actors in order to promote and increase their active participation in the project. Moreover efforts for the integration of the active learning educational material to be part of the national curricula were undertaken. Most important a European Educational Network of School authorities, Schools and teachers was established and collaboration with other relevant organizations and projects such as FEEDU, FEE/Eco-Schools, SPARE was achieved. Although an international events was initially planned several national events were organized instead, as the project team decided that this would be more effective.

Work Package 5 - Evaluation

Under this WP a qualitative survey among primary target group (children and teachers) on knowledge and attitudes regarding energy, RUE, RES and transport before and after implementation of the educational package took place. The results were used for the evaluation of project processes and actions.

Participation and Commitment

All project partners were actively involved at the initial design phase of the project. The target groups were also involved from an early stage. The work was started during the proposal phase by approaching relevant school authorities as well as individual schools to ensure commitment

(letters of intent etc). Also national energy authorities and other relevant actors have been approached to provide support, funding etc.

In the context of the project and in order to ensure wide commitment and long-term effects two levels of advisory groups were established: an International advisory group (IAG) and National advisory groups (NAGs) that reviewed and evaluated the project processes and project deliverables and brought concrete suggestions. In the negotiation phase all partners have worked to establish the National Advisory Groups (NAGs). Energy and educational experts have been informed of the project and lists of participants have been developed. The two groups were used extensively to provide input during the project as well as to disseminate results and experiences.

Moreover the involvement of educational authorities throughout the project period was essential to ensure good results. Involvement of educational authorities was also strong from the very beginning. The consortium has therefore worked closely with the various national school authorities in the proposal and negotiation phases to secure their commitment in the project. Close cooperation between the Greek partner and the Departments of Environmental Education of the Directorate of Primary Education in Heraklion, Crete and Fthiotida has been ensured through letter of intends prior to the beginning of the project that verified and described towards the Commission their interest and commitment in the project and maintained throughout the project's implementation period.

Communication and dissemination

This part was effectively dealt under WP4 and WP6 of the project. Initially, the project targets and content were presented in detail to the key actors and communication channels were established with them at an early stage, in order to promote and increase their active participation in the project. National educational authorities were approached in order to promote the integration of the active learning educational material into the national curricula. The developed network aimed in assuring the continuity of the behavioural change efforts towards sustainable energy use. Since the project envisaged a widely and easily accessed toolkit, an online information system platform was also developed. Finally a great number of brochures was distributed to school children and their families.

Learning, evaluation and monitoring

The project design included a monitoring process in order to evaluate the effectiveness of the approach towards changing childrens' behaviour. This was undertaken under WP5 that had a total duration of 23 months.

A survey (questionnaire) regarding energy knowledge and attitudes was carried out before and after the implementation of the educational material in all the pilot schools in order to estimate the effects of the project on the key actors (children).

In addition, a survey among the teachers that used the educational material was also carried out. The aim was to reveal how they have used the products, what are the needs for local adaptations, what new ideas of application have they developed themselves, how did they find the response among their pupils, how is the cooperation between other school staff such as janitors and school masters, and how did they find the approach from the promoters of the active learning and energy monitoring concept. This survey consisted of both a questionnaire and an interview. The later was sometimes formed either as a focus group discussion among the teachers with the participation of other staff members and authorities.

The assistance of an external evaluation expert assisted was also foreseen in the project both during the pre- and post evaluations in each country with regards to planning, implementation and assessment of results and comparison between the countries (how and what to ask, analysis of results).

In addition to the evaluation process described before, the project included quantitative assessment of the actual behavioural change through the energy savings that were achieved in the participated schools through the implementation of the energy monitoring tool. Energy Monitoring was implemented in all schools over a period of 12 months/one school year. Data from the monitoring was gathered by the partners and compared and discussed briefly in the consortium. An existing data collection system was used for this purpose that was developed and managed by the Norwegian Directorate for Primary and Secondary Education (<http://sustain.no>). In the case of Greece only three schools have provided data to the database. In the following graph the analysis for one case is shown.

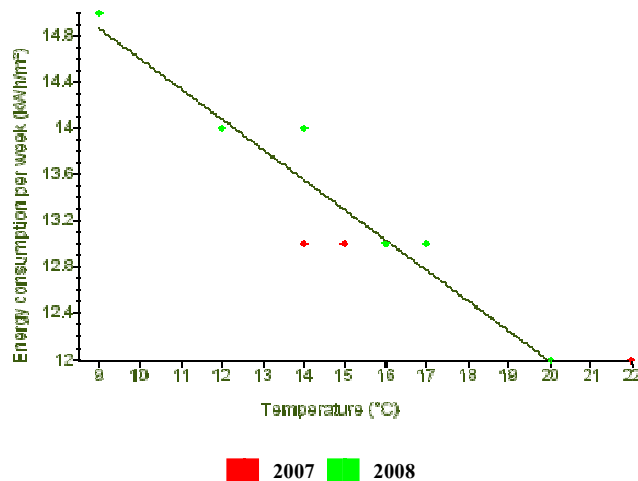


Figure 1. Energy Temperature curve for one school in Greece (<http://sustain.no>).

