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Developing environmental education programs in Moldovan schools: A practical guide for teachers

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1. Introduction

The purpose of my two-year graduate studies in the Environmental Studies Program at the University of Montana was to learn about environmentalism in the USA. During my studies I became increasingly interested in content and methods used by environmental educators in this country. Because I believe that environmental education is one of the most important tools that can help Moldovan society to step on a new quality of life level and insure a prosperous and successful future, I saw a great opportunity to contribute to the development of environmental education in Moldova by making my knowledge and experiences acquired in the USA available to Moldovan teachers.

This guide is the product of collecting information and adapting it to the framework of education in Moldova. It is intended to become a teachers’ tool for step-by-step designing of effective environmental education programs in Moldova and a source of providing information about organizing environmental education program content, methods and activities. To help teachers to see environmental education as a part of the bigger picture, I include an overview of environmental problems in Moldova and a characterization of the present environmental education programs.

I hope my work can give momentum to the development of a new concept of environmental education in Moldova. Using the positive elements of education from the past and combining them with advanced Western education concepts and successful teaching technologies Moldova can escape from the heritage of the authoritarian
education system and avoid the environmental mistakes made by Western countries. This guide can be such a source for facilitating the formation of environmentally conscious citizens and promoting an environmentally and economically sustainable society.

This work is written in English. I am planning to publish this guide and make it available to teachers after its translation to Romanian and the revision by Moldovan curriculum specialists. The reader, whether a teacher, educator, or university student, can feel free to use this guide to meet his/her needs and to change activities for his/her purposes.
2. Overview of Environmental Problems in Moldova

This land does not belong to us.
It belongs to our grand, grand, grandchildren.
-Stephan the Great

2.1. Introduction

Moldova is a small and newly independent country in the middle of Eastern Europe. With a moderate climate and a fertile soil (75% of the territory consists of Chernozems (http://coral.bucknell.edu)) it has traditionally been an agricultural country. It is known for its wines, fruits, vegetables, crops, and cattle. During the fifty years of communist rule, resulting after the annexation of Moldova to the USSR in 1940, private property was changed by state property, resulting in a deep effect on the society and environment. Since 1940, the environmental quality has been neglected and the natural resources have been abused. The agricultural methods and other economic activities used during the communist period of rule had an extensive and exploitative impact and brought a host of environmental problems, such as soil erosion, water and air pollution, deforestation, etc. The current economic crisis is only aggravating the situation and brings new problems related to a lack of environmental control and under-funded public education (Spinei, 1997).

2.2. Consequences of the communist rule

The transformation of family owned and operated farms into kolkhozes (centralized community farms) was the beginning of the era of exploitation both of the
land and people. The heads of kolkhozes usually were communists or were appointed by
the communist apparatus and had one goal: to produce more and more regardless of the
methods and costs of such on the land or human health. The predsedatel (kolkhoze head)
alone had all the power in the kolkhoze, while the average kolkhoznik (farmhand), whose
land was transformed into the kolkhoze property, did not have any decision power. Each
kolkhoze had to supply an increasing amount of product each year. The state was paying
next to nothing, and farmers had little material incentive. It was a common situation for a
kolkhoznik to steal from the kolkhoze to support his/her family. However, those kolkhoze
leaders that did not follow communist guidelines and could not meet the production
demands were replaced. In this manner, former landowners became farmhands with very
little or no control over their former lands and its harvest. Disowned peasants did not
have much interest and incentive to work for the state. When Moldovans lost their land
they also became less dedicated to their work. In addition, they lost interest in caring for
the land itself.

2.3. Soil resources problems

With an increasing amount of Moldovan lands being used for croplands, as well
as a large work force, cheap machinery, and fuel from Russia, Moldova’s agriculture
system began to intensively exploit the land. While Moldova was only a small percent of
the former USSR territory (only 33,700 square kilometers, or about the size of
Maryland), the country became a leading agricultural supplier for the entire USSR and
accounted for a large portion of its exports (Hill et al, 1997). This did not come without
consequence to Moldova's environment. Today 54.6% of Moldova is under arable cropland; 13% under permanent crops; 9% forest and meadows; 15% uncultivated land, including lakes, rivers, and marshes (http://coral.bucknell.edu). In a race for maximum production, 13,000 hectares of marginal lands were brought under the plow. Draining marshes and plowing steep hillsides became a common practice (Spinei, 1997). About 30% of the agricultural lands in the republic are affected by erosion, resulting in 25 million tons of soils lost annually (Hill et al, 1997). These rates of erosion are threatening long-term agricultural production, the main source of income in Moldova. Scientists estimate that about 330,000 hectares of land need to be withdrawn from agricultural use. At the same time, 205,000 hectares of fertile soil went under industrial constructions, roads, and subdivisions (Spinei, 1997).

Currently, on about two million hectares or 82% of all farmland that is placed on hillsides, Moldova loses two times more in topsoil value due to erosion compared to the value of the harvest (Gabiaev 1991). Deforestation, insufficient or nonexistent anti-erosion policies, the perpendicular plowing of hillsides and a lack of windbreaks have already turned more than 100,000 ha of productive land into coulees and landslides (Gabiaev & Gorash, 1990). Most of the crop fields do not follow the landscape forms and cannot be plowed by contour. The historical preference of Moldovans for tillage and other planting practices neglects the principles of soil conservation (Hill et al, 1997).

In order to support the field crops (sunflower, corn, wheat, sugar beets, etc.) mineral fertilizers and pesticides are heavily applied. The amount of mineral fertilizers introduced to support monoculture crops is not always appropriate to the physiological needs of crop type and often is oversupplied (Hill et al, 1997). At the same time, cattle...
manure is often disregarded as an organic fertilizer and dumped elsewhere, creating water-related problems. Since 1961, an average of 17 kilograms of pesticides was used on each hectare of cropland. Both pesticides and fertilizers in many places were and still are kept outside in piles and in leaking containers, thus poisoning the soil and leaking into groundwater and waterways. Some farmers still use or have in storage DDT (http://coral.bucknell.edu). The amount of copper in vineyard soils is exceeding the health standards (Gabiaev & Gorash, 1990). About 15-30-meters-wide strips on both sides of major roads are polluted with heavy metals, such as lead and cadmium (Gabiaev, 1991). The accumulation of toxic chemicals lessens the crop yield by reducing useful soil bacteria and presents a threat to the health of consumers (Spinei, 1997). Some other technologies contribute to the degradation of the soil quality. The machinery used in agricultural practices often is not appropriate and leads to soil compaction. In some places, extensive irrigation and incorrect irrigation techniques caused salinization and the withdrawing of the land from agricultural use.

2.4. Water resources problems

Water quality is a main concern in Moldova. Intensive agricultural technologies cause mineral and organic run-off. Ineffective wastewater treatment plants allow the release of untreated wastewater. There is a lack of buffer zones between agricultural land and water bodies. Illegal dumping is widespread. Over a half of the landfills do not meet sanitary standards. High levels of pollution and contagious disease agents in surface and underground waters endanger human and ecosystem health (French, 1991).
The two major rivers, the Nistru and the Prut, are used as sources of drinking water for 13 major cities, and are considered to be moderately polluted. The remaining 3,200 rivers and streams and have 3,500 dams on them are considered polluted or severely polluted. About a third of groundwater used by rural inhabitants for their freshwater needs does not correspond with safety standards. Approximately 40 to 90% of groundwater supply contains nitrates in concentrations dangerous to human health (Spinei, 1997).

The 1996 state environmental inspection of wastewater treatment plants documented that only 225 of the 560 existing plants are in operation. In 500 other towns, such plants do not even exist. Ten million cubic meters of liquid waste from animal growing farms have accumulated and are stored in holding ponds. Instead of being used as fertilizer in place of chemical fertilizers, these ponds remain stagnant, posing a serious threat to Moldova's water resources as they leach into ground water supplies. The threat posed to the surface water is also very great should any one of these dams collapse. However, the economic crisis caused many polluters to stop or reduce their harmful activities. Causing a reduction in the pollution, nevertheless, the crisis also stopped the construction of new wastewater treatment plants as well as the remodeling and repairing of the existing treatment plants (Spinei, 1997).

A series of dams on the Nistru and Prut rivers, as well as on other rivers have disturbed migratory routes of spawning fish, putting several species of fish to the brink of extinction. Although the dams prevent seasonal flooding, provide electricity and store water for irrigation they, nevertheless, have affected aquatic ecosystems by changing water temperatures and patterns of the natural fluctuation of water levels. The slower
flow allows the water temperatures to rise. In combination with high soil erosion, fertilizers, and manure nutrient run-off, a new thermal regime is turning the Nistru river into a silted and highly eutrophicated ecosystem with poor fish diversity. Nistru’s riverbed was actively exploited as a source of gravel. This induced more changes in the river’s flow and lowered the water table. The concentration of pesticides residue and heavy metals in the river is higher than the health standards (Gabiaev, 1991). Both the Nistru and Prut valleys suffer from human intervention. Their deltas, which are wildlife sanctuaries, are drained for agricultural use and are threatened by the development of oil refineries needed to support the growing energy and food needs of the population.

