

Hands-on Science Network, 2006  
3<sup>rd</sup> International Conference on Hands on Science  
“*Science in a Changing Education*”

**“Solar Energy – Awareness & Action”:  
Describing the developments of the  
1<sup>st</sup> year of a Comenius school  
partnership project**



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# Project aim and focus ...

- The **“Solar Energy – Awareness & Action” [SEAA]** is a Comenius 1 project with **5 partner schools** from Portugal, Spain, Italy, Malta & Greece [Escola Antré Soares (PT), Colexio de Educación Infantil e Primaria Froebel (ES), Scuola Secondaria di 1° Grado C.B. Cavour (IT), Stella Maris College Junior School (MT) & 9<sup>th</sup> Primary School of Rethymno (EL)].
- All project participants have become associated members of the **“Hands-on Science” Network** and the activities of this project also **enroll in the activities of the network**.
- The **main aim of the project** is to sensitise the pupils on issues and aspects of solar energy, within a framework of sustainable development and environmental and ecological awareness, both at conceptual and at practical-experiential level.
- Furthermore, **the pupils are encouraged to act as conscious citizens**, construct their own devices which work with solar energy and present them to local communities within open *Science Fair* procedures and activities, in an attempt to inform and sensitise the general public.

# Project activities approach ...

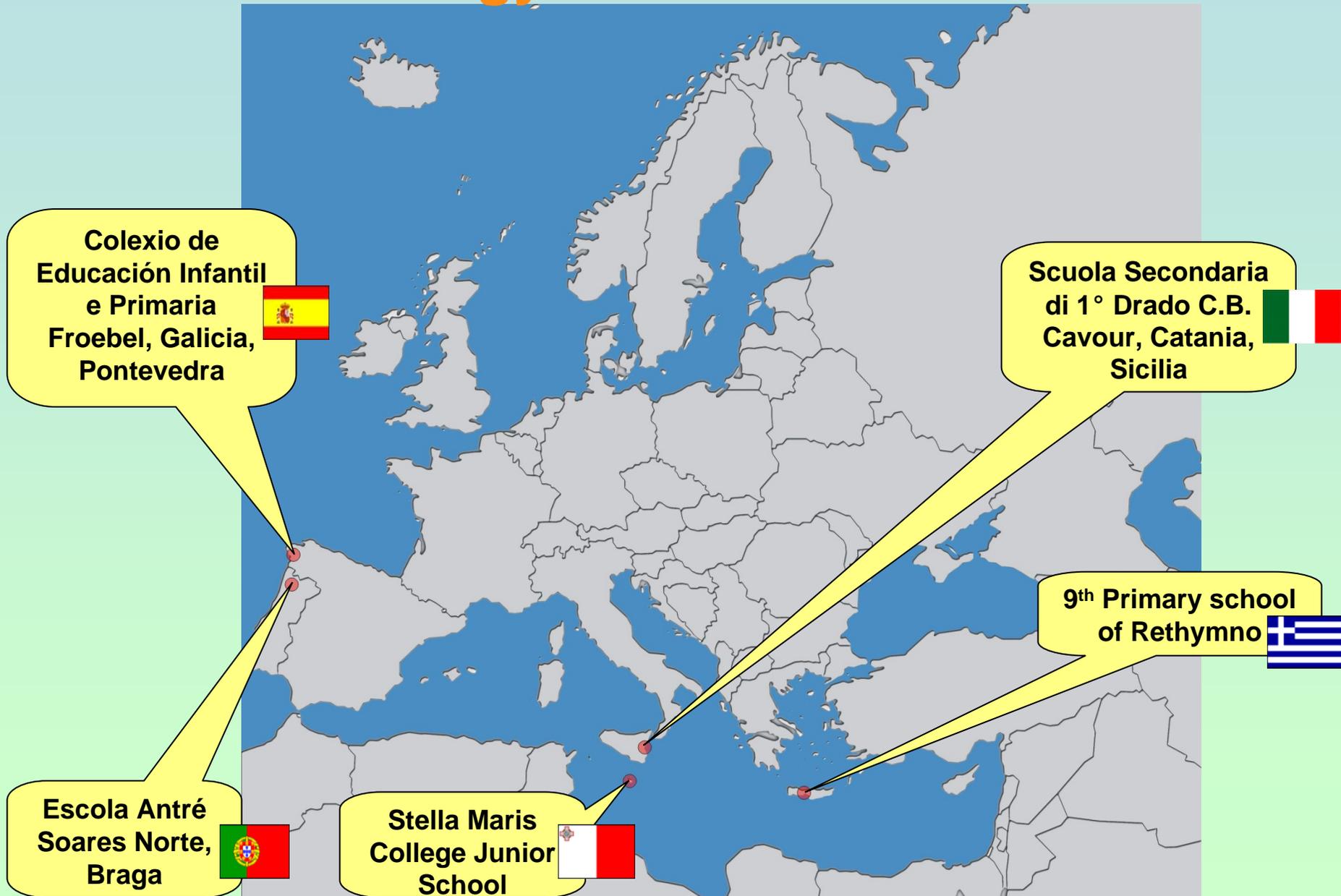
- A **thematic approach** to solar energy has been planned to include or even interweave **formal**, **non-formal** and **informal** teaching and learning approaches.
- These include **investigations**, **hands-on activities** and **project work** within formal and non-formal educational contexts, but also within a free-choice learning environment involving outside classroom activities (e.g. on site visits and science fairs).
- **Shared project activities** have been planned and undertaken by groups of children in each school, encouraging pupils to learn from the experience of **working on a contributed set of ideas and projects from all participating countries**.

## Numbers of pupils & teachers participating in project work per school and in total numbers.

<b>SEAA School Partners</b>	<b>Pupils</b>		<b>Teachers</b>	
	<b>F</b>	<b>M</b>	<b>F</b>	<b>M</b>
<i>Escola Antré Soares (PT)</i>	<b>58</b>	<b>54</b>	<b>6</b>	<b>1</b>
<i>Colexio de Educación Infantil e Primaria Froebel (ES)</i>	<b>25</b>	<b>28</b>	<b>5</b>	<b>1</b>
<i>Scuola Secondaria di 1° Grado C.B. Cavour (IT)</i>	<b>148</b>	<b>62</b>	<b>10</b>	<b>5</b>
<i>Stella Maris College Junior School (MT)</i>	<b>0</b>	<b>90</b>	<b>5</b>	<b>5</b>
<i>9<sup>th</sup> Primary School of Rethymno (EL)</i>	<b>75</b>	<b>70</b>	<b>5</b>	<b>5</b>
<b>semi-total</b>	<b>306</b>	<b>304</b>	<b>31</b>	<b>17</b>
<b>Total</b>	<b>610</b>		<b>48</b>	

# Consortium of Countries and Schools of Comenius 1 Project

## “Solar Energy: Awareness & Action”



## Project meetings ...

- **Two meetings** have been conducted during the first year of the SEAA Project. Members of the participating schools first met at the *9<sup>th</sup> Primary School of Rethymno, Crete* in November 2005 and then we met again at the *Escola Antré Soares, Braga* in May 2006.



SEAA 1<sup>st</sup> meeting, 9<sup>th</sup> Primary school of Rethymno, GR, 13-17 November 2005



SEAA 2<sup>nd</sup> meeting, Escola Antré Soares, Braga, PT, 2-6 May 2006

## Discussions in project meetings ...

- In both meetings **project issues** have been discussed, whereas **ideas and activities** have been proposed and developed within a framework of prospective classroom approaches and/or applications.
- Discussion regarding the selection of particular activities and/or applications to be implemented as project tasks appears to be **an open on-going process**, based on a plethora of available activities and resources retrieved and distributed by the coordinator in an electronic form.
- Of course, **these may be complemented with others** to be found on the course. **Some of these resources are being progressively uploaded as links on the project web site**

(URL:< [http://9dim-rethymn.reth.sch.gr/contents\\_en/project\\_resources.htm](http://9dim-rethymn.reth.sch.gr/contents_en/project_resources.htm)>).

# Project resources on the web ...

Project Resources - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Refresh Home Search Favorites

Address [E:\9dim-rethymn.reth.sch.gr\contents\\_en\project\\_resources.htm](E:\9dim-rethymn.reth.sch.gr\contents_en\project_resources.htm) Go Links

9<sup>th</sup> Primary School of Rethimno [Pages in Greek](#)

Machis Kritis 33, 74100 Rethimno, Tel. & Fax: +30 2831 0 24378

[Project Resources](#)  [Solar Energy](#) [Solar water heaters](#) [Solar cookers](#) [Solar toys](#) [Solar dryers](#) [Greenhouses](#) [Other solar applications](#) 

*Comenius 1 Project*

*1<sup>st</sup> Project Meeting*

*Project Resources*

*Project ideas*

*Project development*

*Downloads*

*9<sup>th</sup> Primary School Profile*

## Solar dryers or Solar dehydrators

<ul style="list-style-type: none"> <li>● <a href="#">Solar Food Dehydrator</a></li> </ul>	<p>Made from two cardboard boxes, some clear plastic wrap, and a little tape. You can build a nearly free solar dehydrator. Set it on a stool or chair and face it's solar collector towards the sun, and you have a functional food preservation machine for little work and even less money ... <b>[an excellent construction idea]</b></p>	★★★★★
<ul style="list-style-type: none"> <li>● <a href="#">Preserving the harvest: Dry it out!</a></li> </ul>	<p>Your school garden has fulfilled its promise of plenty, and the harvest has begun. Perhaps you're celebrating abundance by feasting on your delicious produce. But what happens when the harvest and feast are over? When the plant's life cycle ends, or frost or heat preclude the garden's ability to bear, and the leftovers from your cornucopia are ready to eat <i>NOW?</i> ... <b>[another excellent construction idea with valuable information]</b></p>	★★★★★
<ul style="list-style-type: none"> <li>● <a href="#">Drying Food</a></li> </ul>	<p>Drying is the oldest method of preserving food. The early American settlers dried foods such as corn, apple slices, currants, grapes, and meat. Compared with other methods, drying is quite simple. In fact, you may already have most of the equipment on hand. Dried foods keep well because the moisture content is so low that spoilage organisms cannot grow ...</p>	★★★★★
<ul style="list-style-type: none"> <li>● <a href="#">Drying Foods</a></li> </ul>	<p>Foods may be sun dried with or without a solar dehydrator, in a gas or electric oven, or with a portable electric dehydrator. Dehydrators with thermostats provide better control over poor weather conditions and food quality than sun drying ...</p>	★★★★★
<ul style="list-style-type: none"> <li>● <a href="#">Solar chimney dehydrator</a></li> </ul>	<p>A Solar chimney dehydrator can be constructed with any number of designs, adjusted to meet whatever needs you have ... <i>a rather difficult design though</i></p>	★★★★★
<ul style="list-style-type: none"> <li>● <a href="#">Make a Solar dryer</a></li> </ul>	<p>For around \$50, perhaps even for no cost if you are an inveterate hoarder and have a well stocked shed you can make a drying cabinet and enjoy the fruits (and vegetables) of your labor ...</p>	★★★

Done My Computer

# Project policy

- As part of our policy orientation, we have discussed and decided the **variety of activities to focus** on the 1<sup>st</sup> and later during the 2<sup>nd</sup> and 3<sup>rd</sup> year of the project.
- We have agreed to **work on all possible categories of solar energy** applications and constructions, but on **particular distinct designs for each project year**.
- In this sense, **different groups of pupils and different classes will deal with a similar, but differentiated, set of solar energy applications and constructions every year throughout the project years**.

