Date: Name:
Group:

Activity book

My Ecofriendly House

Target: Grade 8 students.
Duration: At least 6 periods of 75 minutes.
Broad Area of Learning: Environmental awareness and consumer rights and responsibilities.
Subject-Specific Program: Science and Technology.
- **Competency 1:** Seeks answers or solutions to scientific or technological problems.
- **Competency 2:** Makes the most of his/her knowledge of science and technology.
- **Competency 3:** Communicates in the languages used in science and technology.

Cross-Curricular Competency 8: Cooperates with others.
Visual Arts Competency 1 (in part): Creates personal images.
Main compulsory concepts:

The Earth and Space:	Natural energy sources
	Winds
	Water cycle
	Renewable and nonrenewable energy resources
The Technological World:	Specifications
	Design plan
	Technical drawing
	Material
	Components of a system
	Energy transformations
	Mechanisms that transmit motion

Expectations and evaluation

This learning situation aims at developing specific abilities and attitudes. Study carefully this section before engaging in your project as your rating depends on how well you meet these expectations.

Competency 1: Seeks solutions to technological problems.
C1.1 – Appropriate representation of the situation. You must demonstrate a clear understanding of the problem.
C1.2 – Development of a suitable procedure for the situation. You must be able to plan carefully all aspects of the work to be done and to respect specifications.
C1.3 – Appropriate implementation of the procedure. You must be able to follow your procedure step by step, to make adjustments, to justify them and to work safely.
C1.4 – Development of relevant conclusions. You must be able to test your solution, to find its strengths and weaknesses and to suggest improvements.

Competency 2: Makes the most of his/her knowledge of science and technology.
C2.1 – Formulation of appropriate questions. You must think of questions that will lead you to developing original and efficient solutions.
C2.2 – Appropriate use of technical concepts. An accurate technical drawing is expected.
C2.3 – Relevant explanations. You must demonstrate that you understand how your solution works.
C2.4 – Suitable justifications of solutions. You are expected to explain how your solution affects individuals, society, the economy and the environment.

Competency 3: Communicates in the languages used in science and technology.
C3.1 – Appropriate interpretation of scientific and technological messages. It is expected that you understand and use correctly relevant information.
C3.2 – Messages produced using vocabulary and in accordance with related rules and conventions. You must respect vocabulary, rules and conventions.

Cross-Curricular Competency 8: Cooperates with others.

CC8.1 - Recognition of needs of others. You must show you can listen to others, respect their views and accept others as they are.

CC8.2 - Appropriate attitudes and behaviors. You must demonstrate an ability to participate in the exchange of ideas and to manage conflicts.

CC8.3 - Active participation in the work of the team. You must demonstrate the ability to be an active member of the team and to respect team decisions.

CC8.4 - Contribution to improving the way the team works together. You must be able to recognize everyone's work and to propose ways to improve teamwork.

Visual Arts Competency 1 (in part): Creates personal images.

C1.2 – Effective use of transforming gestures. You must demonstrate the ability to transform raw materials into a quality product.

C1.3 – Appropriate use of the properties of materials. Materials should be put to creative and innovative uses.

C1.4 – Coherent organization of the images' components. The project must demonstrate coherence between colors, form and function.

C1.6 – Authentic production that integrates original and expressive elements. Expression of personal preferences must be obvious in the design, create the house of your dreams!

Universal scale	Rating
Outstanding (exceeds expectations)	5
Very good (meets expectations)	4
Acceptable (meets minimal requirements)	3
Insufficient (presents serious flaws)	2
Unacceptable (unable to accomplish task)	1

Problem

Your Engineering Firm has received a request for proposal from the Ministry of Sustainable Development. You are invited to:

> ***Propose an environmental house prototype using 3 of the 4 following renewable energy sources: sun, wind, water, or geothermal. This innovative house should use and conserve energy efficiently as well as minimize damage to the environment and to residents.***

In teams of 4, you must:

- Produce a scale model of the house integrating the 3 energy modules.
- Provide design plans and technical drawings for each part of the project (complete the appropriate section of the Activity book).
- Create a brochure explaining in simple terms how the modules function and promoting the numerous advantages of your Ecofriendly house concept.

Your project should include some of the following elements:

- House orientation (sun, shade, wind, seasonal changes)
- Natural landscaping (trees, hedges, grass, garden, green roof, etc.)
- Heating (thermal and photovoltaic solar panels, passive heat, window types, geothermal energy, fireplace, insulation, wind bloc, etc.)
- Wind turbine
- Air quality (conditioning, fans, exchanger, filter, humidity, etc.)
- Water (wastewater management, water reclamation, rain, pond, plant transpiration, etc.)
- Ecological building materials (wood, stone, ceramic, brick, etc.)
- Natural pigments (mineral, organic)
- Sustainable interior design (floors, walls, carpets, appliances, furniture, lights, etc.)
- LEED certification

In this learning situation you are invited to seek solutions to a technological problem in a cooperative spirit.