2.5. Air resources problems

Air masses from the Atlantic Ocean move through West-European countries. Being under that influence the concentration of toxic substances in the air in Moldova depends greatly on the air quality in West-European countries. A decrease in air quality presents a concern primarily during unfavorable weather conditions and in the Moldovan industrial cities of Tiraspol, Balti, Chisinau, Ribnita, and Tighina. In 1996, 2500 Moldovan businesses with stationary agents of air pollution produced 175,800 tons of toxic gases and particulate matter. The main energy provider “Moldenergo” generated 55% of this material. An overall 70% of all air emissions are produced by power plants (Spinei, 1997). Part of the pollution could have been prevented by more effective technology. For example, today energy use in Moldova is two times less effective than in the USA and three to six times less effective than in Japan (French, 1991).
Between 1994 and 1996, the amount of air emissions from stationary air polluting agents decreased, except those from power plants. This tendency is related to the economic slowdown, however the number of cars has increased due to access to the West-European used car market (Spinei, 1997). The majority of imported cars are old and have highly polluting emissions. During the winter, most of the rural population is using wood or coal for heating. Considering that 60% of the population inhabits rural areas, emissions from residential wood and coal are significant. By burning leaves and plant litter, farmers contribute further to air pollution.

2.6. Lands with special status

Dense population and extensive agriculture left little room for wildlands. Uniform tree plantations have replaced most of the native forests. From 20% of Moldova territory covered by forest two centuries ago, the area of forest has been reduced to about 6% today (Gabiaev, 1991). The grasslands have been plowed or actively grazed. This alteration of native habitat has created a high number of threatened species. About 40 species of insects, 30 species of birds and 10 species of mammals are on the list of endangered species (Gabiaev & Gorash, 1990). The European bison that once roamed the grasslands of Moldova now can be found only on the national flag.

The total area of lands protected at some degree is 41.7 thousand hectares (ha), that is about 1.2% of Moldovan territory. Among them are: parks, 350 ha; steppe reservation, 112 ha; forest reservations: Codrii, 5,200 ha; Iagorlic, 1,034 ha and Redeni, 5,336 ha; and landscape reservations, 2,000 ha (Gabiaev, 1991). Currently, some of these lands are threatened by illegal cutting and recreation development.
2.7. Economic crisis and environment

After the collapse of the USSR, Moldova was left with a sad heritage: a noncompetitive, centrally command-controlled, planned economy; crop management practices that do not correspond with sustained natural resource management; uniform cropping systems regardless of location; and a damaged environment (Hill et al, 1997, Spinei, 1997). Compared to western countries' air and water quality standards, the environmental standards in Moldova (as in all former Soviet Union countries) are stricter and are based on scientific determination of the level necessary to avoid health problems. However, the enforcement of these laws has been poor and the regulations have not been respected (French 1991). The Environmental Protection Department has inherited this poor and ineffective regulatory system and struggles for funding.

Moreover, after becoming independent, Moldova has faced skyrocketing prices on machinery and fuel (98% of the energy resources in Moldova are imported). Prices on agricultural products, however, remain low. Kolkhozes, dependent on the former Soviet Union for sales of their products, lost their markets and were forced to deal with the increasing prices of high input technology. The economic crisis was further aggravated by a lack of subsidizing from the government and a series of unfavorable years for agriculture (www.moldova.org). When the prices on heating fuel dramatically increased most rural inhabitants could not afford to buy it (a ton of coal costs $100, while the average monthly salary is about $50) and were left with only one choice. The windbreak trees, tree plantations and ancient forests became the target of illegal cutting (Spinei, 1997). The lack of windbreaks increases soil erosion, hillside tree plantations cut for
firewood cannot stop new landslides, and wildlife habitat is suffering. A positive effect of increased prices is that fewer pesticides and mineral fertilizers are applied. However, with no fertilizers introduced and the misuse of organic fertilizers the amount of nutrients in the soil and the soil’s fertility are in decline (Hill et al, 1997, Spinei, 1997).

Although Moldova is promoting new reforms and received about $650 million from world banks to support the reforms, Moldova’s economy is in tough shape (www.moldova.org). The budget deficit is significant, and there is not enough funding to fix the environmental problems.Salaries are small and are not paid in time. Most of the people struggle to make ends meet even working full time, and they are pessimistic about political and economic reforms. Social passivity and mentality inertia slow the introduction of better technologies and agricultural methods (Hill et al, 1997). Blurry political games and quickly amassed fortunes by politicians (while the average citizen cannot make his ends meet), characterize the frustration and disbelief in the fairness of the reforms. However, during the transition from planned economy to a market economy, state enterprises have been privatized, and many kolkhozes have disappeared, giving way to new forms of land ownership that will hopefully reconsider agricultural practices directed toward a sustained agricultural system.

Nevertheless, a new threat to Moldova’s environment has been introduced by the new economy. High consumption levels of West-European countries are regarded as the main characteristics of a high quality of life and have been adopted by Moldovans. The increase in consumption levels stimulates the imports that might negatively react on the balance of imports and exports. Western investors are welcomed by the government to develop local natural resources and are given significant tax breaks. Along with the tax
breaks, they are sometimes given exemptions from environmental regulations or rights to develop wildlife sanctuaries. Local environmentalists fear that Moldova will repeat the environmental mistakes committed by the West and sacrifice the environment for the sake of material abundance (Warner & Kreger, 1992).

2.8. Conclusions

Environmental problems in Moldova are critical. Some of these problems remain from the old regime, others are associated with the economy crisis, and some are imported from West-European countries (Spinei, 1997). The communist dominance left Moldova with people that do not trust the government, do not get involved in decision-making processes, and are reluctant to support any reforms pushed from above. The communist command system economy left Moldova in economical hardship and with a heritage of abusive land management practices (Hill et al, 1997). Soil erosion is threatening the greatest natural resource of the country and is undermining the sustainability of agriculture itself. Surface and underground waters are heavily polluted. About a third of Moldovans have no access to safe drinking water. The natural ecosystems are quickly deteriorating (Gabiaev, 1991). Environmental regulation mechanisms do not function properly (French, 1991). In addition to all these, the Western life style is actively propagated by Western advertisers, planting the seeds of over-consumption and exploitation of natural resources for selfish interests.
3. The Education System and Environmental Education in Moldova
Before and After Independence from USSR in 1991

3.1. Introduction

The problems existent in Moldova’s society are amplified in the education system. The collapse of the Soviet Union did not reflect only political and economic failure, but a failure of educational mechanisms as well (Programul national de dezvoltare a invatamintului in Republica Moldova 1995). The present education system is struggling through a transition period and faces other problems that overshadow the development and establishment of environmental education in schools. Therefore, environmental education in Moldova is not one of the top priorities of the education system and remains underdeveloped and incomplete. The current environmental education programs are taught on the same principles as they were before 1991, and have been cut due to a lack of funding (Programe pentru invatamintul general secundar 1995).

3.2. Education system before independence

Before independence in 1991, Moldova’s education system was communist. The purpose of communist education was both to develop citizens with high moral standards and competitive theoretical and practical skills. The citizens were educated to become active promoters of communist ideals. Ultimately, they were educated to become members of a society where equality and freedom are the principles of life, where exploitation of people by other people does not exist, and wars are forgotten (Poletaev et
al, 1989). However, all these noble goals were merely propaganda. Those people ruling the country had another set of priorities. Using the goals of communism as a decoy, they built an authoritarian society, where average citizens were no more than puppets and where the word "democracy" lost its meaning.

The Ministry of Education oversaw the education system. Financed from the state budget it established national standards for education. As in all the militarized Soviet Union, the education system was excessively centralized. Thus the different forms of education were unified, and all levels of educational structures had a uniform content (Programul national de dezvoltare a invatamintului in Republica Moldova 1995). Each county had an office that coordinated the local schools and reported to the central office in Chisinau, then in Moscow. The programs and curriculums were mandatory for all schools. The curriculum content could vary over periods of time, but teachers had to comply with a given content and a given amount of time for each topic.

The communist education system was using the same educational mechanisms as the principles of authoritarian communist society, such as a dictatorship, intolerance of any ideas other than communist, disregard of personal freedom and freedom of speech. Should any teacher try to promote ideals other than communist, or to criticize the communist system, a specially appointed person from the teaching staff would immediately report the case to the communist organs. Students were also encouraged to inform teachers about the character of political conversations their parents had.

The communist standards of morality were the only standards accepted in schools. Students were treated not as personalities but as parts to be put into the authoritarian
machine. Cultural, ethnic and religious diversities were ignored because the future member of communist society was to be something amorphous, fully dedicated to the leaders, without ties to a past that could divert attention (Programul national de dezvoltare a invatamintului in Republica Moldova 1995).

Environmental education programs existent in the communist education system were limited and focused primarily on science. Environmental problems were pointed out, but no study of the reasons for these problems was done, because it could undermine students’ perceptions of the communist ideals and way of life. Officially, it was okay to recognize that there were environmental problems, but they were presented as insignificant. At the same time, the West was brought up as an example of environmental disaster and discrimination (Gontea, 1989, Gabiev & Gorash, 1990).

As a consequence, the prestige and image of education in Moldova have deteriorated, followed by decrease of moral, cultural and social values, and a loss of scientific significance of education. Average citizens were not aware of the environmental impact of the communist economy and the consequence on their health and on future generations. The chronic deficit of financial support only aggravated the capability of educating the public about environmental problems (Buzdugan, 1989, Programul national de dezvoltare a invatamintului in Republica Moldova, 1995).

3.3. The education system after independence

During the transitional period education undertook between the communist and the democratic education systems, the Ministry of Education (traditionally in charge of
education) developed a new national program of education. It aimed to overcome the heritage of the Soviet Union and based itself on the example of more developed countries. The new education system is oriented to global human values, the development of national culture through the improvement of education and higher levels of professionalism by applying holistic approaches and decentralized regulatory methods (Programul national de dezvoltare a invatamintului in Republica Moldova, 1995).