## Project policy

- Furthermore, **by the end of the 3 year-period** of the project we will have accumulated **a broader set** of solar energy applications and constructions **tried out and tested within classroom practice**, which can be delivered as a final outcome of the whole project.
- In this sense, we believe that **a broader range** and number of future citizens **will become aware and activated** on solar energy issues.
- This appears more likely to **establish a tendency** in local citizens' communities for a considerate decision making process and future actions regarding alternative-renewable energy policies and a sustainable development, within a framework of environmental sensitivity and care.

## Setting the framework of project activities

- Collaborating **teachers have exchanged ideas** on experiments and investigations regarding aspects of solar energy to be treated with pupils.
- Information on applications and/or constructions about **passive** (e.g. solar houses and solar architecture, greenhouses, solar cookers, solar dehydrators etc.) and **active solar systems** (e.g. solar water heaters, solar heating/cooling for homes, solar power stations with reflectors etc.) as well as **photovoltaic systems** (e.g. solar cells and arrays, solar cars and solar toys with PV cells and motors etc.) has been shared and discussed.

# Setting the framework of project activities

- A particular **set of six activities on solar energy applications** has been developed and put forward as a basis for the first year approach to solar energy applications.
- In more detail, two activities, **one simple and one more advanced**, for each of the three categories of solar energy applications (*passive*, *active* and *photovoltaic*) have been designed as follows (cf. URL: < [http://9dim-rethymn.reth.sch.gr/contents\\_en/downloads.htm](http://9dim-rethymn.reth.sch.gr/contents_en/downloads.htm) >):
  1. A **simple pizza box solar cooker** with investigations on “hot boxes” and “heat traps”.
  2. A **more advanced solar box cooker** with one reflector and without a top lid.
  3. Simple **solar collectors to heat up water** made out of plastic bags affixed on black and white cartons, providing the foreground for relevant experimentation activities.

## Setting the framework of project activities

4. A ***solar water heater*** with a collector with an “S” tube arrangement and a plastic bottle tank, setting the scene for an investigation on the *thermosiphon effect*.
5. Experiments with ***a photovoltaic cell and the performance of a motor*** after shading the cell or covering it with transparent, semi-transparent and non transparent materials.
6. A ***solar toy car with a PV cell*** and a motor in an attempt to sensitise pupils about the potential of photovoltaic systems in a rather familiar and playful way.

Thus, project work has been done in each participating school based on the above indicative activities for the current year, although **partners have also developed their own projects** within a broader thematic framework including other subjects apart from science such as language, mathematics, environmental education, theatre and drama, music, crafts and technology, geography, ICT, etc.

# Setting the framework of project activities

An indicative list of such activities is as follows:

- **text production** by pupils related to the Sun and solar energy in the form of leaflets, narrations and poems
- **collecting and rewriting stories** and tales about the Sun in various cultures and civilizations throughout history
- **the story of the *sunflower*** and its products, presenting tales about the sunflower in various cultures and creating a collective piece of art with sunflower craftwork
- **technological interventions and/or improvements** on solar energy applications like solar cookers, solar water heaters and solar toys, based on problems needed to be resolved in terms of better construction and performance of the devices
- **construction of horizontal sundials** with simple materials, their orientation and calibration through principles of mathematics and geography
- **dancing and singing songs** related to the Sun in various languages
- **role playing and theatre performances** with a “Sun” or “solar energy” topic.

# Setting the framework of project activities

- There has also been an attempt to actively **develop a communication amongst participating pupils** from different schools through an exchange of letters and postcards organised in pairs, groups and/or classes.
- This has proven to be **a difficult task** mainly due to language difficulties and adequate combination of interests and age groups, but **it has been considered essential** in building up **a warm atmosphere of friendship** amongst participants to function as a solid basis for future joint experimentation and project development.
- An **electronic mailing list** has been developed, involving all participating colleagues from the partner schools, providing *in vitro* communication with first hand and updated information about the developments of the project for everyone.
- Moreover, **a web site of the project** has been launched under the site of the coordinating school, the 9<sup>th</sup> Primary School of Rethymno, accessible at the URL: < [http://9dim-rethymn.reth.sch.gr/contents\\_en/Comenius.htm](http://9dim-rethymn.reth.sch.gr/contents_en/Comenius.htm) >, which provides information about the project to partners and the general public.

# Indicative myths and legends discussed in the project



Myth of *Phaeton*  
("the shining one")



Tale of *Dedalus*  
and *Icarus*



Legendary story of *Archimedes*' (287-211 BC)  
"burning mirrors" against *Marcellus* ships

# Text production in the form of letters exchange



**Escola Antré Soares,  
Braga, Portugal**

# Text production in the form of letters exchange

From Stella Maris  
College, Malta

Stella Maris College  
St. Albert Street  
Gzira - Malta

6th January 2006

Hello Tiago,

It's Mathias Rosales from Malta.  
I have to ask you so many questions I hope  
you answer all of them. My favourite food is  
chicken from the grill. I hope you like chicken  
too. I like playing video games too  
especially with my play station 2.

Do you have a play station  
2? If you have you have to buy Final Fantasy  
X or Final Fantasy X-2. They are really cool!  
Do you like rock? My favourite band is  
Green Day. Do you like Green Day? Do you  
play an instrument? I play the violin.

Give me a letter with a  
a picture of you. Sorry I can't give you  
a picture of me my mum doesn't let me.

Hope you write back soon,  
from your penpal

Stella Maris College  
St. Albert Street  
Gzira - Malta

9th April, 2006

← remove  
to read

Green Day  
Avenge Sevenfold

Hi Tiago,

It's me again. Time to answer all  
your questions. I didn't understand the  
word you liked eating but I thought it was  
pizza so yes our country has pizza.  
I have no idea if I'm gonna buy  
a P.S-3.

Do you watch wrestling?  
I like Rey Mysterio, Boogeyman, Undertaker  
and many more. Who do you like? Do  
you collect pokémon cards or wrestling  
cards? I gave you a free card.

Buy Smackdown! vs Raw  
or Smackdown! vs Raw 2006 they're really  
cool. That photo is me wearing my  
school uniform. Don't I look cool!

Send soon!

Mathias Rosales

# Text production in the form of a leaflet (a)

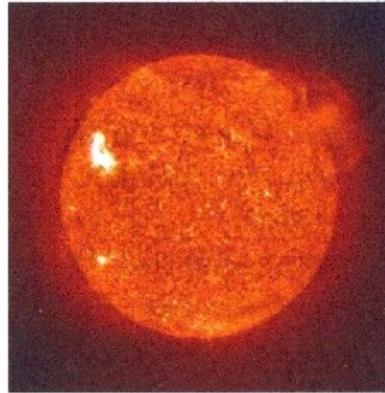
## Risk Factors

Individual people, who fall into one or more of the following categories, should take extra precautions against UV rays exposure. Those are people with:

- a family history of skin cancer.
- prone to sunburn after sun exposure,
- excessive sun exposure in childhood,
- individuals who work for long periods in the sun such as gardeners, fisherman, stonemasons and farmers,
- fair skin, hair and eyes or redheads,
- having numerous freckles and
- those who experienced severe sunburn at a young age, during childhood or teenage years.

Page 5

## Stella Maris College, Malta



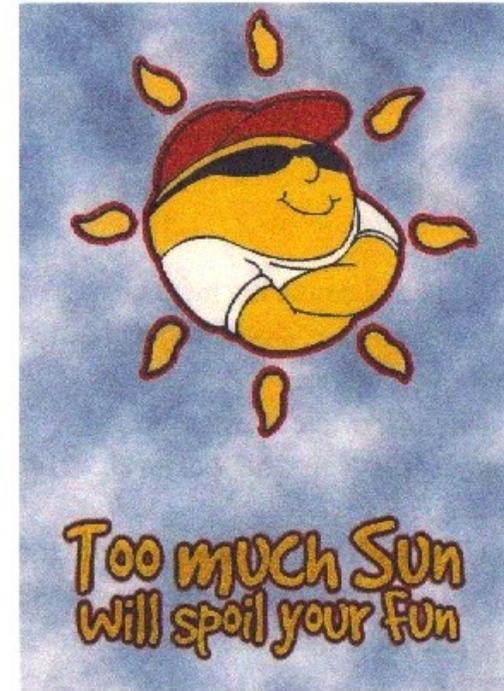
*For further information contact*

*Stefan on:*

*e-mail: stefancassa@hotmail.com*

*mobile: 79680761*

Page 6



*The sun, its effects and  
sunscreens.*

*Practical tips you should  
be aware of.*

Cover

# Text production in the form of a leaflet (b)



- Sun rays cause harmful effects on our skins throughout the whole year round.
- The ultraviolet rays are responsible for the harmful effects of the sun.
- UVB rays cause skin redness and sun burn; UVA rays are responsible for photodermatoses and other skin rashes.
- UVA can also suppress the immune system causing recurrent infections such as lip sores and certain fungal infections.
- UVA can cause skin ageing, in the long term; they accelerate premature ageing at the appearance of pigmentation spots.
- This increase in the harmful effect of the sun is due to the depletion of the Ozone Layer.

Page 2

## Stella Maris College, Malta



- Between 11 a.m. and 4 p.m. avoid the sun its harmful rays you should shun!
- Even when overcast the sun can burn your skin quite fast!
- Limit exposure to the sun's beam! Wear a hat and a T-shirt! Sunglasses and cream protect your kids from the sun's beam!
- When pregnant, in the sun do not bask or else you may get pregnancy mask!
- Some drugs with the sun will interact so be prepared and check the pack!
- Apply sunscreen from head to toe and reapply so you don't glow!
- Staying in the sun too long is harmful even with the sunscreen on!

Page 3



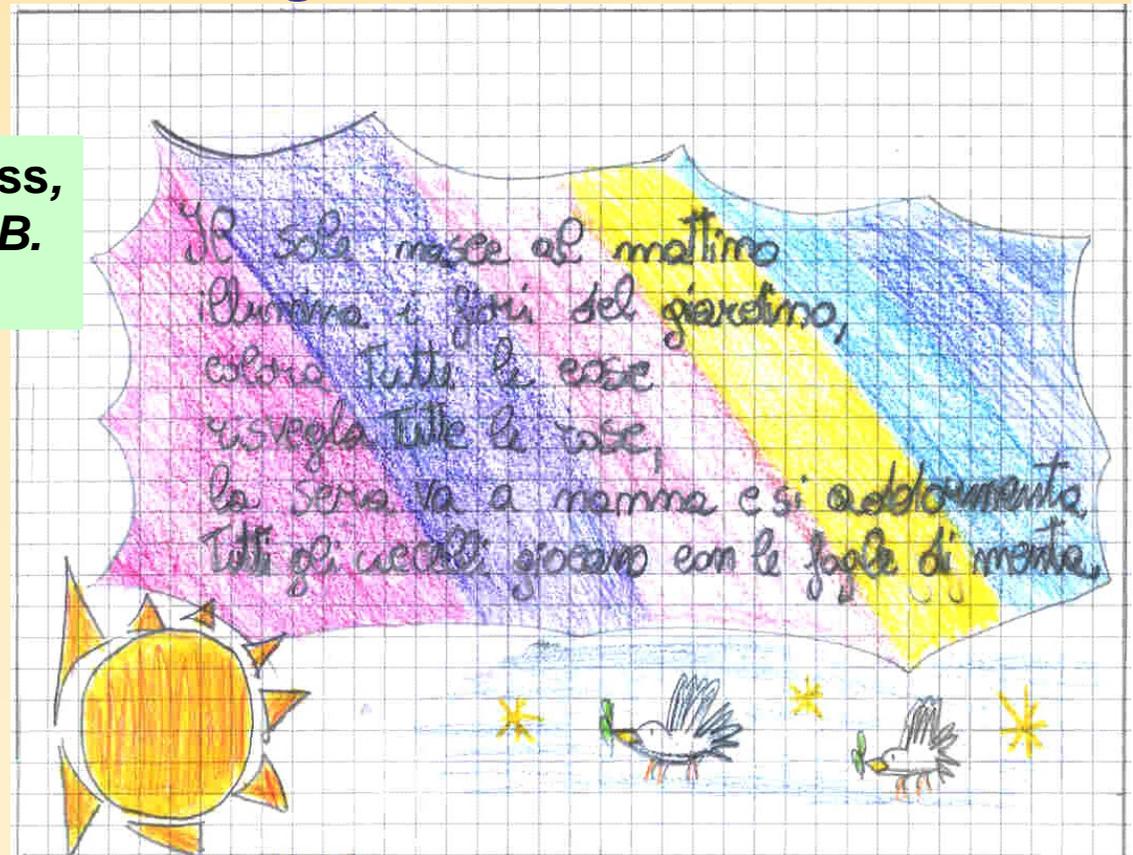
- Apply sunscreen half an hour before going out.
- Use sunscreens always in summer, not only when going to the beach but even when going out.
- It is important to choose a good sunscreen.
- Use sunscreens during school activities such as sports day, outings and other events.
- Dark skinned people should still use sunscreens.
- Protective clothing such as a T-shirt, sunglasses and a wide brimmed hat should be worn.
- Avoid swimming with wet T-shirts since the sun's rays pass easier.
- Even if using sun screens, do avoid staying in the sun between 11 a.m. and 4 p.m.

