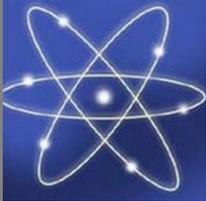
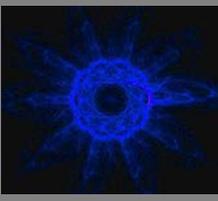


PROFILES IBSE Learning Module

Teaching Guide

**WHAT ARE THE USES OF
NUCLEAR POWER?
HOW DOES NUCLEAR ENERGY
AFFECT OUR ENVIRONMENT?**





Suggestions and learning outcomes

The project sought to develop the knowledge, skills and attitudes of involved students, so that they can participate effectively in discussions on topical issues, as they are explained in different countries, in different systems. At the same time, it is strongly stressed the direct exchanges of the ideas and experiences, for the students involved in the project, for recording a clear picture of the democracy in action.

Looking to the achievement of the objectives, the science contributes to the formation of young people as unique individuals, being able to discern and to take informed decisions, through:

- increasing the interest of students towards civic issues, as well as to the principles of democracy;
- training the young people to express their views related to civic issues and presenting those views in front of the representatives of the institution;
- acquiring by pupils of the necessary capacities and skills needed to act as responsible citizens;
- stimulating the students' desire to deepen the understanding of the current problems of the society;
- increasing the confidence and self-esteem of the pupils through the involvement in the discussion of various issues presented in media.

From the scientific point of view, this project allows students to learn about defining:

- certain physical systems encountered in the environment;
- nuclear phenomena;
- possibilities of practical application of theoretical knowledge related to nuclear physics;
- phenomena in the field of nuclear physics;
- physical characteristics of the phenomena in the field of nuclear physics;
- causal relations existed in nuclear physics phenomena;
- application of knowledge gained through the study of Physics in related fields;
- presentation in written or oral form of the results of the investigative approach, using specific Physics terminology;
- advantages and disadvantages of current technologies from the environmental perspective.

In those Module lessons, students will have to:

- edit a report in which they submit argument in respect of reasons and decisions taken;
- discuss about the right to work, the right to live in a healthy environment, and the right to exercise an economic activity in a democratic society;
- identify the effects of nuclear power usage on the human health, nature and society;
- retrieve specific information from the proposed websites;
- analyze the selected information in relation to the proposed questions;
- decide individually and as a group if there is agreed or not the construction of a nuclear power plant near the city;
- analyze the pros and cons of building a nuclear plant near the city;
- analyze solutions found by certain countries for the same problem;
- work in groups in order to take the optimal decisions concerning the agreement for the construction of the power plant near the city;
- submit collective decisions made in front of class.

Suggested teaching strategy

Conduct the Module lessons

The Module is oriented on the Nuclear Energy topic. The Module lessons will be conducted having the format of *deliberations*.

The deliberations are focused on the exchanges of ideas and arguments, in order to take a proper decision.

1. INTRODUCTION

The theme is presented, and recalls the definition of judging. There can be consulted the specific rules in order to record an effective deliberation.

2. FORMATION of GROUPS

The class is divided into groups of 5 students. In order to assess the impact of various modern technologies of energy generation in the society in which we live, it is proposed to

constitute a Committee, consisting of 5 people: 1) a physicist; 2) a doctor; 3) a biologist; 4) a historian; 5) a mayor. This Committee will have to decide on the advisability of building of a power station, near the city (called X), having a considerable foreign investment.

3. PRESENTATION of the CENTRAL QUESTION for DELIBERATION

The *central question* must be submitted for deliberation as: "is the building of a power plant, near the city (called X), involving a sizable foreign investment, good for people and environment?". The question is displayed permanently.

4. INDIVIDUAL REPORTING

Each student, individually, must edit a report about how it will affect the construction of the nuclear power, the city and the environment, what are the advantages and disadvantages of its use, from the perspective of a doctor, biologist, physician, historian and mayor of the city.