A new education system in Moldova is organized on six levels and is designed on the basis of West-European and Romanian education systems. The structure of the education system in the Republic of Moldova is:

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>I.</td>
<td>Preschool education: ages 3-6</td>
</tr>
<tr>
<td>II.</td>
<td>Secondary general education</td>
</tr>
<tr>
<td>II.1.</td>
<td>Elementary education: grades I-IV</td>
</tr>
<tr>
<td>II.2.</td>
<td>Secondary education:</td>
</tr>
<tr>
<td>II.2.1.</td>
<td>Gymnasium education (schools with emphasis on languages and art), grades V-IX</td>
</tr>
<tr>
<td>II.2.2.</td>
<td>Lyceum education grades (schools with emphasis on sciences), grades X-XII</td>
</tr>
<tr>
<td>II.3.</td>
<td>Complementary education</td>
</tr>
<tr>
<td>III.</td>
<td>Special education</td>
</tr>
<tr>
<td>IV.</td>
<td>Professional education:</td>
</tr>
<tr>
<td>IV.1.</td>
<td>Elementary</td>
</tr>
<tr>
<td>IV.2.</td>
<td>Secondary</td>
</tr>
<tr>
<td>IV.3.</td>
<td>Post-lyceum, 1-2 years</td>
</tr>
<tr>
<td>V.</td>
<td>Higher education:</td>
</tr>
<tr>
<td>V.1.</td>
<td>University education, 4-5 (6) years</td>
</tr>
<tr>
<td>V.2.</td>
<td>University colleges education, 2-3 years</td>
</tr>
<tr>
<td>V.3.</td>
<td>Post-University education, Ph.D. programs</td>
</tr>
<tr>
<td>VI.</td>
<td>Continuing education for adults (Programul national de dezvoltare a invatamintului in Republica Moldova, 1995).</td>
</tr>
</tbody>
</table>

Serious issues characterize the transition period of the education system. The education system is reluctant to reform, and the old education system structures are conservative and inert in applying new science and technologies. Education content often
is out of date compared to Western countries. Education assessment of students, teachers and curriculums are not developed or are inadequate to modern education theories. Teachers are isolated from the scientific and pedagogical information available in other countries. No database regarding education exists in the republic. Students' and teachers' activism and creativity are not stimulated.

Although the education system has been liberated from the subordinance of the communist party and ideological control of instruction content and methods, teachers habituated with communist standards, ideals and methods of education are not sufficiently equipped to contribute to the development of students. Trained to teach communist ideas with communist methods, teachers lack a framework and methods for promoting global values. Thus, teaching methods have not changed and remain as they were during the Soviet Union.

Teachers lack tools and skills for educating their students spiritually in a changed society. Many educators try to use traditional and Christian values to build moral and social values of students. In some cases, not having an adopted framework for such issues, teachers bring political extremes into class, causing chaos, disbelief and social passivity among youth.

The funding deficit hits heavily on the quality and variety of education programs and causes teachers to quit their jobs. The financial allocation for education is decreasing every year. In 1995, Moldova allocated only 2.1% of gross internal product for education, while the world average is 5%. Schools are forced to cut their purchases of new books, furniture and teaching materials. Many extracurricular programs cease to exist due to
poor school funding. Schools are also forced to reduce the number of teachers which results in poor quality of education. Moreover, low teachers’ salaries during the Soviet regime became even lower and do not correspond with living expenses. Even these small wages are often not paid for months, which sends teachers looking for other jobs and affects their ability to perform as teachers.

Overall education in Moldova is still haunted by the USSR heritage. The education system is still centralized. New curriculums are in the development stage. Teachers lack training for implementing new teaching technologies. Transitional period changes at all levels are painful for teachers who are implementing them, and for students, who suffer from the lack of organization. Lack of moral and material stimuli for teachers’ professional advancement is impeding the reforms. Poor funding represents another significant delay in education reforms (Programul national de dezvoltare a invatamintului in Republica Moldova, 1995).

3.3.1. Environmental education after the independence

In describing the reasons for the ineffectiveness of school environmental education programs in forming environmentally responsible citizens in Moldova, it is important to understand what environmental education in Moldova represents, how it is organized and what methods it is using.

The focus of environmental education in Moldova’s schools is on the science of ecology, the study of threatened species, and resource conservation (Gabiaev & Gorash 1990, Gabiaev 1991). Most of the environmental activities are taught in the course of
biology. However, throughout the last five years, the total hours students spend studying environmental studies is less than 20. During this time students study:

1) threatened plant species in Moldova; national parks and reservations; pollution and its effects on plants; problems in plant protection; and main laws in the country that protect nature (7th grade);

2) mammals' significance in nature and human life, and their protection (8th grade);

3) nine-hour ecology course that covers the basic concepts of ecology, such as: relationship organism-environment, natural and artificial ecosystems, environmental protection (high school (Programe pentru invatamintul secundar general, 1995).

In the lyceums (schools with emphasis on science), biology courses provide a deeper understanding than regular schools do, concerning the relationship between biological systems and the environment (Biologie: Programa pentru leceele teoretice, 1991).

A complimentary environmental education program that is focusing skills and participation is taught throughout extracurricular activities, such as: 1) nature clubs; 2) publishing of student newsletters; 3) special events, such as science contests; months of nature protection; months of birds, etc. These learning experiences complete the theoretical part of environmental education. Nevertheless, these activities do not engage all students and often are only pointing at the problems (Gabiev, 1991). The economic crises forced the government to cut the education budget. Thus, many extracurricular programs ended. Many nature clubs have been closed, and those that are left are reduced significantly in outreach and programs. Other environmental actions organized by schools sometimes treat the symptoms of problems instead of treating the roots of those problems. In such cases, these actions fail to instill in students an understanding of the significance and potential of such actions. Besides, local businesses and residents often
give a bad example to the students, neglecting pollution prevention measures and not complying with state environmental department regulations.

Theoretical knowledge is the top priority of Moldova's education. The national curriculum is extremely academic and theoretical, very rigid, covering too many topics in too short a time. Teachers have to teach a large amount of material. As a consequence, the dominant teaching method in Moldova is lecturing. Teachers prefer lecture style because it gives them control over class discipline and a desired pace of conveying information. Teaching evolves mainly around textbooks written for the teaching of the required curriculum. In such learning, students are told about things, but rarely experience them. Lectures give students a great deal of information in a short period of time, but they do not encourage students to develop critical and creative thinking skills needed for solving environmental problems. By passive learning, students do not have many opportunities for the development of their abilities to independently identify, tackle, and solve problems.

Other factors interfere with the education process. Teaching materials, specialized literature, textbooks, supplies for conducting science demonstrations and experiments are limited. The work of environmental educators is insufficiently not coordinated (Shea, 1995). Classes are crowded and students have never been encouraged to ask questions. A common situation is where students are apathetic, class materials are deficit and it is hard to make students become involved in extracurricular activities. Under such circumstances, time-consuming hands-on activities and environmental
education take the back seat, and the time planned for them in the curriculum is often used for reinforcing theoretical knowledge.

Moreover, teachers of biology, who are mainly responsible for environmental education in schools, lack methodological and pedagogical sources that would help them to lead environmental education activities with social, economical, and cultural perspectives. Even if willing to lead, environmental information is not always available to teachers, and teachers lack adequate training (Programul national de dezvoltare a invatamintului in Republica Moldova, 1995).
3.4. Conclusions

Environmental education programs in Moldova lack success in educating students about the significance of environmental problems; as a result students study them only superficially and are not motivated to become involved in solving environmental problems. Often students know that the environmental situation is not good, but they are apathetic about getting involved, thinking they can not tackle any of the problems.

Facing the changing environment, Moldova’s educators bear the responsibility of educating students and adult population about environmental problems, a rational use of natural resources, and the necessity of a careful and respectful attitude toward nature. It is imperative to move students beyond awareness toward environmentally-responsible behavior in spite of transitional problems, education reforms and the general social passivity. Beginning with environmental awareness and knowledge, students need to become actively involved and dedicated to improving and maintaining environmental quality.
4. Developing Environmental Education Programs:

A Practical Guide for Teachers

4.1. Introduction

In a situation where coordination in the work of environmental educators is not effective and there is a need for quality environmental education textbooks and teaching materials (Gontea, 1989, Shea, 1995), Moldovan educators can themselves take a step in developing environmental education programs oriented on problem-solving, social activism and improvement of local environmental conditions. By designing a program that will fit their class, personal knowledge and teaching style, Moldovan teachers will improve their own teaching techniques and the environmental education programs in schools (Braus and Wood, 1993).

The focus of this guide is on helping teachers to understand EE and to make a difference when EE materials are lacking by applying available information on environmental problems and by dealing with real community issues. A program designed for a specific group has a better chance to achieve its objective than a program for a wider audience (Braus and Wood, 1993). A learning process that is based on local issues is more attractive to students and is more likely to be effective. The principle “think globally, act locally“, is particularly helpful, giving students an understanding that even global environmental problems can be solved at the individual level. Students feel empowered when they learn that they can contribute to solving global problems. It also helps students to understand how their own behavior and actions affect international,
national and local problems and to learn how their actions at the local level can prevent or solve environmental problems. This knowledge can help teachers to fill the gap in their training and help them to incorporate environmental education in their curriculums.