Specifications

Nature and function of the technological object:

The prototype serves to illustrate an ecological house and to demonstrate the functions of its various systems.

Material specifications:

1) House model:

- use provided material (cardboard, choroplast, wood sticks, plastic, straws, gears, etc.).
- *1:25 scale.*
- maximal surface : 54 m^2.
- maximal hight (per level): 2,44 m.

2) Energy modules:

- use provided material (cardboard, choroplast, wood sticks, plastic, straws, gears, motor, etc.).
- *1:25 scale.*
- *at least one system must use a mechanism that transmits motion.*
- the energy modules must integrate to the house model.
- each module may either serve to illustrate a system or actually be fully functional. (Evaluation takes into consideration the level of difficulty of the project and the level of functionality achieved by the module).

Aesthetic specifications:

- visually pleasant. (External appearance, interior decoration, furniture, accessories, etc.)

Financial specifications:

- students should invest no more than 5.00$ in their project.

Environmental specifications :

- use of recycled materials is strongly suggested to demonstrate consistency regarding environmental awareness.

PHASE I: PREPARATION

1) Description of the task *(Defines a problem)*

Summarize the problem considering the given specifications.

What will be built?

_____

_____

_____

_____

What is the purpose of this particular design?

_____

_____

_____

_____

_____

What are the 2 most important specifications to respect?

_____

_____

_____

_____

_____

C1.1 – Appropriate representation of the situation

1	2	3	4	5

2) Planning your project *(Chooses a design scenario)*

You must now plan you house concept and how the work will be divided between teammates. Here is a checklist to help you plan your work:

☐ - distribution of house model and energy modules (who does what)
☐ - distribution of documentary research (who looks for what)
☐ - list of material
☐ - building steps
☐ - testing and assembly
☐ - decoration and/or final touches
☐ - creation of the brochure (who does what)
☐ - submitting the final project (who is responsible for what)

House model will be responsibility of:_____

Module 1:_____by:_____

Module 2:_____by:_____

Module 3:_____by:_____

Material required for my project:

_____

_____

PRECEDURE (LIST OF THINGS THAT I MUST DO):

1._____

2._____

3._____

4._____

5._____

6._____

C1.2 – Development of a suitable procedure for the situation

1	2	3	4	5

Renewable energy resources

The following questions will guide you in your documentary research:

1.1 Name 3 types of renewable energies and technological systems required to exploit them.

_____

_____

_____

_____

1.2 Explain some advantages and drawbacks related to the exploitation of these natural energy sources (economic, social, environmental, ecological, etc.).

_____

_____

_____

_____

1.3 Discuss some positive impacts of an ecological house on the quality of life of a family.

_____

_____

_____

_____

3) Documentary research *(Understanding how technological objects work)*

In order to advance, it is essential to know more about your subject.

Formulate 10 questions with your teammates. Write here the questions which apply to your project, as well as the answers you find. Ideally, this information should help you plan your construction and complete your brochure. Don't forget to include information on how your system works, and on the advantages and disadvantages of your ecological house.

Date	**Place where work was done (class, lab, home, library, etc.)**
Documentary research	
Here is the information I collected on my topic (use extra space if necessary). _____ _____ _____ _____ _____ _____ _____	
Sources	
List your sources of information (Websites, journals, reference books, etc.). _____ _____ _____ _____	

C2.1 – Formulation of appropriate questions

1	2	3	4	5

4) First draft of my project *(Chooses a design scenario)*

You may now sketch a draft of your project that takes into consideration the provided specifications and information you have collected on the topic. You may add personal notes to clarify your sketch. This draft must be **approved by your teacher** before you begin building the object.

Project:

Personal notes:

My Ecofriendly house self-evaluation

Level of competency achieved

Scale	Rating
Totally	3
Partially	2
Not at all	1

C1 - Seeks solutions to technological problems

Criteria	Observable manifestations	Rating
1- Appropriate representation of the situation	▪ We have defined the needs to satisfy (p. 6).	
2- Development of a suitable procedure for the situation	▪ We have planned a procedure to build our technological object (p. 7).	

C2 - Makes the most of his/her knowledge of science and technology

Criteria	Observable manifestations	Rating
1- Formulation of appropriate questions	▪ We have formulated various questions regarding our project (p. 9).	