Students from each group will have to share interesting facts and ideas found in the proposed documentation, in order to acquire a better understanding of the phenomena.

5. PRESENTATION OF INDIVIDUAL REPORTS

In each group of students, the reports will be read carefully and underlined for facts and ideas considered as important or interesting arguments which motivate each individual position.

6. DELIBERATIONS and IDENTIFYING MAJOR ARGUMENTS

Each group of 5 students will share the presented arguments and identify the most powerful arguments in favor of deliberation (pros and cons).

Each student can use what they learned about the related subject and must exploit their own experience and their own opinions about the topic.

Finally, it would take a decision at the group level (it can be pros or cons).

7. PRESENTATION OF THE POSITION OF THE GROUP

Each group shall submit, in turn, the agreed position, and that, as responsible citizens, should have a voice in a real case, in the society.

9. PROCEDURAL RESOURCES

- methods and processes: Structured Academic Controversy, deliberation, conversation, observation, explanation, exercise;
- forms of organization: 5 groups, individual front materials;
- resources: computers, video-projector, flipchart, media texts.

Students will vote before and after the final Module lesson. They can express personal opinions about questions. As example, they can answer to questions like the ones below:

ANALYSIS OF THE PROCESS OF DELIBERATION

Express personal opinions to the questions such as:

- Who were the most powerful *pros* arguments?
- Which have been the most powerful *cons* arguments?
- What were the areas of consensus?

- Are the principles of democracy met in the analyzed texts? (the right to work, the right to a healthy environment, the right to exercise an economic activity) - what conflicts have arisen?
- What consequences may result related to the use of nuclear energy for the human health, environment and society?
- All think so? How do you think that others think?
- Why this issue is important for the democratic society?
- What you can do in the class?
- Who do you think about who might be involved and how?
- What do you think related to a student from another country, about the central question?
- Have you changed your opinion after the deliberation process?
- Who might be responsible?
- How can be solved the problem or how other countries have acted?
- Have you learned something new today?
- What you have learned from each other?
- What would you like to learn more?
- Where to get information?
- Have you identified in a small group the whole group opinion?
- What solutions have been found in other countries?
- How to link the lesson to the quality of a citizen? Can you be affected?
- What should I do if I were a person with responsibilities?
- Have you agreed, remained undecided or been against to the problem of judging?

STUDENTS' OPINIONS / REFLECTIONS

Students are asked: "Do you agree or disagree with the deliberation process related to the central problem?" The result of the vote is noted.

Achieving the Competencies

Competence	How it is acquired
1. Tactfulness to describe the nuclear phenomena and to identify practical opportunities for the application of theoretical knowledge related to Nuclear Physics	- it is achieved by the students in strong relation to the knowledge that students have already gained on this subject, but it can be deeply developed during the first part of the Module (<i>presentation of the question for deliberation and allocation of roles</i>).
2. Deftness to compare and classify natural phenomena and characteristics of some phenomena in the field of Nuclear Physics and to analyze causal relationships in pursuit of nuclear physics phenomena and apply the acquired knowledge through the study of Physics in related fields	- it is achieved in the <i>individual reporting</i> part of the students' work.

3. Cleverness to define characteristics of some encountered physical systems, to describe the nuclear phenomena and to identify practical opportunities for the application of the theoretical knowledge related to nuclear physics	- it is achieved in the process of students' debating, in the third part of the Module (<i>identification of the major arguments</i>).
4. Cleverness to present in the form of a written or oral report, the results of investigation, using specific physics terminology, and to argue the advantages and disadvantages of current technologies, from the environmental perspective	- it is achieved in the last part of the Module (<i>presentation of the group position and deliberation review process</i>)
5. Ability to find specific information in the suggested webpages	- it is achieved throughout their investigation activities whereas students often turn to the proposed web sites.
6. Ability to analyze the selected information in relation to the proposed questions	- it is achieved throughout the work done by the students, in order to move to the next level of investigation / deliberation.

Other considerations

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