Having previously described the environmental problems and the education system in Moldova, in this chapter, I will try to answer the questions: What is EE? How do you start developing an EE program? How do you set the goals for an EE program? What should the goals be? How do you achieve the goals? What do students need in order to become environmentally literate? On which outcomes do you focus? How do you teach EE? Which teaching strategies and methods can be applied? How do you design class activities? How do you evaluate students and the program?

4.2. Defining environmental education

Evolved from outdoor and conservation education, environmental education became an international concern in the 1970's through the efforts of the UN Conference. In 1977, educators from all over the world gathered in Tbilisi. Delegates ratified the definition of environmental education and set objectives. Environmental education was identified as:

"...a process aimed at developing a world population that is aware of, and concerned about, the total environment and its associated problems, and which has the knowledge, attitudes, skills, motivation, and commitment to work individually and collectively toward solution of current problems and the prevention of new ones." (The Tbilisi Declaration, 1978)
The goals of environmental education include: to maintain and improve environmental quality and to prevent future environmental problems (Braus and Wood, 1993). The objectives underlined by environmental education are:

**Awareness:**

1) help students acquire an awareness and sensitivity about the environment and its problems;
2) develop the ability to perceive and discriminate among stimuli;
3) process, refine and extend these perceptions;
4) use this new ability in a variety of contexts.

**Knowledge:**

1) help students acquire basic understanding of the environment's functions;
2) recognize how people interact with the environment;
3) recognize how issues and problems dealing with the environment arise and how they can be resolved.

**Attitudes:**

1) help students acquire a set of values and feelings of concern for the environment;
2) motivate students to participate in environmental maintenance and improvement.

**Skills:**

1) help students to acquire skills needed to identify and investigate environmental problems;
2) help students to acquire skills needed to contribute to the resolution of these problems.

**Participation:**

1) help students to acquire experience in using their knowledge and skills in taking thoughtful, positive actions toward resolution of environmental problems.


These objectives refer to the objectives of a universal education for humanity that is aware, knowledgeable, skilled, active and involved in social and economic and political life. EE helps to educate about conflicting values among people, that these conflicts must
be addressed to prevent and solve environmental problems. It also gives practical skills: how to prevent pollution, how to recycle, how to grow healthy food. It stresses citizen action skills, like writing collective letters to authorities, organizing community projects (Braus and Wood, 1993, Weilbacher, 1994).

4.3. Starting an environmental education program

The first step in designing an EE program is assessing the most significant environmental problems that face the country and the community. Outlining the environmental problems helps to categorize them and determine how serious they are (Wood and Wood, 1987). Here is a sample of the classification of environmental problems:

**Pollution problems:**

1. Air pollution: smog, ozone depletion, global warming, and acid rain.
2. Water pollution: hazardous waste, sewage problems, heavy metals, agricultural runoff, leaking landfills, polluted water coming from other countries.

**Resources problems:**

4. Forests: over-harvesting, cutting forests for agricultural expansion.
5. Soil: erosion, degradation, irrigation/desertification, and contamination.
8. Energy: overuse of coal, oil and gas, energy resources deficit.

After identifying problems, it is important to define how people can cause these problems. Coming up with a problem statement is needed to understand the roots of environmental issues. A correct problem statement will ensure that the program’s efforts
will be directed toward solving the given problem and not its symptoms. Knowing where
to aim will ensure that the objectives of the program will address the target problems.
Here is an example of problem statement: People in the community seem to lack an
understanding of how their actions affect the environment and consequently their own
lives. Many people use pesticides regularly, illegally cut forests, toss domestic litter in
rivers and other inappropriate places, and ignore soil conservation techniques (Braus and

4.4. Setting programs’ goals

The programs’ goals derive from the problem statement and represent things that
teachers plan to achieve. Formulating the goals of a program will facilitate visualizing
program’s outcome. It serves as a reminder to which educators can return for the
evaluation of their success. The goal of an EE program should not dictate new behaviors,
but rather help students to learn how to investigate the pros and cons of environmental
and economic decisions that are made in the community. This is how students can
become effective and involved decision-makers in the future (Braus and Wood, 1993).
Here is an example for developing an EE program’s goals:

Level 1. The ecological foundations level: provides students with sufficient
ecological knowledge to permit them to make ecologically sound decisions with
respect to environmental issues.

Develop concepts:

1) Populations: birth, growth, change and its effects, death, extinction, etc.
2) Natural communities: structure, behavior, interaction of individuals and population in
a particular place (forest, desert, pond, etc.).
3) Ecosystems: structure, interaction and effects between living things and the non-living environment (natural change, succession, adaptation, etc.).
4) Energy and chemical cycles: how energy and chemicals go through a natural system (water cycle, oxygen cycle, energy cycle, pollution, etc.).
5) Balance of nature: the tendency of natural systems to establish balance over time when disturbed naturally or by humans.
6) Man as a component of the natural system: the effect of human behavior on natural systems (development of technology, effects of people’s attitudes and values).

Level 2. Issues and values: seeks to guide the development of conceptual awareness of how individual and collective actions can affect the quality of life and environment; how issues can be resolved through investigation, evaluation, values clarification, decision making, and citizenship action.

Provide opportunities to conceptualize:

1) Difference between environmental issues and environmental problems (problems can be natural or man-made, issues are conflicts arising from how people view the problem).
2) Human cultural activities (religious, economic, political, social, etc.) influence on the environment from an ecological perspective.
3) Individual behavioral impact on the environment from an ecological perspective.
4) Variety of ecological issues and the ecological and cultural implication of these issues.
5) Alternative solutions available for solving environmental issues and the ecological and cultural implications of these issues.
6) Need for environmental issue investigation and evaluation as an integral part of environmental decision making.
7) Roles played by different human values in issues and the need for personal values clarification as an integral part of environmental decision making.
8) Need for responsible citizenship action in resolving environmental issues.

Level 3. Investigation and evaluation: provides for the development of the knowledge and skills necessary to let learners investigate and evaluate environmental issues.

Develop in learners:

1) Knowledge and skills needed to identify and investigate issues and to synthesize the gathered information.
2) Ability to analyze environmental issues and associated value perspectives with respect to ecological and cultural implications.
3) Ability to identify alternatives for specific issues and the value perspectives associated with these solutions with respect to ecological and cultural implications.
4) Ability to identify and clarify own values positions related to specific issues and their related solutions.
5) Ability to evaluate, clarify and change own values positions in light of new information.

Provide opportunities to:

6) Participate in environmental issue investigation and evaluation.
7) Participate in a valuing process to permit the learner to evaluate his/her values.

Level 4. Action skills: guides application of skills necessary to take positive environmental action for achieving equilibrium between the quality of life and the quality of the environment.

Develop in learners:

1) Skills that will permit working individually or in a group toward an environmental problem solution.

Provide opportunities to:

2) Make decisions concerning action strategies with respect to an environmental issue.
3) Apply action skills to specific issues.
4) Learn about different levels of environmental action (individual, group, organization, etc.).
5) Learn about different action categories: persuasion, consumerism, political action, legal action, and eco-management.
6) Evaluate the actions taken toward achieving equilibrium between the quality of life and the quality of the environment.
7) Evaluate the costs of ecological and human benefits of environmental actions (modified from Hungerford et al., 1980).

4.5. Developing programs’ objectives

Programs’ objectives are the means of achieving program’s goals. Teachers can develop objectives by outlining the content, skills, values and attitudes, and cognitive skills needed to accomplish the goals. For example, in order to solve an environmental
problem, students need these skills: 1) recognize the problem; 2) define it; 3) collect information; 4) listen with comprehension; 5) organize information; 6) analyze information; 7) generate alternative solutions; 8) select a solution; 9) develop a plan of action; 10) implement a plan of action; 11) and evaluate a plan of action.

Critical thinking skills involved in solving an environmental problem include: 1) open-mindedness; 2) taking a stand on the issue; 3) looking at the entire situation; 4) trying to find why the problem exists; 5) looking for alternatives; 6) keeping the problem in focus throughout decision making; 8) looking for information; 9) analyzing the quality of information; 10) defining the problems clearly; 11) and being sensitive to the feelings and knowledge level of others (Roth, 1992).

In rural areas teachers have to take into account that many students will become farm workers. Teaching about global warming might not be a top priority. Instead of focusing on global problems, it might be reasonable to try to help students understand their local environment: learn how to plow on contour, plant windbreaks, apply pesticides and fertilizers safely, dispose garbage and farm in sustainable ways. If the program is targeted to urban students, the objective might be very specific for that area. Teachers might consider the role students play in causing a problem and the role they could play in solving it, as well as their future role in the community (Braus and Wood, 1993).

Examples of the program objectives are:

a) help people understand environmental problems in the community;
b) show how their actions affect the environment and the quality of life for all people who depend on natural resources;
c) learn how they can do things differently to reduce environmental damage;
d) ensure that there will be a continual supply of natural resources in the future.
4.5.1. Learner outcomes

To ease the job of meeting the programs’ goals, teachers can outline learner outcomes they want to achieve. For example, a detailed list of desired student outcomes might look like this:

After completing an environmental program students will be able to:

**Knowledge and Awareness**

1) List five threats to natural resources in their community and country (soil erosion, contamination and desertification, deforestation, loss of wildlife, water pollution etc).
2) Describe the consequences of the above problems.
3) List the advantages and disadvantages of taking the following actions to solve environmental problems: use soil conservation measures, construct primary and secondary sewage plants, establish fuelwood plantations to preserve the habitat, remove marginal lands from agricultural use, establish garbage disposal regulations, etc.
4) Understand structures and processes in selected social systems (city, village, farm, local market, shopping center, etc).
5) Define the concept of ecosystem and describe how it works, its components and their relationships.
6) Draw a diagram of relationships in typical ecosystems: forest, pasture, pond, river, and farm field.
7) Describe how changing water quality affects the environment.
8) Develop a plan on how to preserve soil, water and other natural resources.
9) Give examples of environmental action projects designed to protect environmental quality.