Page 4

# Text production in the form poems and drawings

*Il sole nasce al mattino  
Illumina i fiori del giardino,  
Colora tutte le cose  
Risveglia tutte le rose,  
La sera va a nanna e si addormenta  
Tutti gli uccelli giocano con le foglie di menta.*

**Student Irene Napoli from 1° G class,  
Scuola Secondaria di 1° Grado C.B.  
Cavour, Italy**

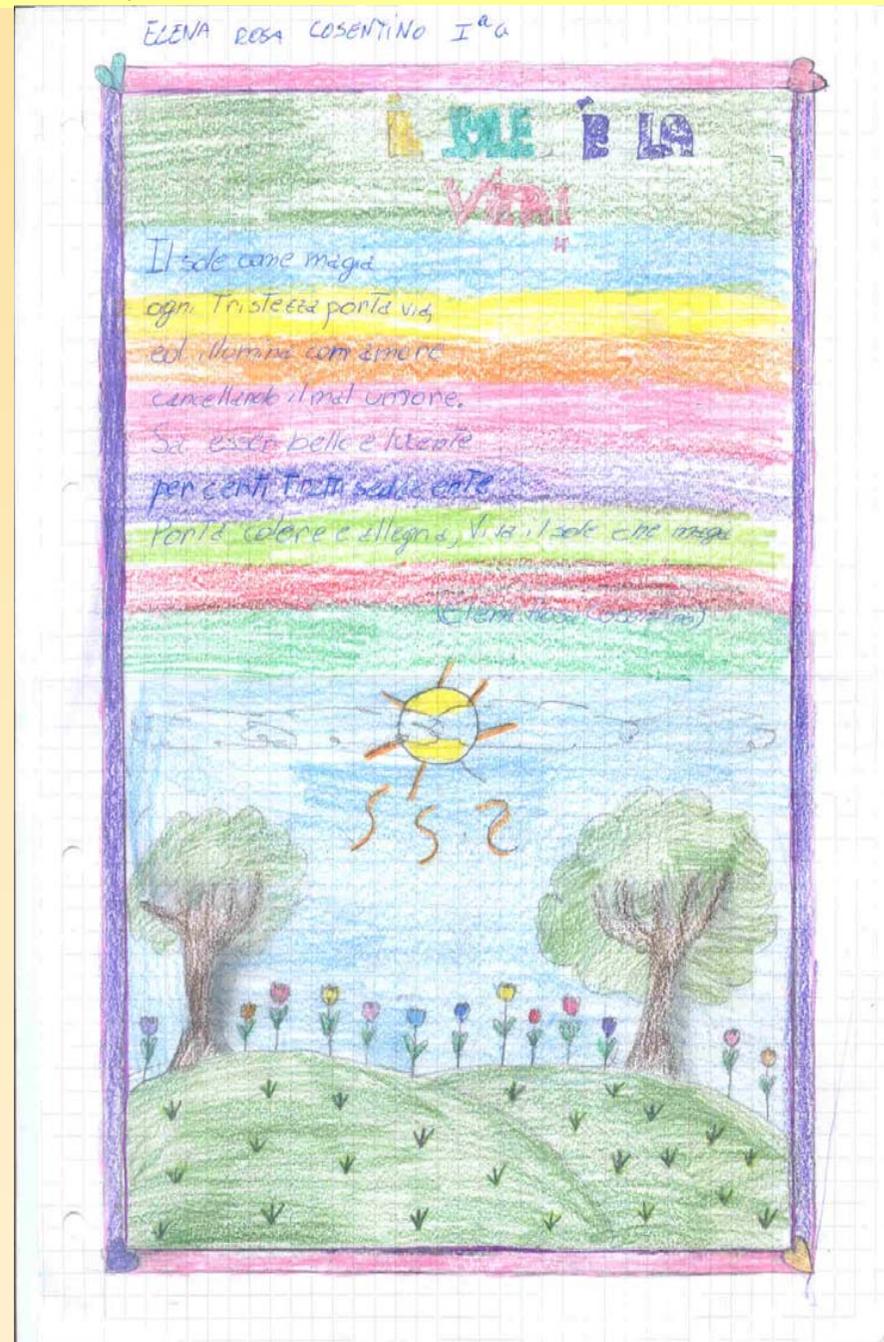


# Text production in the form poems and drawings

## Il sole è la vita

Il sole come magia  
Ogni tristezza porta via,  
Ed illumina con amore  
Cancellando il malumore.  
Sa esser bello e lucente  
Per certi tratti seducente.  
Porta colore e allegria,  
viva il sole che magia!

Student *Elena Rosa Cosentino* 1°G,  
Scuola Secondaria di 1° Grado C.B.  
Cavour, Italy





# Constructing a tunnel greenhouse ...

*Scuola Secondaria di 1°  
Grado C.B. Cavour, Italy*



# Planting the tunnel greenhouse ...

*Scuola Secondaria di 1°  
Grado C.B. Cavour, Italy*



# Planting seeds in wooden raised beds at school ...

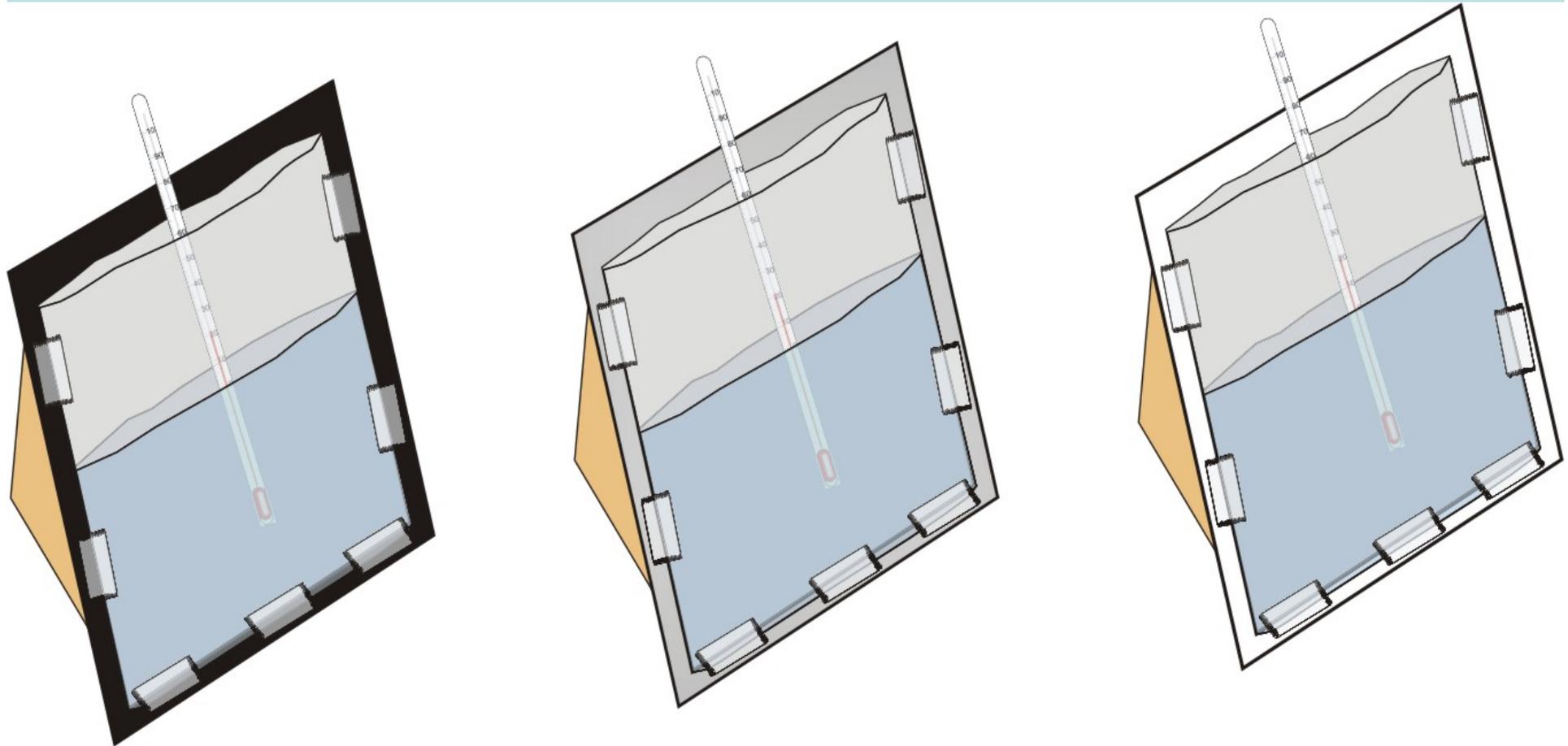
***Colegio de Educación Infantil e Primaria Froebel, Espania***



***Friedrich Froebel  
(1782-1852)  
contended that  
"the garden is a  
place to learn the  
consequences of  
one's actions in a  
very direct way."***