CC 8 - Cooperates with others

Criteria	Observable manifestations	Rating
1- Recognition of needs of others	▪ I listen to others and respect their views. ▪ I accept others as they are.	
2- Appropriate attitudes and behaviors	▪ I participate in the exchange of ideas. ▪ I manage conflicts when they appear.	

PHASE II: REALIZATION

5) Project monitoring *(Carries out the procedure)*

You are now ready to start your project. Since a few periods are necessary, it is essential that you keep track of everything you do in order to know where you're at.

Date	Place where work was done (class, lab, home, library, etc.)

Description of the work done today

_____

_____

_____

_____

_____

_____

_____

_____

Problems encountered	Solutions proposed
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Date	Place where work was done (class, lab, home, library, etc.)

Description of the work done today

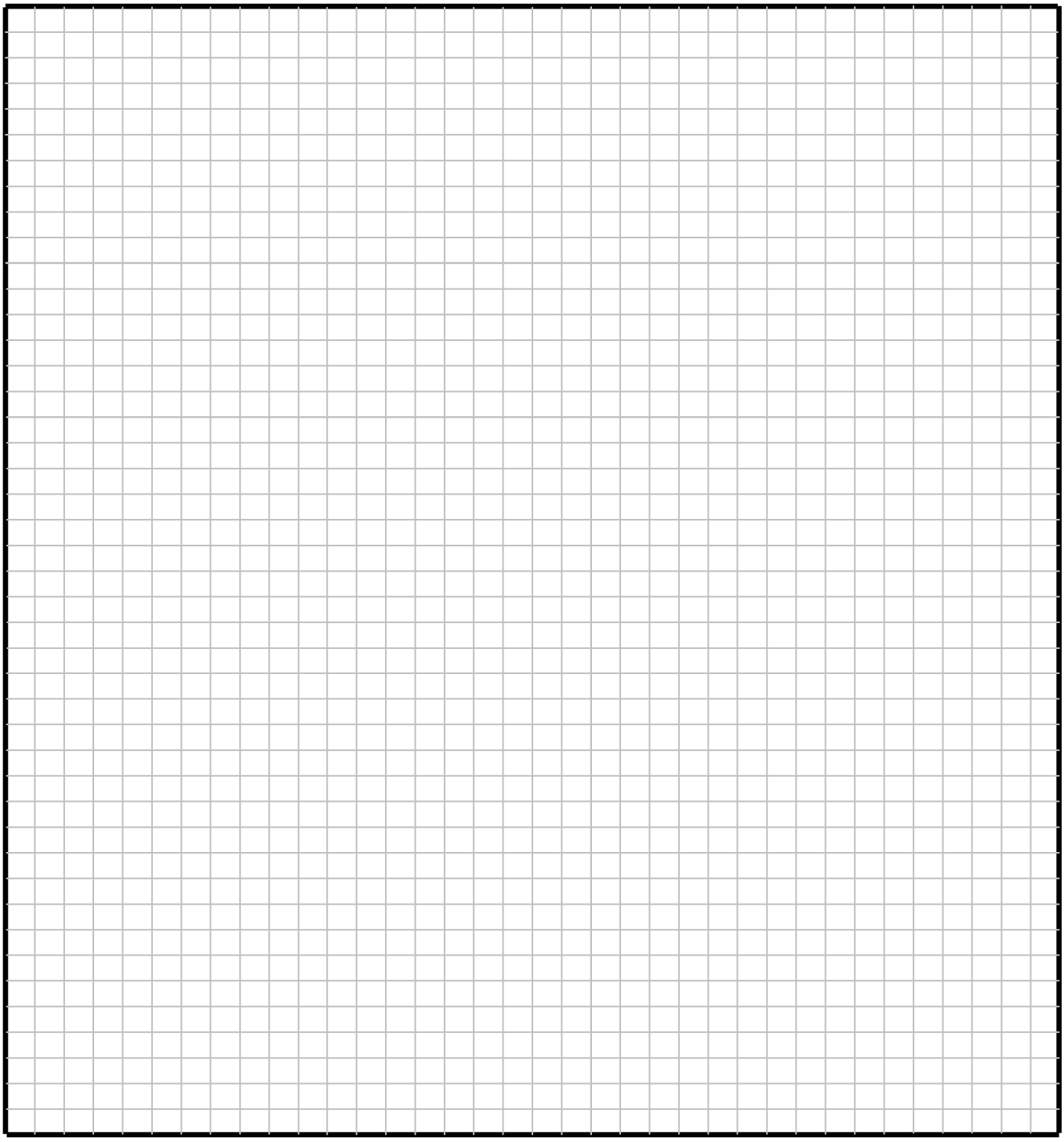
Problems encountered	Solutions proposed

C1.3 – Appropriate implementation of the procedure

1	2	3	4	5

TECHNICAL DRAWING

PROJECT:



C2.2 – Appropriate use of technical concepts

1	2	3	4	5

BROCHURE

Insert here a copy of your brochure and indicate which part you did. **Make sure your name and group are included on the brochure.**

C2.3 – Relevant explanations

1	2	3	4	5

C2.4 – Suitable justifications of solutions

1	2	3	4	5

My Ecofriendly house self-evaluation

Level of competency achieved

Scale	Rating
Totally	3
Partially	2
Not at all	1

C1 - Seeks solutions to technological problems

Criteria	Observable manifestations	Rating
3 – Appropriate implementation of the procedure	▪ I have followed the steps in the plan. ▪ When required, I adjusted my procedure, noted the changes and justified them. ▪ My prototype respects specifications. ▪ I have worked safely.	

C2 - Makes the most of his/her knowledge of science and technology

Criteria	Observable manifestations	Rating
2 – Appropriate use of technical concepts	▪ I have produced a technical drawing of my technological object (p. 14).	
3 – Relevant explanations	▪ We have produced a brochure explaining in simple terms how the modules function and promoting the numerous advantages of our Ecofriendly house concept.	
4 – Suitable justifications of solutions	▪ We have explained in our brochure how our Ecofriendly house concept can affect individuals, society, the economy and the environment.	

CC 8 - Cooperates with others

Criteria	Observable manifestations	Rating
3- Active participation in the work of the team	▪ I have carried out my task according to the procedure agreed by the team. ▪ I have participated in the project with a cooperative attitude.	

PHASE III: INTEGRATION

6) Analysis of the final project *(Analyzes his/her solution)*

You are now ready to evaluate your project. Your must present your brochure, technical drawings, house and modules and demonstrate how they work. In view of comments from the teacher and your peers, and according to you awn assessment, indicate here the strengths and weaknesses of your Ecofriendly house concept.

Date:	
Description of the work done	
Evaluation of the final project. _____ _____ _____ _____ _____ _____	
Strengths and weaknesses	**Improvements suggested**
_____ _____ _____ _____ _____ _____	_____ _____ _____ _____ _____ _____

C1.4 – Development of relevant conclusions

1	2	3	4	5

Questions to broaden your horizons…

1.1 Describe 5 things you can do every day to save energy. Indicate the type of energy that is conserved.

_____

_____

_____

_____

_____

1.2 Explain global warming.

_____

_____

_____

_____

1.3 For or against the Kyoto protocol? Why?

_____

_____

_____

_____

My Ecofriendly house self-evaluation

Level of competency achieved

Scale	Rating
Totally	3
Partially	2
Not at all	1

C1 - Seeks solutions to technological problems

Criteria	Observable manifestations	Rating
4 – Development of relevant conclusions	▪ I have tested my prototype. ▪ I have analyzed its strengths and weaknesses. ▪ I have suggested improvements.	

C3 – Communicates in the languages used in science and technology

Criteria	Observable manifestations	Rating
1- Appropriate interpretations of scientific and technological messages	▪ Throughout this project, I have discussed, used and shared scientific, technological and technical information.	
2- Messages produced using vocabulary and in accordance with related rules and conventions	▪ Throughout this project, I have respected vocabulary, rules and conventions related to engineering and architecture.	

CC 8 - Cooperates with others

Criteria	Observable manifestations	Rating
4- Contribution to improving the way the team works together	▪ I have assessed my participation and that of each teammate. ▪ I have identified desirable improvements when necessary.	

TEACHERS' EVALUATION OF C3, CC8 AND VISUAL ARTS C1

C3 – Communicates in the languages used in science and technology

Criteria	Rating
1- Appropriate interpretation of scientific and technological messages	
2- Messages produced using vocabulary and in accordance with related rules and conventions	

CC 8 - Cooperates with others

Criteria	Rating
1 - Recognition of needs of others	
2 - Appropriate attitudes and behaviors	
3 - Active participation in the work of the team	
4 - Contribution to improving the way the team works together	

Visual Arts C1 (in part) - *Creates personal images*

Criteria	Rating
2 – Effective use of transforming gestures	
3 – Appropriate use of the properties of materials	
4 – Coherent organization of the images' components	
6 – Authentic production that integrates original and expressive elements	