**Attitudes**

1) Explain what needs to happen in order for people to change their behavior about neglecting soil conservation measures, dumping garbage, clearing forests.
2) Describe how people’s attitudes about local environmental issues vary.
3) Describe how they feel about worsening environmental quality and why.
4) Describe and justify their own attitudes about environmental problems and their commitment to fix them.
5) Describe how they feel about new laws that would limit land use and protect soil and water, but would cause their family to lose money.
6) Discuss why individual behaviors do not always correspond to what individuals should be doing to preserve the soil and protect the water.
Skills

1) Predict how threats to soil and water quality affect them personally and affect their families and community (smaller yield, less income, health problems, etc).
2) List several patterns of behavior in the social system for a sustainable society.
3) Compare and contrast alternative methods for protecting the soil.
4) Design an educational program targeted at local farmers.
5) Work in small groups to develop soil conservation techniques.
6) Graph changes in water quality over the past ten years.
7) Hike in the local forest without harming it.
8) Analyze a case study involving an environmental problem by defining a problem, identifying the key players, describing the underlying attitudes and beliefs that affect the problem, and discussing alternative solutions.
9) Practice agriculture in ways that do not damage environmental quality.
10) Evaluate the effectiveness of an environmental education program for primary school students.
11) Write a persuasive letter to convince a family member to change behavior that is harming the environment.
12) Design an experiment to test the advantages and disadvantages of new methods to farm.

Participation

1) Demonstrate and implement simple soil conservation techniques to prevent erosion.
2) Organize and implement a clean up of a stream/park.
3) Design and carry-on an education program for farmers.
4) Plan and implement a program to demonstrate farming techniques that do not damage soil and water quality (Braus and Wood, 1993).

An urban school EE program might focus more on: 1) a country's natural resources as a whole; 2) the impact of industry on the environment and the relationship between economic stability and the sustainable environmental process; 3) how law and regulations are passed in the community and in the country; 4) and how citizens can have input in the political process (Braus and Wood, 1993).
4.5.2. Values in environmental education programs

Environmental education is inextricably linked to personal values. Personal values are a combination of beliefs and attitudes that depend on the environment, education, personality and life experience. Almost everything we do, the way we act and view things, is based on our set of beliefs, attitudes and values. The value systems students develop affect their choices and decisions regarding all aspects of their life, including environmental issues. Often many of us experience confusion about what we feel and how we should act. In order to survive we need food, water, shelter and clothing. In order to obtain it we harm the environment and might destroy life-supporting systems. EE can help us to learn how to meet our needs in a way that does not harm the environment (Braus and Wood, 1993).

An EE program deals with individual and societal beliefs, attitudes, values and actions, so it is important to include values and ethics while teaching environmental issues. One of the goals of EE is to encourage environmentally sound behavior and to help students to establish rules for such a behavior by themselves. Brainwashing students to adopt somebody else's personal beliefs does not work. By developing independent thinkers, teachers can help students develop their own code of ethics (Raths et al, 1978).

An EE program should help the students to understand the problems and the consequences of current behavior. The purpose of moral and ethical education is to help students to think independently and openly, respect the opinions of others, evaluate their moral thinking and reach their own judgements based on their own principles. The following list gives the characteristics of a morally mature person: 1) respects human
dignity; 2) cares about the welfare of others; 3) integrates individual interests and social responsibilities; 4) demonstrates integrity; 5) reflects on moral choices; 6) seeks peaceful resolution to conflicts.

An education program is more effective with well-planned activities focusing on attitudes and values. Programs that focus on awareness and knowledge do not necessarily change attitudes and behaviors that have an adverse impact on the environment. Knowledge does not affect behavior. An attitude component can help students understand themselves and help to develop themselves morally. Students can reach higher stages of moral reasoning when they are concerned about issues that go beyond self-interest, like equality, social justice, and other social, political and moral issues (Braus and Wood, 1993, Zimmermann, 1996).

Through a value clarification process students learn to weigh pros and cons, evaluate consequences, respect different beliefs and build their own value systems. Such activities and learning help them to see the difference that new actions could take. EE can empower students to improve the quality of their lives and of the community. This feeling can lead to a feeling of pride and self-respect. Participating in a community project helps students to affirm their values and see that their actions make a difference (Braus and Wood, 1993).

4.6. Fitting environmental education programs in a school curriculum

An EE program can have many forms (Curriculum Report, 1988). The two main methods of teaching EE are the infusion and the block methods. The infusion method
incorporates EE content and process into established courses throughout the curricula.

Traditionally, in Moldova EE has been infused mainly into science. Although EE deals with environmental science concepts it also includes economics, math, geography, ethics, politics and other subjects, and can be included into all subject matters, including history, social studies, reading, writing, and other courses (Hayden et al, 1987).

The advantages of the infusion method are:

1) requires fewer resources;
2) does not compete with other standard objects;
3) can be done immediately without curriculum development;
4) encourages transfer of knowledge and integrated problem solving across the curriculum;
5) appropriate for all ages;
6) can continually reinforce and build upon key environmental concepts;
7) allows all students an opportunity to get exposure.

The disadvantages of the infusion method are:

1) difficult to infuse EE;
2) requires extensive teacher training and effort;
3) often relies on motivated teachers for efforts to succeed;
4) EE message can get lost/ students might not get it;
5) difficult to evaluate success.

The block method involves assigning specific classes or units focusing on environmental science, issues, action and other environmental topics to the curriculum. In middle school, students might take an environmental science course that teaches biological, earth and physical sciences with an environmental perspective. In high school, students might take a class focusing specifically on environmental issues and problem solving, or there might be one or two units in a social studies class dealing specifically with environmental issues (Engelson, 1985).
Block method advantages:

1) easier to implement as a single subject;
2) allows teacher to present concepts that build throughout the course;
3) teacher training is somewhat easier;
4) easier to evaluate a separate course;
5) pulls everything together for students and can achieve depth and comprehension;
6) puts a priority on the subject.

Block method disadvantages:

1) hard to get schools to “buy” it;
2) needs trained EE teachers;
3) takes time from standard topics (hard to squeeze into loaded curriculum);
4) might imply that environment is its own subject and not interdisciplinary;
5) hard to find teachers to design and teach courses;
6) not as easy to see connections with other subjects;
7) may cause some teachers to assume EE is not my responsibility (Braus and Wood, 1993).

It makes sense to use the infused method in middle school by giving a more in depth environmental focus in science classes. It would be easier for teachers to do that and not require special training and textbooks. In high school EE should be taught as a separate course, or a secondary project, where students play an active role, experience real problems through hands-on activities and solving real problems (Sharma and Tan, 1990).

Teachers can use other methods to incorporate EE into the curriculum:

1) Development of modules: Instead of having a yearlong class, teachers can design an environmental unit or module that can be added to their classes.
2) After school clubs: This brings interested students together after school to form environmental clubs, that focus on environmental issues, nature and community service. These clubs can be linked to already existing groups.
3) Environmental week or month: Schools around the world try to focus attention on the environment by celebrating special environmental events. EE activities can take place in schools or communities on the Earth Day.
4) Informal activities: Educators work with educators in communities to blend formal and informal EE efforts. Many teachers take their students to museums and zoos for
EE activities, sponsoring EE camps, community clean-ups and other activities (Braus and Wood, 1993).

4.7. Developing effective learning environments

4.7.1. Effective strategies

Teachers tend to teach in a style most comfortable to their own learning preferences, even though that style may not be the most effective. In Moldova the most used type is the chalk talk, in which teachers teach, students take notes and then take tests on what they have learned. However, hands-on learning, through experiments, debates, simulations and other participatory activities students discover concepts on their own. Even lecture style can be enhanced through different techniques (Braus and Wood, 1993).

Instead of giving information and controlling students' behavior, teachers can lead the student's experiences by creating appropriate learning situations. For example, instead of talking about different alternatives for transportation teachers can ask students to design environmentally friendly methods of transportation on their own. In the process of designing it they will learn more than from hearing about it. In such activities students tackle the tasks of classifying, analyzing, comparing and develop connections between ideas and concepts they are learning. Teachers serve as coaches, directing students' thinking, challenging and encouraging collaboration between students (Ballantyne and Packer, 1996).

Another method often used in EE is active learning. During active learning student physically interact with real objects and the real environment. For example, students design and implement an action group project directed to improve the local
stream habitat. This method helps students to move to higher levels of thinking and learning. Teachers act as facilitators and guides, providing a learning environment for exploration and interaction. Such learning has been shown to increase retention, motivate students to learn, and encourage group cooperation. It is especially successful with problem solving activities (Braus and Wood, 1993).

EE encourages a team problem solving approach. Cooperative learning can motivate students to contribute to the solution of the problem by taking part in a creative activity without being experts. Cooperative learning promotes critical thinking and creativity, and encourages positive self-esteem and respect for peers. Research shows that lower and middle achievers in mixed groups learn more in cooperative groups than in individual activities. The high achievers learn as much through cooperative learning as through competitive activities. In a group, students have a chance to take responsibilities, share the leadership and know what are they are accountable for (Johnson et al, 1984).