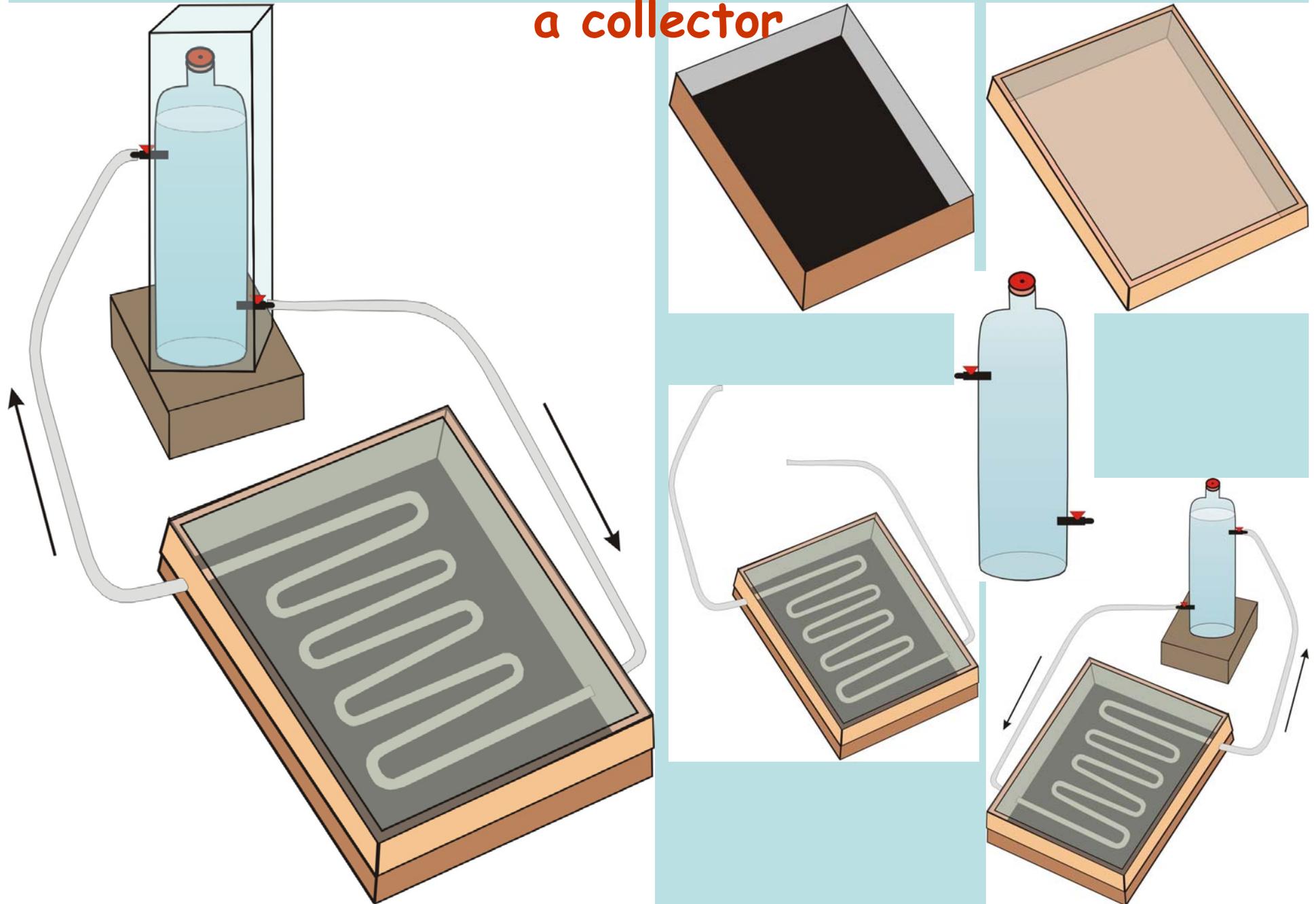


# Heating up water in plastic bags-simple collectors

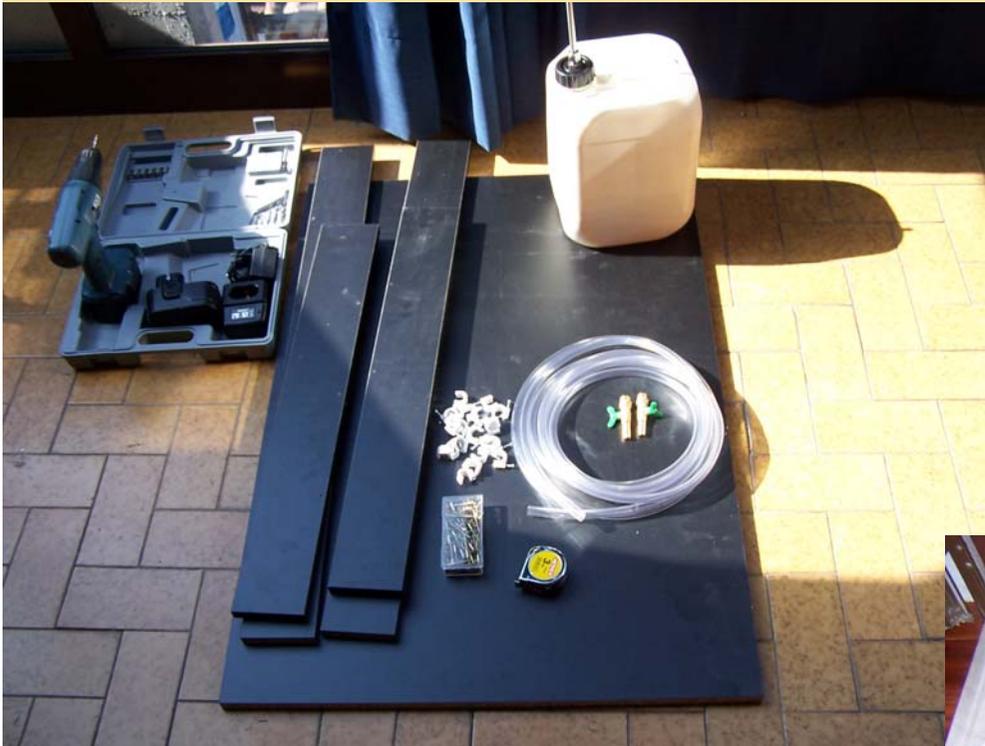


**9<sup>th</sup> Primary School of  
Rethymno, Greece**

# A simple solar water heater with a plastic bottle and a collector



# Solar water heaters constructions



*Scuola Secondaria di 1° Grado  
C.B. Cavour, Italy*



# Solar water heaters constructions

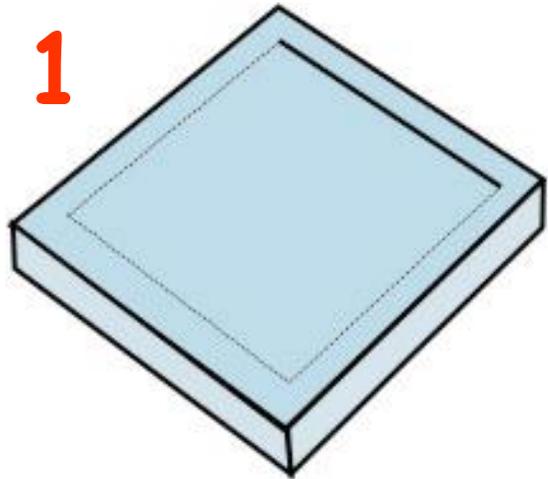


**Escola Antré Soares,  
Braga, Portugal**

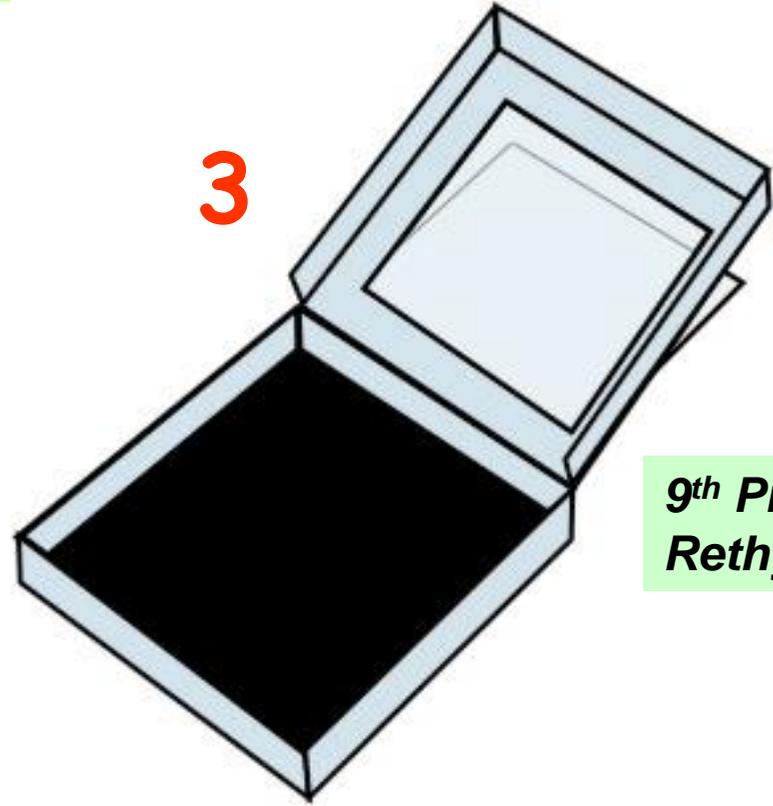


# Construction of a simple solar cooker out of a pizza box

1

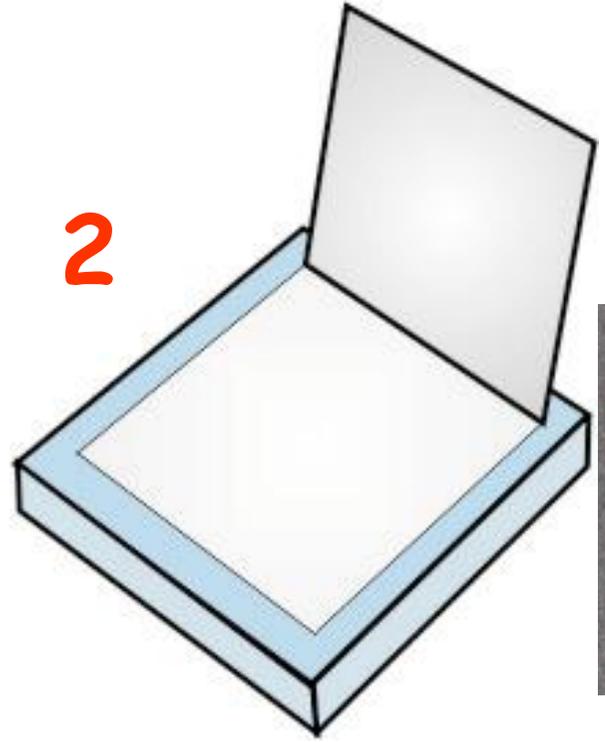


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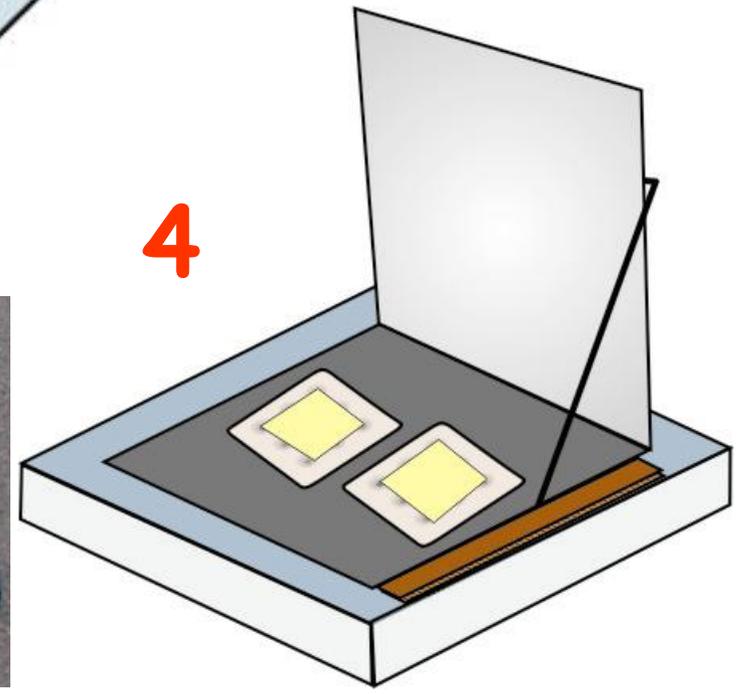