It shall be noticed that focus was given on the exchange of experiences with the teaching material and method and not on the actual data. However the use of specific performance indicators and goals was foreseen and at least the following were used at the monitoring process.

Indicator	Parameter	Goal
Total savings	kWh	5%
Specific saving	kWh/m ²	5%
Average saving per school	kWh/school	5%
Saving per pupil/child	kWh/pupil	5%

The outcome of this evaluation effort was a report describing the strong and weak points of the educational material and the contact approach to the local school systems, the achievements deriving from the use of active learning and energy monitoring, a list of suggestions for improvements of the contact approach and the use of the educational material, and a number of success stories and contact names that helped disseminate the concept to other schools in each partner country and the rest of the EU.

Link to other programmes and policy

The program was merely built upon the recommendations from ManagEnergy report “**Reflection Document on an EU-wide Co-operation of Local Actors on Sustainable Energy Education**”. All partners had substantial experience in educational and energy informative projects that greatly facilitated the successful implementation of the project.

Under WP 3 coordination with existing programs like FEEDU, SPARE and Eco-Schools was highly promoted. Moreover the educational material was based on existing tools that were adapted into the specific national conditions and educational systems. Existing communication and dissemination platforms such as the ManagEnergy’s **Kid’s Corner** were used in addition to the project’s web-site in order to increase the accessibility and diffusion of knowledge and experience

Step 4: process of programme

Communication between project partners was established from the very beginning of the project's design. The work schedule included semestrial work meetings where decisions on all issues were made unanimously. The project was quite demanding from a managerial point of view since it involved many partners and countries as well as activities that needed good coordination. In general the management was very successful and all the relevant problems were effectively dealt.

One of the issues-problems that was encountered in Greece and is of particular interest for this analysis is the difficulty in communication with the schools and teachers. This was merely due to lack of knowledge and difficulty in understanding on behalf of the teachers but mostly because the schools and consequently the teachers were not familiar with the procedures and the demands of a European Program as this one (deliverables, deadlines etc).

In addition some of the schools that eventually did not send the data from the EM to the electronic database for processing claimed that there was difficulty in understanding the process as well as language problems. However, they did not reply to the partners request for undertake this task on behalf of them.

A significant change of the deliverables of the project was the cancellation of the international events that was initially planned to take place towards the end of the project. Instead one national event per country was organized. This was a common decision by all partners and was taken in order to increase the effectiveness of the dissemination of the project inside the country as the participation at an international event would be limited.

Step 5: outcome of process

The pre-identified project's goals and objectives were in general achieved. The EM data analysis as well as the comparison between the ex-ante and ex-post questionnaires analysis indicate that true behavioural change both among the pupils and the teachers was achieved. This behavioural change is surely expected to influence energy utilization in the houses of the pupils and affect their overall environmental awareness in general. Moreover the process of AL and the use of new technology tools brought even more benefits to the pupils than just increased energy awareness. In that sense the children enjoyed the participatory learning process that promoted the cooperation between them.

The project lasted three years and there was substantial preparatory work. Therefore the results of the program were mostly visible towards the end of the program when the EM was implemented.

The program is considered rather successful and has gained the Sustainable Energy Week 2008 prize. The EC Project Officer as well as the vast majority of the participants were very pleased with the outcomes. Moreover the indications from the EM show that real energy savings were achieved and behavioural change accomplished.

Although time and budget were totally respected the effectiveness of the program in monetary terms may not be justified.

Regarding the programme's follow up in Greece, results from a questionnaire (see following table) that was distributed to the teachers involved, strongly indicated that the majority of them intend to use the toolkit in teaching new classes.

Table 1. Answers of the teachers to the question whether they intend to use the toolkit in the future

Answer	No of teachers
Sure	71
Probably	32
No	2

Step 6: analysis and conclusion

The following five factors-conclusions have been identified as most important:

- The target group. The small age of the main target group is crucial for the achievement of the main objective that is the change of energy use patterns.
- The AL process. It is considered as a very effective process to pass through the information and the general message of efficient use of energy inside the main target group.
- EM and the promotion of specific energy efficiency actions in schools the actual application of which gave a more real character to the project far from being just a spread of theoretical knowledge.
- The teachers as intermediaries were proven not to be familiarized with the topic and more training would be needed.
- The actual integration of the method to the national curriculum is rather difficult due to the complicated procedure needed and the lack of flexibility provided to the teachers.

References

Website of the project:

<http://www.consortium4al.eu/>