Outdoor experience needs to be an important part of environmental education. Nothing can replace first hand experience to help understand the community, natural systems and environmental issues. The outdoors can be used as laboratories for students' investigations and experiments. Real community studies make environmental education more relevant to the students' lives. Real experiences enrich the curriculum and help to strengthen the ties between the program and community. Incorporating innovative teaching strategies and EE can enhance teaching and help students understand local issues and develop the skills they need to address them (Braus and Wood, 1993, Caduto and Bruchac, 1997).
4.7.2. Lesson planning

Effective environmental education programs require that teachers set aside time to plan where the program is going, how to get there, and how to find out if it gets there. Planning takes a lot of time, but makes a big difference in the success of the program. A lesson plan helps to organize the content and determine the teaching method. Teachers need to have a written lesson or a short outline to keep them on track and spend the time effectively.

Some strategies that help to develop effective lesson plans are to:

1) have a purpose of the lesson and let students know it;
2) start with familiar concepts and move to more complicated concepts;
3) decide what approaches and specific activities to use to achieve the objectives;
4) take time to arrange materials and other events;
5) decide how to assess the effectiveness of the lesson (Braus and Wood, 1993).

A lesson plan should take into consideration the thinking and learning sequences of the learning process (Trowbridge and Bybee, 1996). For example, these are the sequences of introducing a new concept - acid rain:

1) (Engagement) getting the students involved in the learning process. It can be a question, an example or a demonstration (What is acid rain? Where is it coming from? How does it affect the environment?);
2) (Exploration) students actively explore, whether hands-on, or researching, looking for clues for solving the problem (students create theories about the origins of acid rain, experiment with how acid affects plants, etc.);
3) (Explanation) students put their findings together and explain the studied concept (students share their theories and findings about acid rain);
4) (Elaboration) students find connections between the new concept and their previous experience (students find solutions for preventing acid rain);

5) (Evaluation) students summarize what they have learned and reinforce the knowledge about the concept (students create a concept map on acid rain to describe how the acid rain is formed, how it affects the environment, and describe acid rain problem solutions).

4.7.3. Effective Questioning

Questions can help students grow intellectually and creatively, and open students to express themselves freely without worrying about being wrong. Questioning tips:

1. Wait five seconds after asking a question to give students time to think and participate in a discussion.
2. Facilitate with follow-up questions to push students beyond their answer (i.e. “Why? Can you elaborate? Give an example?”).
3. Do not judge: if the student is wrong, avoid saying "you are wrong", instead, move the discussions along so the right answer will surface later and be reinforced.
4. Help students to listen more carefully by asking them to summarize somebody's answer.
5. Survey: get students involved by surveying the class (i.e. “How many people agree with the presented point? "").
6. Encourage interaction: ask students to call on somebody else.
7. Play devil's advocate: encourage students to defend their reasoning by offering different points of view.
8. Don't rely on raised hands: call on students randomly instead of calling on those with raised hands.
9. Encourage thinking aloud: ask students to describe how they came up with the response.
10. Cue student responses: when asking say that there are several alternative answers.
11. Do not answer the question: instead of answering a question ask what do students think.
12. Involve students: ask them to ask each other questions (Braus and Wood, 1993).
Write down questions for the class: many educators think about questions before class. It is easier to come up with stimulating questions when having plenty of time.

4.7.4. Age characteristics

The teacher should be aware of age characteristics and develop and teach appropriately for age concepts and skills. What would be appropriate to teach in high school? Accordingly to Piaget (in Braus and Wood, 1993), students 11-12 begin to think abstractly, start to hypothesize and use deductive thinking. With appropriate teaching, students can analyze events, understand probability, correlation, combinations, proportional reasoning, and display other adult thinking skills. Many students also become idealists and use their imaginations instead of relying on reality. Students continue to gain knowledge on environmental issues and focus on critical and creative thinking skills, attitude development and understanding their role in causing and solving environmental problems. Students at this age decide for themselves what is "right" and what is "wrong". From ages 14-15 and up, students can design experiments, come up with hypotheses involving different variables and exhibit higher-level thinking activities. Students at this age can work on critical and creative thinking skills, including problem solving, analysis, persuasive writing (Braus and Wood, 1993, Weilbacher, 1995).

Stages of moral development correspond with the stages of intellectual development. Children of different ages have different moral reasoning capabilities. Students 11-15 develop a personality and a sense of self. They understand different degrees of good and bad. It is a good time to begin to evaluate their own lifestyles in
relation to the environmental issues and discuss how their actions affect the environment. Older students could investigate behaviors to find out why people act in a certain way, and what cultural and economic barriers prevent people from changing their behaviors. Students can find what the consequences (economic, social) might be of implementing one or more of new behaviors. The decision to take action, based on personal principles, to protect the environment for future generation is an example of higher moral reasoning (Braus and Wood, 1993, Weilbacher, 1995).

4.8. Programs’ evaluation

An important component of an EE program is its evaluation. Evaluation should be built into the program in the beginning while designing the objectives. It can help to determine how effective the teaching is, how much material was learned by students and provide hints for changing and improving teaching methods and strategies. Evaluation, as well, serves to record the success story of the program (Braus and Wood, 1993).

The main goal of the evaluation is to assess how well the program achieved its objectives and the effectiveness of teaching techniques used. For evaluating students’ learning outcomes teachers need to look at skills students achieved, students’ motivation to solve environmental problems, and knowledge gained about environmental issues.

Assessing their teaching, teachers analyze their efficiency, use of time and resources, compare their students to others, match their objectives with others, and survey the satisfaction of students. The effectiveness of the program and student outcome can be assessed using traditional and alternative methods. Traditional methods of evaluating
students’ learning are classroom tests, final exams and essays (Marcinkowsky, 1990)

Alternative methods are:

1. interviews;
2. observation;
3. home work;
4. group projects;
5. portfolios (students collect their assignments, tests, essays home work and so on during a period of time to evaluate their own success, portfolios can be put together as well by the teacher on each student);
6. concept mapping (student create maps of learned concepts, placing them in a particular order and showing relationships between them);
7. peer evaluation (students evaluate each other and the program);

Student assessment indicates the knowledge, behavior changes, skills acquired and growth after completing the program. Student assessment can show whether the objectives were met and how they might have been met more effectively. The outcome of the program depends both on students’ learning and on the program itself, so it is important to weigh both (Braus and Wood, 1993).

The EE program can be evaluated on the criteria: 1) growth occurred during the program; 2) effective aspects of the program; 3) effect of the learning environment on the results of the program; 4) the reality of goals and objectives; 5) variety of teaching methods; 6) flexibility of the program to meet students interest; 7) effect of the program on community comparing the results with other programs (Bennett, 1984).

This is an example of environmental program assessment:

Environmental Program Assessment

Evaluation scale: not at all-0, poorly-1, slightly-2, fairly well-3, very well-4
Level 1. Ecological foundations. Grade how well the program will help the students to know about:

1. Populations: birth, growth, change and its effects, death, extinction etc. 0 1 2 3 4
2. Natural communities: structure, behavior, interaction of individuals and population in a particular place (forest, desert, pond, etc.). 0 1 2 3 4
3. Ecosystems: structure, interaction and effects between living things and the non-living environment (natural change, succession, adaptation, etc.). 0 1 2 3 4
4. Energy and chemical cycles: how energy and chemicals go through a natural system (water cycle, oxygen cycle, energy cycle, pollution, etc.). 0 1 2 3 4
5. Balance of nature: the tendency of natural systems to establish balance over time when disturbed naturally or by humans. 0 1 2 3 4
6. Man as a component of natural system: the effect of human behavior on natural systems (development of technology, effects of people’s attitudes and values). 0 1 2 3 4

Ecological foundations total. Add all circled numbers: (  )
Ecological foundations average. Divide total by 6: (  )

Level 2. Issues and values. Grade how well the program provides opportunities to conceptualize about:

1. Difference between environmental issue and environmental problem (problems can be natural or man made, issues are conflicts arising from how people view the problem). 0 1 2 3 4
2. Human cultural activities (religious, economic, political, social, etc.) influence on the environment from an ecological perspective. 0 1 2 3 4
3. Individual behavior impacts on the environment from an ecological perspective. 0 1 2 3 4
4. Variety of ecological issues and the ecological and cultural implication of these issues. 0 1 2 3 4
5. Alternative solutions available for solving environmental issues and the ecological and cultural implications of these issues. 0 1 2 3 4
6. Need for environmental issue investigation and evaluation as an integral part of environmental decision making. 0 1 2 3 4
7. Roles played by different human values in issues and the need for personal values clarification as an integral part of environmental decision–making. 0 1 2 3 4
8. Need for responsible citizenship action in resolving environmental issues. 0 1 2 3 4

Issues and values total. Add all circled numbers: (  )
Issues and values average. Divide total by 8: (  )

Level 3. Investigation and evaluation. Grade how well the program develops in learners:

1. Knowledge and skills needed to identify and investigate issues and to synthesize the gathered information. 0 1 2 3 4
2. Ability to analyze environmental issues and associated value perspectives with respect to ecological and cultural implications. 0 1 2 3 4
3. Ability to identify alternatives for specific issues and the value perspectives associated with these solutions with respect to ecological and cultural implications. 0 1 2 3 4
4. Ability to identify and clarify own values positions related to specific issues and their related solutions. 0 1 2 3 4
5. Ability to evaluate, clarify, and change own values positions in light of new information. 0 1 2 3 4

Provides opportunities to:

6. Participate in environmental issue investigation and evolution. 0 1 2 3 4
7. Participate in a valuing process to permit the learner to evaluate his/her values. 0 1 2 3 4

Investigation and evaluation total. Add all circled numbers: ( )
Investigation and evaluation average. Divide total by 7: ( )

Level 4. Environmental action. Grade how well the program develops in learners:

1. Skills that will permit effective work either individually or in a group toward a solution and are consistent with his/her values. 0 1 2 3 4

Provides opportunities to:

1. Make decisions concerning action strategies with respect to an environmental issue. 0 1 2 3 4
2. Apply action skills to specific issues. 0 1 2 3 4
3. Learn about different levels of environmental action (individual, groups, organization, etc.). 0 1 2 3 4
4. Learn about different action categories: persuasion, consumerism, political action, legal action, and eco-management. 0 1 2 3 4
5. Evaluate the actions taken toward achieving equilibrium between the quality of life and the quality of the environment. 0 1 2 3 4
6. Evaluate the costs of ecological and human benefits of environmental actions. 0 1 2 3 4

Environmental action total. Add all circled numbers: ( )
Environmental action average. Divide total by 6: ( )

Level 5. Teaching methods and practices. Grade how the program materials:

1. Provide specific training in the use of problem-solving skills such as observing, inferring, predicting, classifying, and hypothesizing. 0 1 2 3 4
2. Provide problem solving skills with simulated methods, real-life situations, scenarios, etc. 0 1 2 3 4
3. Be educationally appropriate for the intended student users (reading level, conceptual skills level, etc.). 0 1 2 3 4

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4. Be attractive and appealing to students interest. 0 1 2 3 4
5. Contain goals and measurable objectives. 0 1 2 3 4
6. Provide sufficient suggestions or mechanisms for evaluation. 0 1 2 3 4
7. Provide accurate information for students and teachers. 0 1 2 3 4
8. Provide sufficient background information for the teacher. 0 1 2 3 4
9. Provide clear directions and suggestions for teaching. 0 1 2 3 4

Teaching methods and practices total. Add all circled numbers: ( )
Teaching methods and practices average. Divide total by 9: ( )

Summary: Enter the average value for each level:

1. Ecological foundations average: ( )
2. Issues and values average: ( )
3. Investigation and evaluation average: ( )
4. Environmental action average: ( )
5. Teaching methods and practices average: ( )

EE program total: ( )
EE program average grade. Divide total by 5: ( ) (modified from Gardella, 1993).

4.9. Conclusions

In order to design an environmental education program that is effective and successful teachers should ask themselves:

1) What are the goals and objectives of environmental education? (defining environmental education)
2) What problems are the country and community facing? (environmental problem assessment)
3) What can be done to help students and the community solve these problems? (programs’ goals)
4) How can students learn to solve these problems? (programs’ objectives)
   a) What specific knowledge and skills do students need to tackle these problems? (learner outcomes)
   b) What is the role of attitudes and values in these problems? (programs’ values component)
5) How can I incorporate environmental education programs in school activities? (fitting EE in a school curriculum)
6) How should I teach an environmental education program:
   a) What type of methods should I use? (methods and strategies)
b) How can I design effective lessons? (lesson planning)
c) How should I ask questions? (effective questioning)
d) What is appropriate for different age groups? (age characteristics)

7) How can I evaluate what students have learned and how effective the programs’ content and teaching were? (programs’ evaluation)

From start to finish of an environmental education program, the help of community organizers, public officials, colleagues and other members of the community is invaluable. These people can help teachers to develop a program that will succeed and will have a life-long impact on students. Even the most successful program will not improve environmental quality overnight. The goal of an environmental education program is to help students realize that they can make a difference and equip them with the tools for solving environmental problems.
5. Environmental Education Methods and Activities

5.1. Introduction

This chapter includes instructional methods that can be used in teaching environmental education programs. Activities that apply such methods are provided to illustrate each instructional method. Teachers can use these materials for improving their teaching strategies and incorporating new activities in their curriculums to compliment environmental education activities with a science focus already existent in Moldovan schools.

These activities can improve students' knowledge about local environmental problems, develop their values and attitudes, and equip them with skills and desire to act toward a better Moldova. Other activities included here can help teachers to educate students about an environmentally sustainable society, present different environmental perspectives, and motivate students to become involved in improving environmental quality in Moldova. Examples of activities on value clarification and controversial issues analysis may be used by teachers to prepare students for identifying issues, investigating involved interest groups, weighing options, proposing solutions, developing and implementing environmental actions in their communities.

The targets of these activities are high school students, but these activities can be adapted for other age groups as well. Students from middle school can begin studying environmental problems, exploring how environmental problems emerge and getting involved in simple community projects.
In selecting or designing activities, teachers should take into consideration what they feel comfortable with, and what is appropriate for their students' ages, skills and community. Teaching methods are different and can help to develop particular cognitive and practical skills. For example, using this table teachers can select teaching methods that will help to achieve their lesson objectives:

<table>
<thead>
<tr>
<th>Methods</th>
<th>Awareness</th>
<th>Knowledge</th>
<th>Values and attitudes</th>
<th>Skills</th>
<th>Participation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concept maps</td>
<td></td>
<td>+</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Field trips</td>
<td>+</td>
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<td>Debates</td>
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</tr>
<tr>
<td>Survey</td>
<td>+</td>
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<tr>
<td>Research</td>
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<td>Guest speakers</td>
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<tr>
<td>Action group projects</td>
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<tr>
<td>Value clarification activities</td>
<td>+</td>
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<tr>
<td>Controversial issues</td>
<td>+</td>
<td>+</td>
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<td>+</td>
</tr>
</tbody>
</table>

Whether the activity is teacher-, or student-centered, time, subject, and needs should be considered. Many students and their parents might be involved directly in a problem facing the community. The educator should be careful and sensitive when presenting certain issues.
5.1. Concept maps

To help students to explore relationships between objects, processes, events, and ideas, educators can introduce students to building relationship webs and concept mapping. These activities help to create problem trees and help students develop problem-solving skills. Concept mapping allows students to relate new concepts to ones that they already know. Learning new concepts and incorporating them into knowledge students possess insights into the object of study. Concept maps help students learn information more meaningfully (Novak 1991, Braus and Wood, 1993). For example, here is a map that shows the structure of an ecosystem:

![Ecosystem Structure Map](image)

Students will get a better grasp of the ecosystem concept if they will trace the relationships between the structural elements of an ecosystem and write on the lines a description of the relationship. So, for example, on the lines between Ecosystem and Biotic and Abiotic components students would write, "consists of", and direct the relationship from Ecosystem to Abiotic and Biotic components by arrows. Students would connect Biotic and Abiotic components through a double direction arrow and write on it "interacts with", and so on with all structural components.
Concept mapping is often used as an assessment tool. It allows evaluating students' understanding of the concept at a higher qualitative level. By building concept maps students show how well they understand the concept and the relationships within it and reveal their knowledge about the topic (Novak, 1991).

5.2. Field trips

Field trips give students firsthand experiences with nature, career opportunities, pollution issues, community resources and other environmentally related topics. Before taking students on a trip, define field trip tasks. Prepare a scavenger hunt list, that covers concepts students need to learn. This will focus students' attention on specific goals and maximize the value of the learning experience. Outline the objectives of the field trip and connect them with your program objectives.

Checklist for a field trip:
1. Make sure the place you are going to visit is open;
2. Make sure you have permission to visit it and somebody is expecting you there;
3. Visit the place some time before, so you know what to expect;
4. Detect any possible problems;
5. Make sure students know what to wear and bring to the field trip;
6. Make sure you have the school's and parents' permissions.

Outdoor trips can increase knowledge, skills, and understanding of the concepts and are especially helpful for average and below average students and those with direct-experience learning styles. Personal experiences help increase students' appreciation and interest by providing firsthand experience. Field trips can take place anywhere: in urban areas to study built environments, in fields, at nearby forests, in local landfill or
wastewater treatment plants, or at a zoo, museum, or nature center (Braus and Wood, 1993).

This is an example of a scavenger hunt list for field trip to a local landfill:

1. How big is the landfill?
2. Estimate the price of land under the landfill.
3. Describe the smell and the view of the landfill.
4. What community is using the landfill?
5. How close is the landfill to the community?
6. How close is the landfill to a lake or river?
7. Find things in the garbage that could be used again after repairing.
8. Find things that you think do not belong in the garbage.
9. Find garbage that you think is toxic and can pollute water and air.
10. Find garbage that you think is bad for human health.
11. Find 5 kinds of garbage that can be recycled.
12. Find garbage that will remain here over a century.
13. Find garbage that will turn into dirt.
14. What kind of protection exists to prevent toxic and dangerous health materials to be washed out of the landfill by rain or to leak into the ground?
15. Find a place where pollutants go or could go from the landfill.
16. What kind of regulations do you know about garbage dumps?
17. What do you feel about this place?
18. Who is in charge of managing the landfill?
19. In your opinion, is it managed well? Why?
5.4. Debates

Most environmental issues are complicated and involve trade-offs. By taking part in debates, students understand the sides of an issue, and develop research, communication and critical thinking skills. Educators should pick a topic relevant to their students and encourage them to participate in identifying pros and cons of different options and to discuss different trade-offs involved with environmental issues. It is important to choose a topic that does not have a clear right or wrong answer and is of interest to students (Braus and Wood, 1993). These are examples of dilemma activities:

Dilemma: The Tragedy of Commons

(adopted from Living Lightly on the Planet-Volume 1)

Objectives: Demonstrate how increased population places a strain on natural resources; describe the outcomes of self-interest strategy versus cooperative strategy for managing renewable resources.