9<sup>th</sup> Primary School of Rethymno, Greece

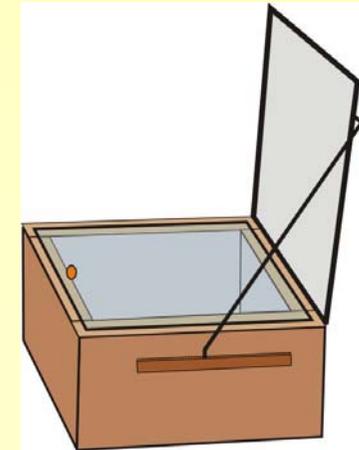
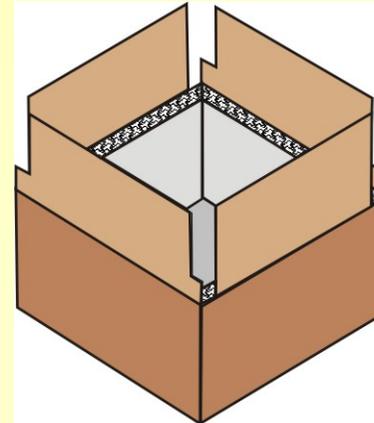
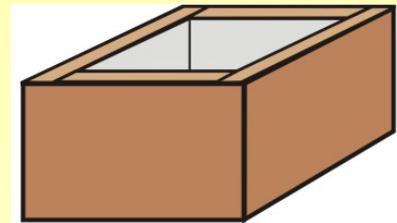
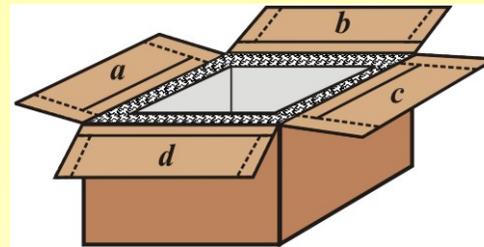
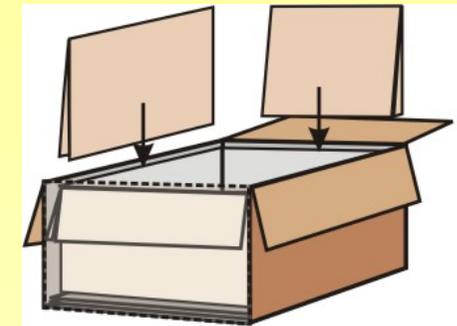
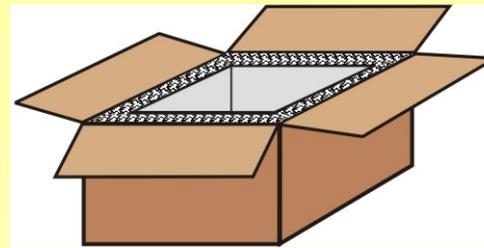
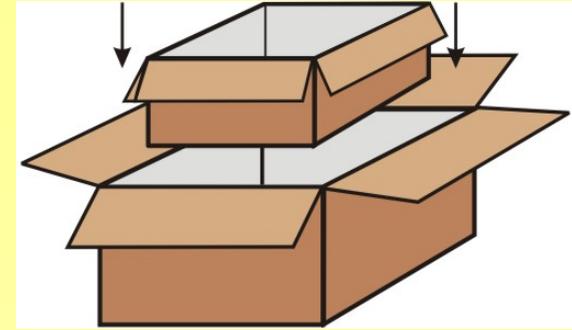
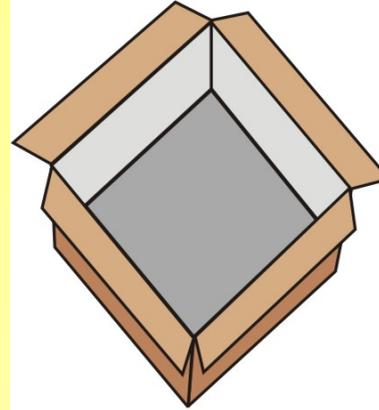
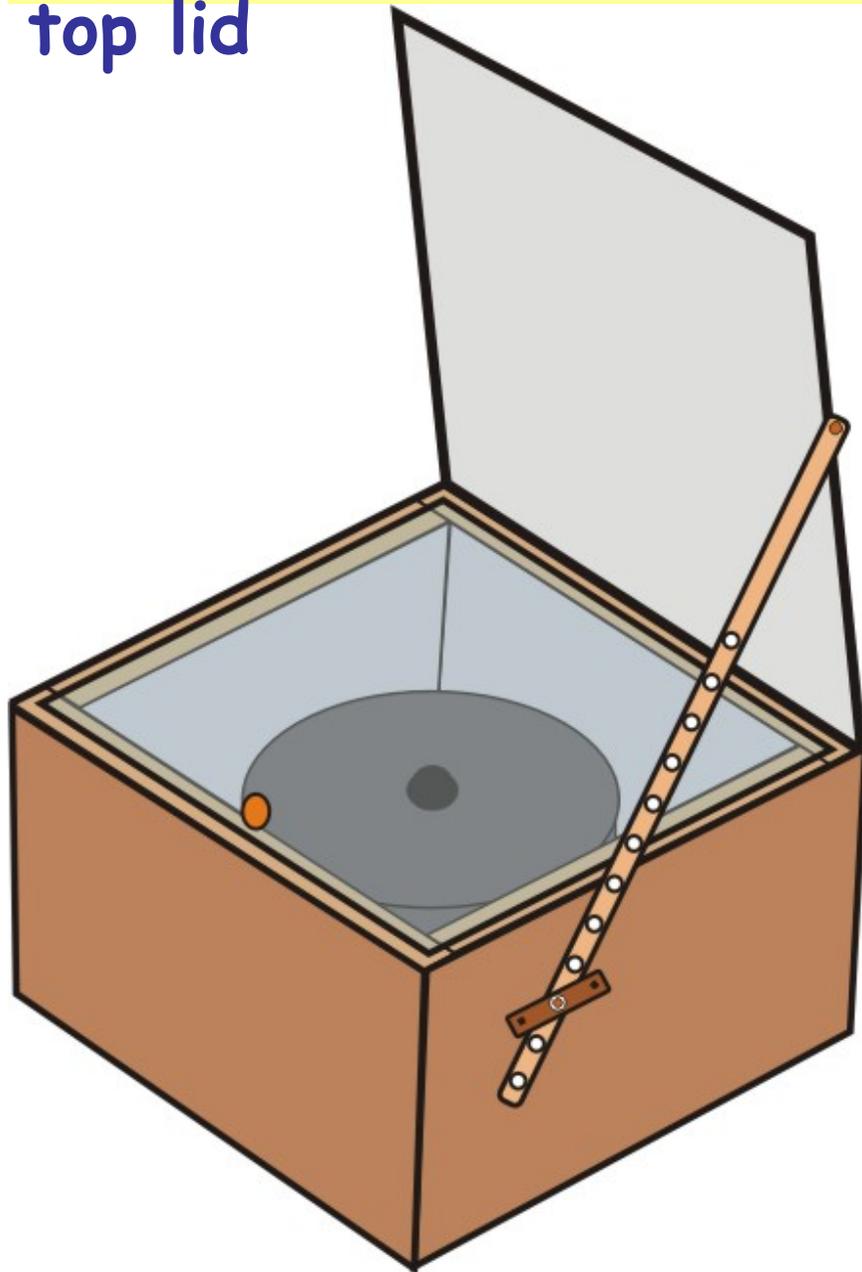
2



4



# A box solar cooker with one reflector and without a top lid



# Solar box cooker constructions



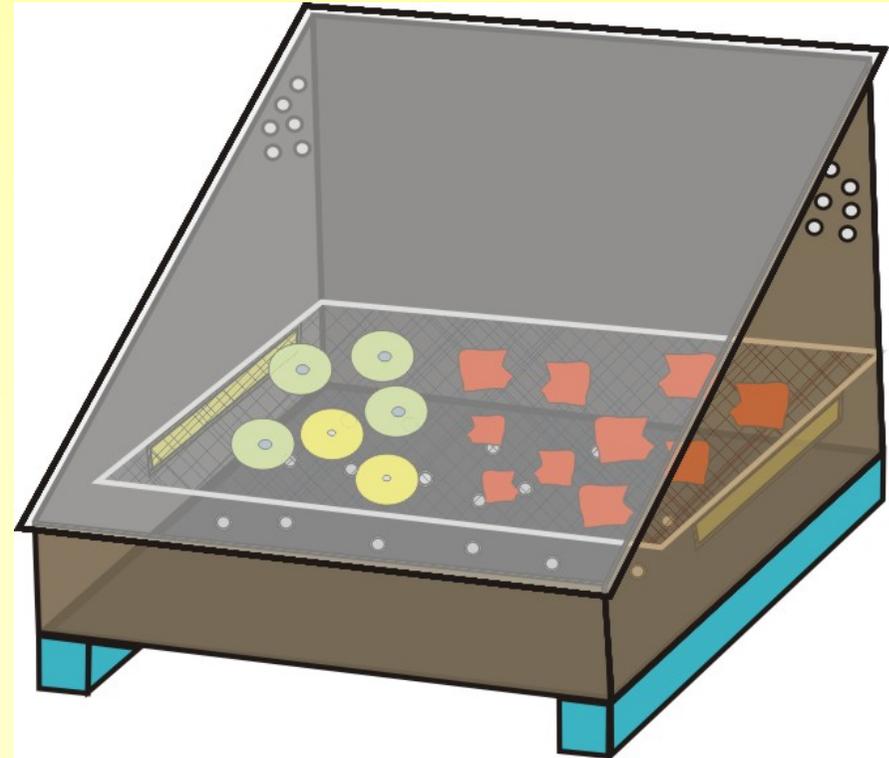
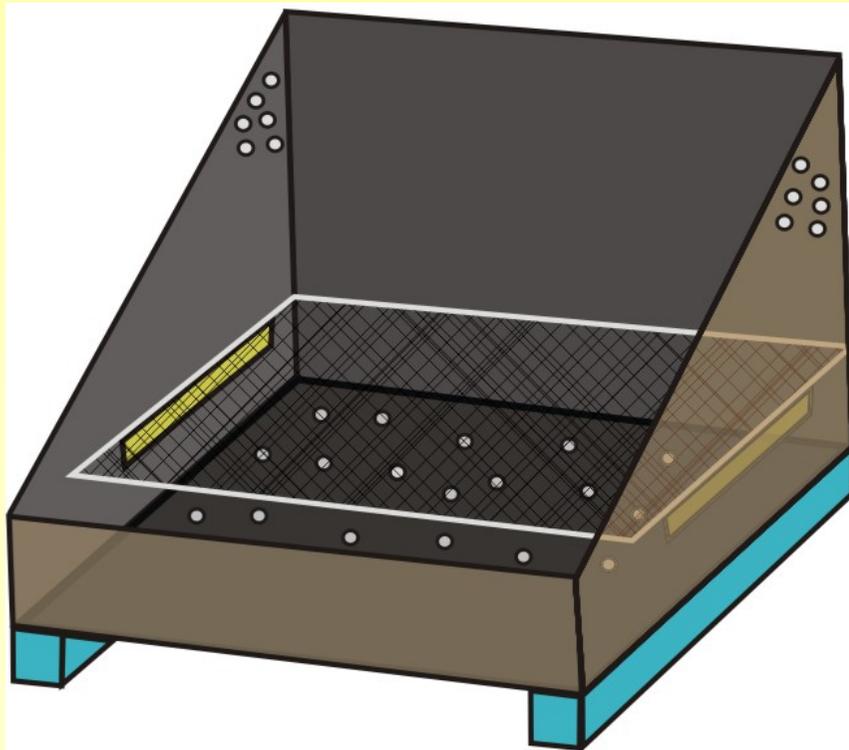
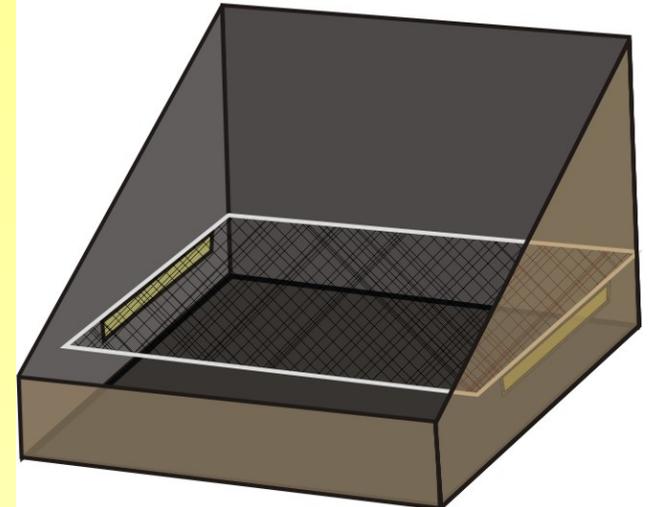
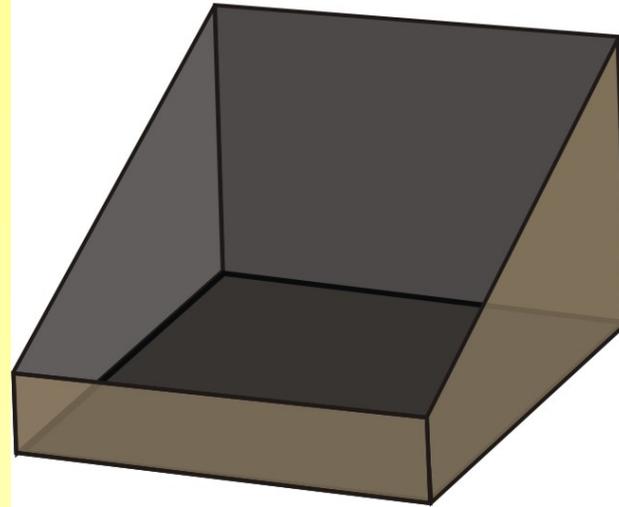
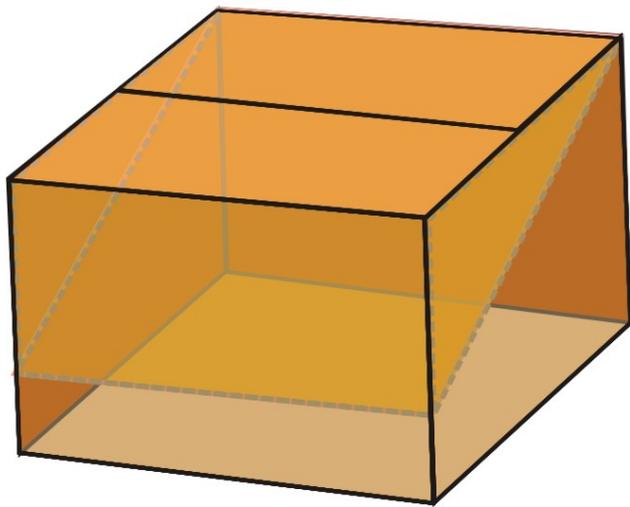
# Solar box cooker constructions



**Scuola Secondaria di 1° Grado  
C.B. Cavour, Italy**



# Constructing a solar dryer for fruits and vegetables out of a box



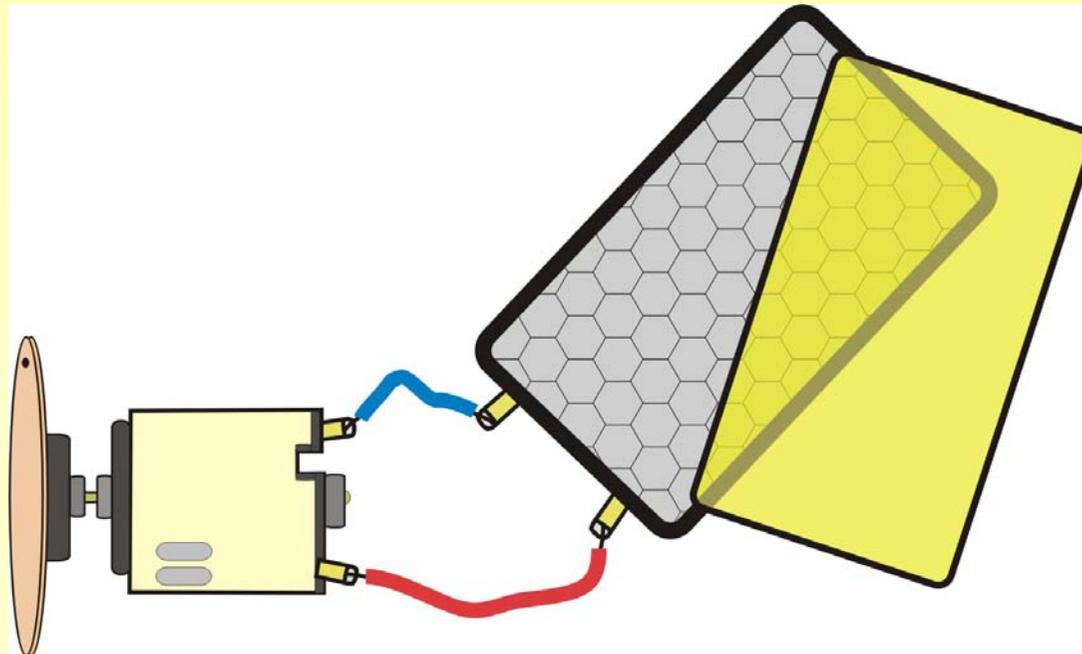
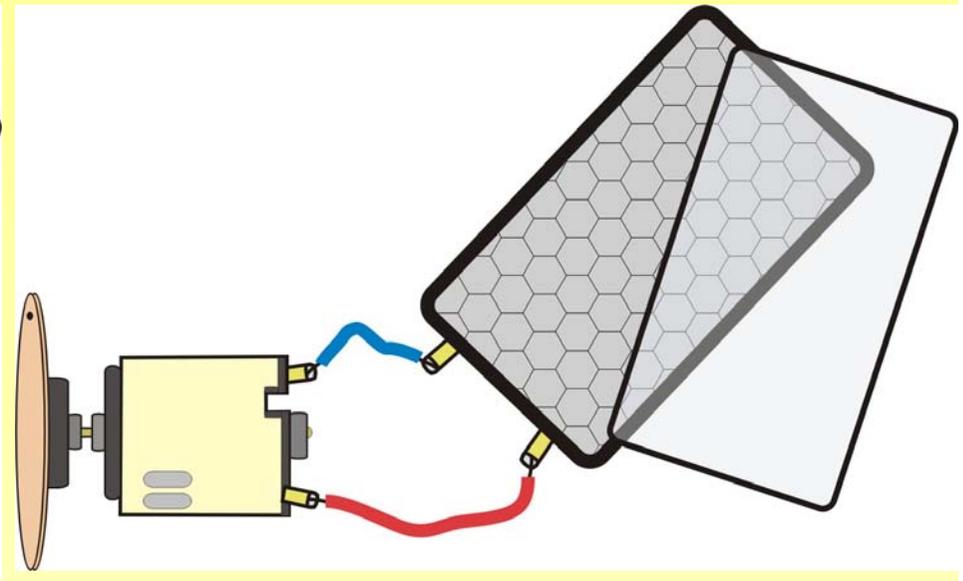
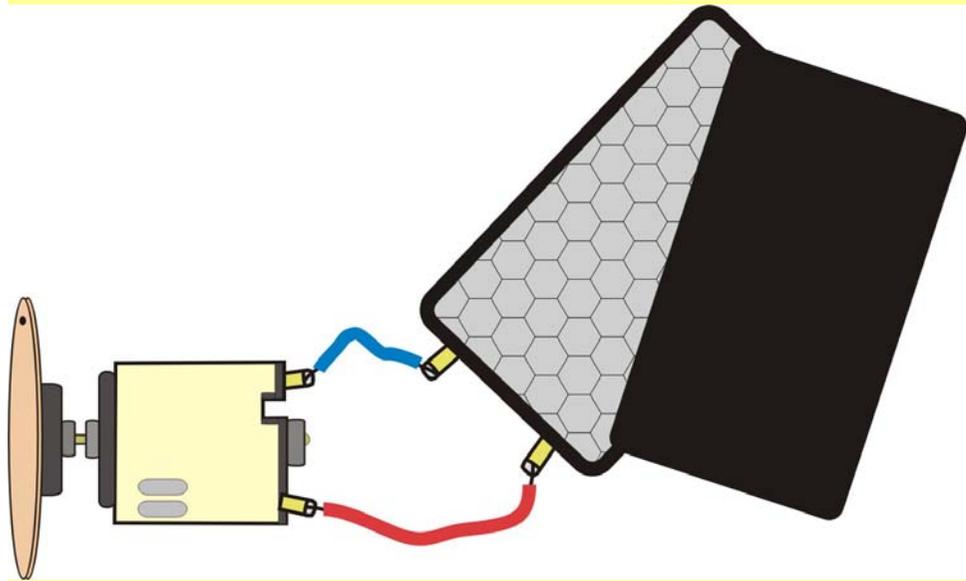
# Constructing a solar dryer for fruits and vegetables out of a box



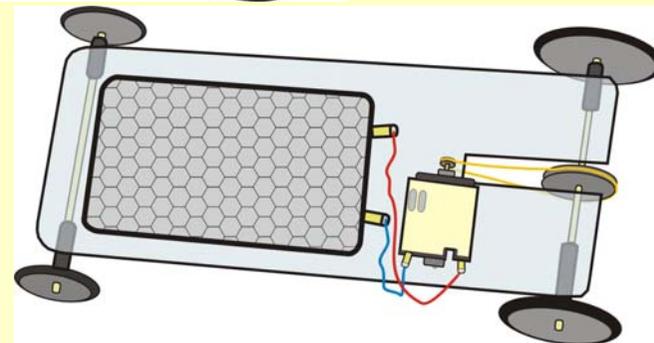
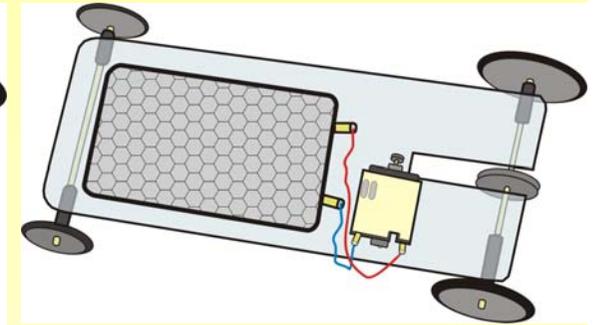
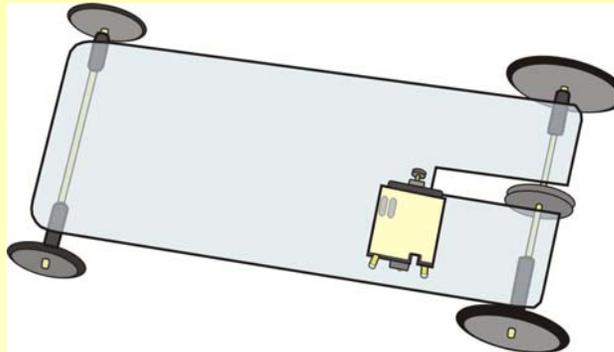
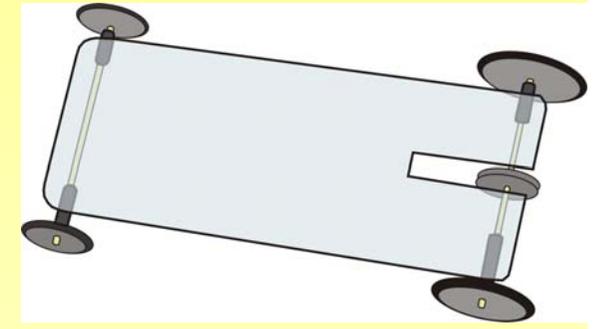
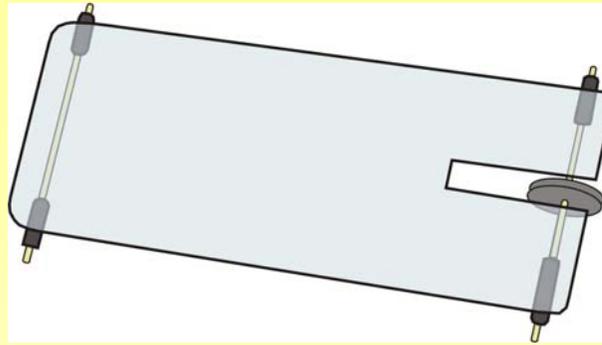
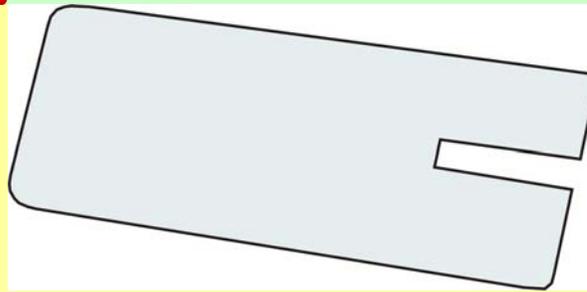
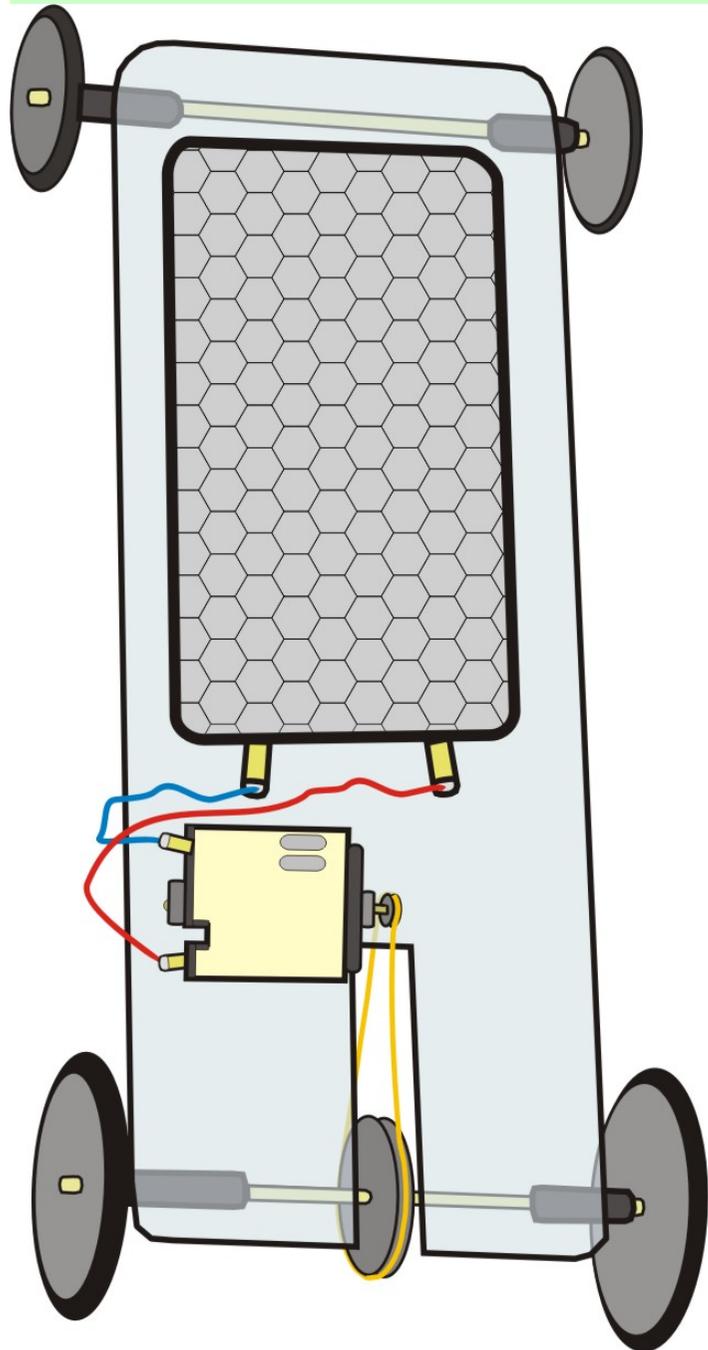
**9<sup>th</sup> Primary School of  
Rethymno, Greece**



# Experiments with photovoltaic cells.



# A solar toy car ... under assembly



# Constructing a "big solar toy car" ...



*Escola Antré Soares,  
Braga, Portugal*

# Constructing a "big solar toy car" ...



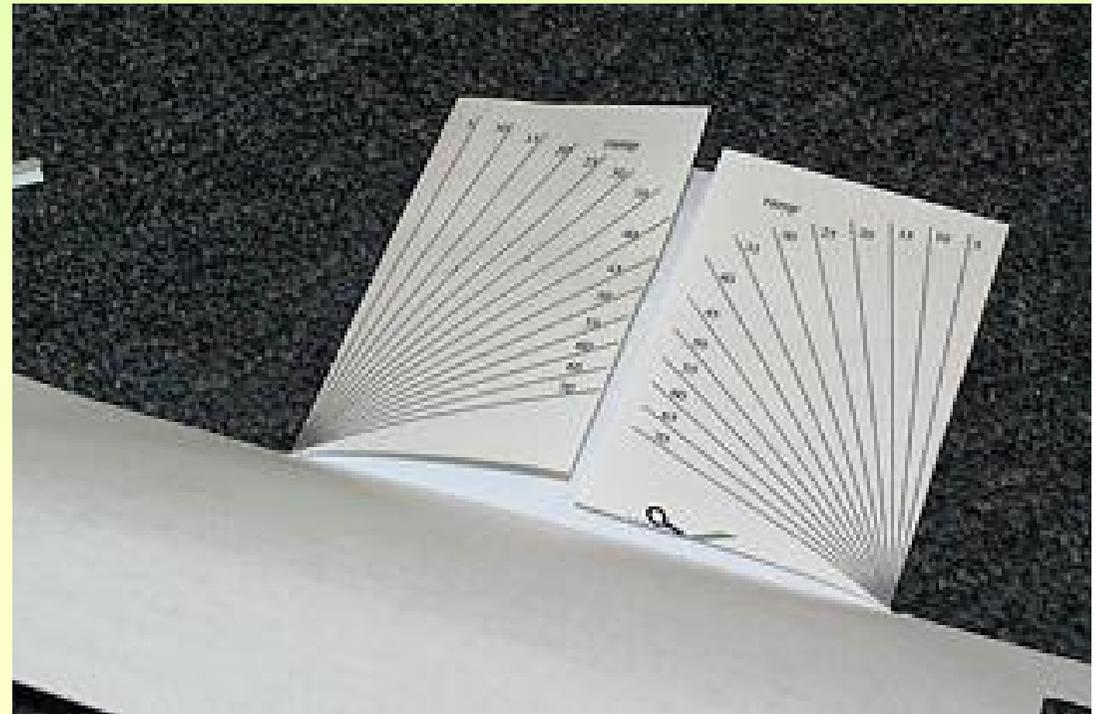
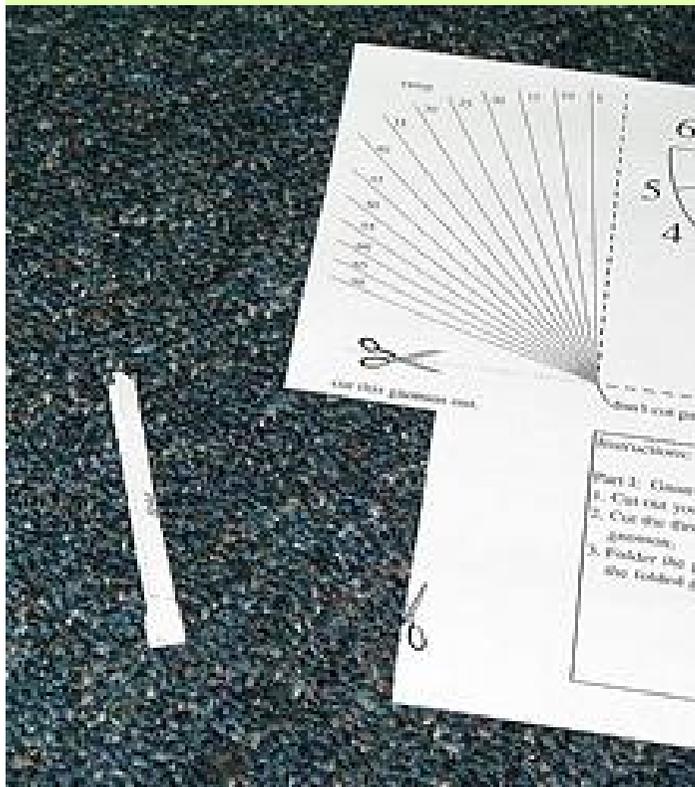
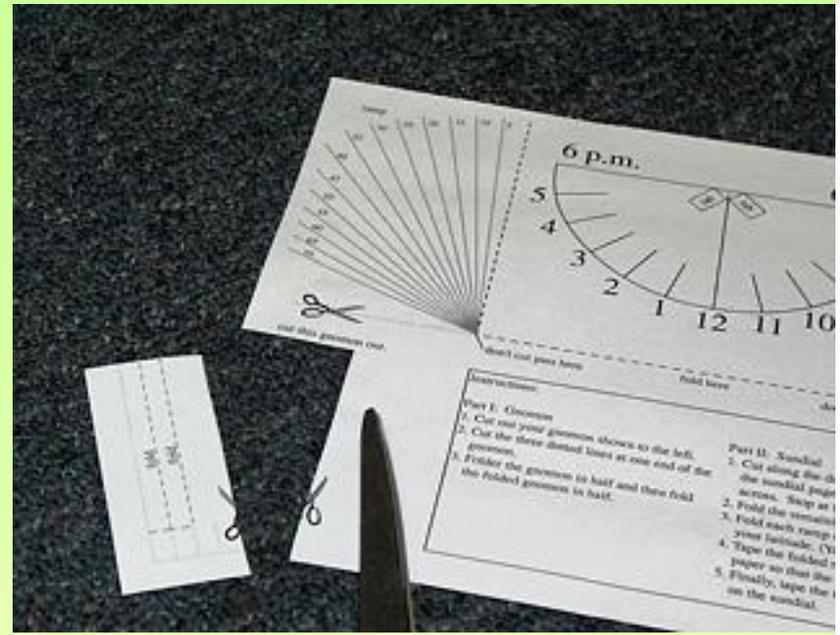
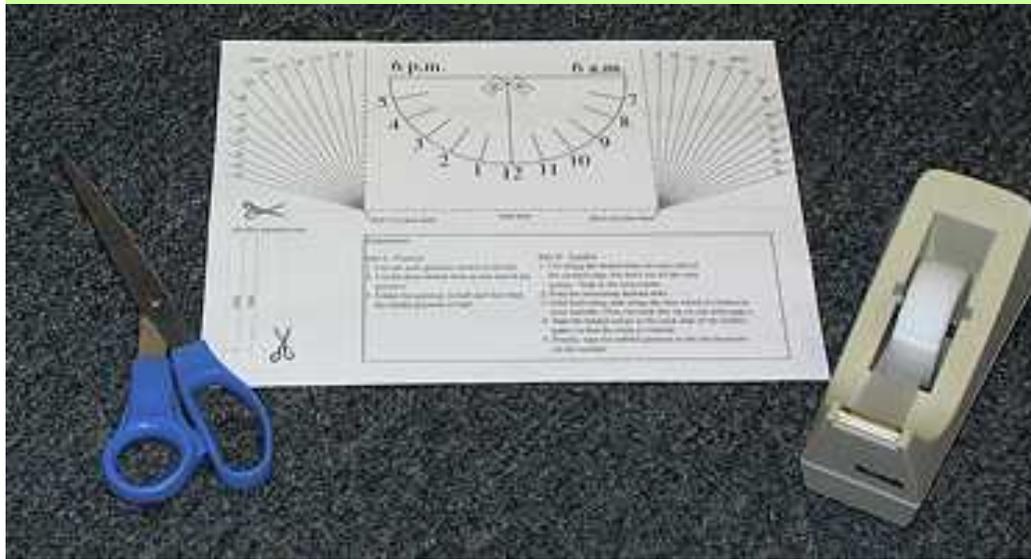
*Escola Antré Soares,  
Braga, Portugal*

# Riding a "big solar toy car" !!!

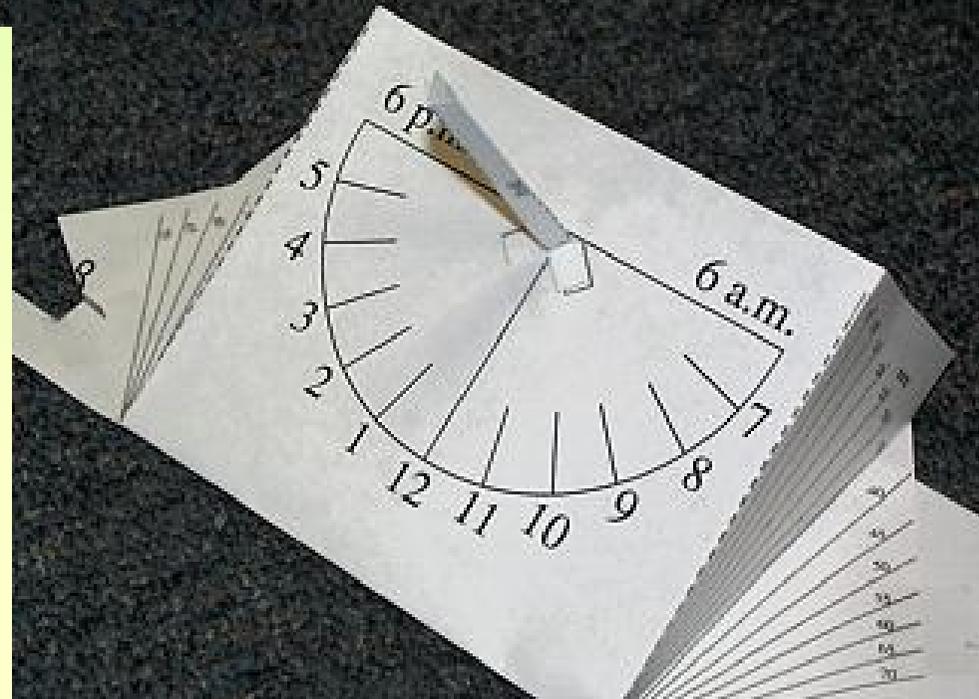
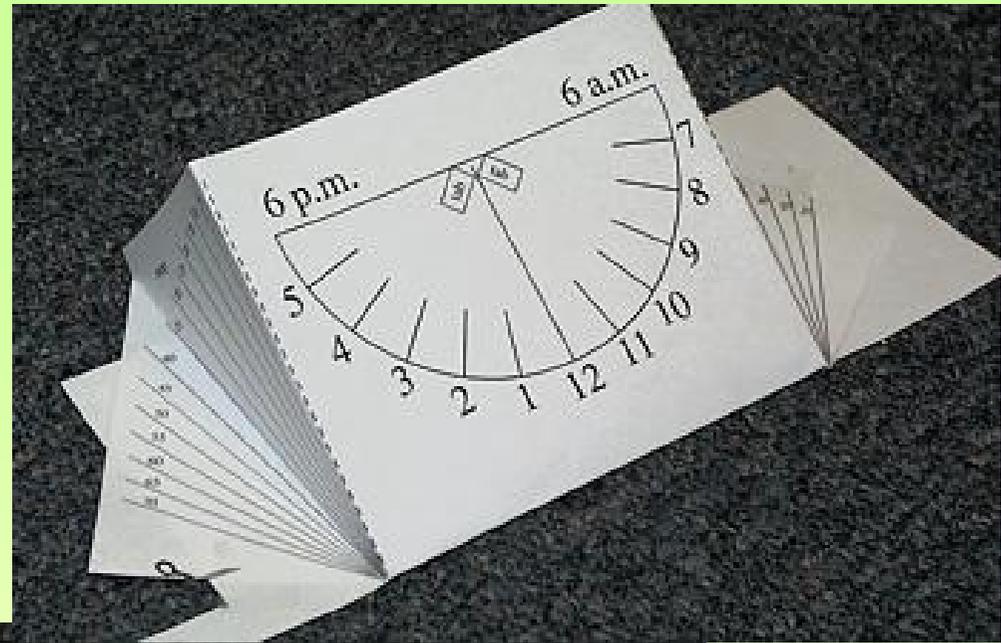
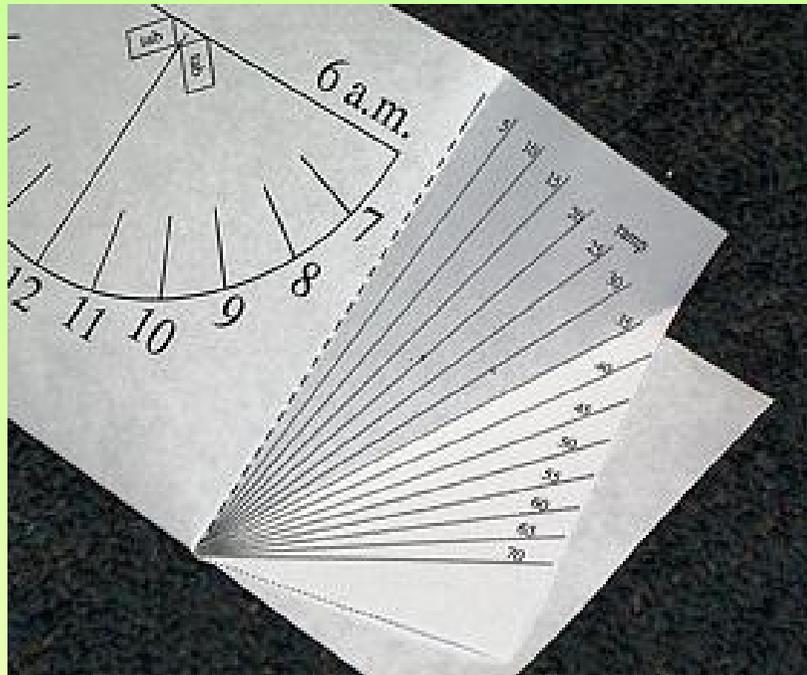
*Escola Antré Soares,  
Braga, Portugal*



# A Sun dial from NASA ... we constructed



# A Sun dial from NASA ... we constructed



# Constructing a horizontal sundial ... for $\sim 35^\circ$ latitude



**9<sup>th</sup> Primary School of  
Rethymno, Greece**



# Science fair activities ...

*Stella Maris College, Malta*



# Science fair activities ...

*Stella Maris College, Malta*



# Science fair activities ...



*Escola Antré Soares,  
Braga, Portugal*



# Craft work with "Sun" and "solar" topics ...



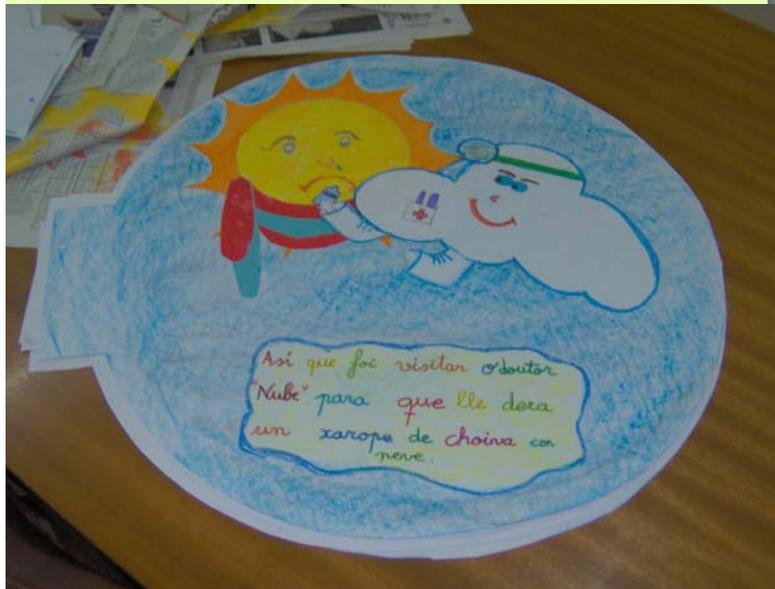
***Colexio de Educación Infantil e Primaria Froebel, Espania***



# Craft work with "Sun" and "solar" topics ...



***Colexio de Educación Infantil e Primaria Froebel, Espania***



# Craft work with "Sun" and "solar" topics ...



**9<sup>th</sup> Primary School of  
Rethymno, Greece**

# The "Sun-dropped lady" theatrical play



**9<sup>th</sup> Primary School of  
Rethymno, Greece**

# A "Sunflower" theatrical play ...

***Colegio de Educación Infantil  
e Primaria Froebel, España***



# "Thank you brother Sun" ... a song!

Come on let's use our energy.  
To work as one in harmony.  
We can do wonders, and have fun.  
Just look above and watch the sky.  
Fill with a glow that blinds the eye.  
Move clouds away, here comes the sun.

Shining bright - what a sight.  
Wonderful, powerful, beautiful  
Dazzling light, radiant white  
Energy, all for free -Powerhouse.

Bring in the sunshine (x2)  
Bring in the light (x2)  
One giant battery (x2)  
Super energy.

Thank you, brother sun  
(God Bless you)  
You're my number one  
(God bless you)  
Shine on in the sky forever more (x2)

*Stella Maris College, Malta*



A "Project logo" from the children of *Scuola Secondaria di 1° Grado C.B. Cavour, Italy*

# Concluding Remarks

- A **variety of solar energy activities**, solar applications and constructions, which took place during the first year of the SEAA Comenius 1 project, have been presented and documented.
- It appears that there has been **a thematic and rather holistic approach**, not only restricting itself to a conceptual and practical level, but also posing emphasis on social and cultural perspectives related to the issues tackled, at least for the majority of the activities.
- During the two project meetings, we discussed the possibility for the **establishment of an “e-twinning network”** (cf. URL:< <http://www.etwinning.net/ww/en/pub/etwinning/index2005.htm> >) amongst school partners, in order to use the services and the “*TwinSpace*” for communication and exchange of project information. This seems to be an interesting idea under elaboration for the following project year.
- Finally, **we would like to thank all pupils and teachers of the collaborating schools**, who have done such a wonderful work on the first year of the project, which credits a valuable asset for the future.

**"Solar Energy - Awareness & Action" Project...  
is to be continued next year 2006-2007!**



**Scuola Secondaria di 1°  
Grado C.B. Cavour, Italy**

A photograph of a sunset over the ocean. The sun is a bright, glowing orb in the center of the sky, casting a shimmering path of light across the water's surface. The sky transitions from a deep orange near the horizon to a darker, muted orange at the top. In the lower right foreground, the dark silhouette of a small boat with a single sail is visible against the dark water. The overall mood is peaceful and serene.

Thank you for your attention