Skills: predicting; planning; cooperative action; moral reasoning.

Materials: a bag of peanuts (or beans, candies, etc.), bowls (1 for each 4 students).

The tragedy of commons occurs when a common resource (air, water, pasture, forest, etc.) is exploited at a more intensive rate. Balance of the resource use and conservation is the central issue of a commons dilemma.

Activity: Introduce the topic to the class and explain that to be engaged in this activity, students will participate in a game. Read the rules of the game aloud.

Ground rules:

1. The object of the game is to harvest as many fish as possible from the sea.
2. At the carrying capacity, there are 16 fish (peanuts) in the sea (bowl). For every fish harvested, the student receives a point.

3. When the game begins, the student may harvest all fish, some or none.

4. Students have four twenty-second trials to harvest fish. Students are notified when to start and when to stop.

5. If fish remain in the sea after each trial, a new fish will be added for each one remaining. However, the total number cannot be more than 16, the carrying capacity of the sea.

Begin the game with 4 students per bowl. Then repeat the demonstration with eight students per bowl to stimulate a population growth. Keep the same rules.

After the game ask these discussion questions:

What were the maximum numbers of points achieved by an individual? By a group?

Why were fish only replaced if some remained in the bowl after each trial?

What is the best strategy for harvesting from this commons?

How will continuing population growth affect our stewardship of the earth’s commons?

Elaborate the activity with questions: Stewardship of a resource is demonstrated when we use a cooperative strategy that shows concern for a resource. Name some other resources that require stewardship. What commons dilemmas exist in our community?

Wrap up by asking students to write down conclusions about the management of the commons.
Types of Agriculture

Objectives: students compare industrial agriculture with sustainable agriculture and learn about their environmental impacts.

Skills: critical thinking; analyzing; and distinguishing.

Material: handout, pictures of industrial and sustainable agriculture.

Handout:

Industrial Agriculture

Industrial Agriculture relies on small variety of crops. It allows for cultivating a few specialized crops, using less labor and applying big machinery and as a result it makes more short-term economic profit. However, the limited variety of crops creates prime conditions for pest infestation, can reduce soil productivity, increases soil erosion and reduces long-term economic profit.

Chemicals, such as mineral fertilizers and pesticides are heavily used. It promotes big harvests, even on very poor soil, where the crops could not grow otherwise, and helps to combat pests. However, both pesticides and mineral fertilizers are expensive and not always effective. Pests can adapt to the action of specific chemicals and survive, that requires an increase of pesticide doze or an application of other pesticides. Introduced fertilizers can be washed by rain or not reach plants’ roots. Pesticides can have negative impacts on human health and kill other species besides pests. Fertilizers can leak into groundwater or rivers and ponds, and cause nutrient overload problems and pose threats to human health.

In such a method there is a minimum need of manual labor. There are fewer employees, less is paid in salaries and thus the profits are bigger. However, there are
fewer jobs in agriculture and people from rural areas are forced to move to town to find jobs.

Machinery is used for most agricultural needs. A few machines can do the work of hundreds of people, which results in big savings in labor and cheaper products. At the same time, machinery is expensive, needs regular repairs, and is expensive to maintain. Machinery affects the structure of soil, increases erosion, and uses non-renewable natural resources. Spilled engine oil, gasoline and engine exhaust create pollution. The use of machinery promotes a dependency on countries that produce machinery and supply fuel.

Finally, Industrial Agriculture relies on borrowed money, imported auto parts and imported fuel. This allows operating on a massive scale, producing more at a cheaper price, and exporting of the products to distant markets. Such practice increases the short-term profits. Nevertheless, profits are shared with banks, machinery producers and fuel suppliers. Profit also greatly depends on market demand.

Sustainable Agriculture

Sustainable Agriculture uses a wide variety of crops. It ensures a steady income in different growing seasons, prevents big pest infestations and requires less fertilizers and pesticides. In harsh years, it is not affected as drastically and other crops can compensate the loss. Various crops improve soil fertility and productivity, and reduce soil erosion. However, a wide variety of crops requires more labor, big machinery can not be used, and that results in less immediate economic gain.

Bio-methods and manual treatment are used to protect the crops from pests. Organic fertilizers serve to restore soil productivity. A minimum of man-made chemicals
is required. As a result, there are fewer substances released into the environment and the product is healthier. However, compared to Industrial Agriculture this method requires more manual labor to produce the same amount of product and can result in smaller harvest.

Manual labor is needed for all agricultural operations. Light, or animal powered machinery and hand tools are used. It creates plenty of jobs for farm workers and more people can make a living in rural areas. However, manual labor can be less productive, is more expensive and thus brings less profit.

Sustainable Agriculture does not depend on prices or availability of machinery and fuel. It can exist without investments from outside, does not share profits and is not dependent on distant markets. However, such practice makes less profit, and farmers may have fewer commodities and less cash.

Activity: Engage students in discussing changes that have occurred in agriculture. Ask students what they think was a positive change and what was not.

Students read the handout and answer these questions:

What type of agriculture produces a bigger amount of product?
What type is producing a better quality product?
What type of agriculture is more successful economically?
What type is more beneficial for a wider group of people?
What type is more environmentally friendly? Why?

Ask students to take a stand: group ones who support industrial agriculture and ones who support sustainable agriculture. Groups prepare their arguments for a discussion.
Have a group discussion where students will try to convince each other on what type of agriculture is better for Moldova.

Elaborate by encouraging students if they see any solution that is a compromise between these two types.

Evaluate the activity by asking what types of agriculture could solve some of the environmental problems in their community.

5.5. Survey

Surveys can help students gather and work with data about an environmental topic, find out how people think about an issue, and learn to ask questions and evaluate responses. Surveys help to compare how different people feel about an issue. There are two types of surveys: one collects facts about an issue and the other finds out opinions on a topic. Surveys also help to promote social skills and get ideas about real community problems (Braus and Wood, 1993). This is an example of an activity where students can perform a survey:

Garbage Management

Objectives: students learn to identify the origins of products they use in everyday life; name the main components of the garbage; and explore solutions for reducing the amount of waste.

Skills: observation; exploration; identification; decision making; and investigation.

Materials: trash samples, pictures of dumping sites, land fills, incinerators, advertisements from local supermarkets and department stores.
Activity: Ask students if any of them have ever seen a landfill or an incinerator. Pass the pictures of them around and ask students to explain what they think about it.

Brainstorm the environmental effects of landfills and incinerators.

As a group, brainstorm types of garbage people produce. Write down the list.

In smaller groups, ask students to identify the resources and types of energy used to produce this waste.

Have a group discussion on the rationality of using disposable things. Ask students to give examples. Brainstorm the advantages and disadvantages of such practices. Ask students what they think about the waste of natural resources and if it is acceptable.

In small groups, ask students to come up with ideas about what can be done to solve waste problems. Discuss the feasibility of proposed solutions and their advantages and disadvantages for consumers.

Ask students to make a table on a paper sheet with a column for each solution. Ask them to fill the table with the garbage components using the previous list.

Ask students what solutions they found for all kind of garbage. Give students an assignment to survey their household waste during a week and report their findings in class.

5.6. Research

To find more out about a topic, students can do research projects. Projects will improve students’ research skills and their ability to work and think independently.
Research is not limited to the library and can be investigated by questioning elders, and other experts (Braus and Wood, 1993).

These are examples of activities that can require student research prior to or after the activity:

**Acid Rain**

*(modified from activity Acid Rain in Project Wild Aquatic)*

Objectives: students describe acid precipitation, generate and test hypothesis about acid rain; make inferences about the potential effects of acid rain on the environment; and find solutions for this problem.

Skills: creative thinking; problem solving.

Materials: a piece of limestone, vinegar, plants.

Rain is normally slightly acidic and becomes increasingly acidic because of higher concentrations of sulfur dioxide and nitrogen oxide in the air. These oxides combine with atmospheric water and form acid rain. Car exhausts produce nitrogen oxide. Electricity generation plants, industry, and smelters that burn coal and oil that contain sulfur in turn produce sulfur dioxide. Acid rain can directly or indirectly cause damages. Directly acid precipitation can damage buildings (for example, the decay of historical buildings in Western Europe is related to acid rain). Indirectly, by solving and washing away nutrients, acid rain reduces soil fertility and damages forest and aquatic ecosystems. Acids also help metals from the soil to concentrate and leak into water supplies. In many North American and North European lakes almost all fish are gone because of acid pH.
Activity: Ask what students know about acid rain. Ask students to generate ideas about origins of acid precipitation in small groups. Let the groups share their hypothesis.

Ask how living beings react to the change of pH in their environment. Elaborate the question performing a designed by students experiment on acid tolerance thresholds of different plants, or plant tolerance to different concentrations of acid.

Collect rainwater samples and test them for pH. Collect water from different wells and lakes around the community and test their pH over a period of time. Find variations of pH and try to find the causes.

Evaluate by asking how acid precipitation is formed and how it can be prevented.

What can students do?

Water Pollution

(modified from activities Deadly Water in Project Wild Aquatic and Water Sleuths in Project Wet)

Objectives: students identify major sources of water pollution; make inferences about pollution effects on the environment; and propose solutions for reducing water pollution.

Skills: critical thinking; problem solving.

Materials: glasses, pond water, sugar, vegetable oil, dirt, ice.

Types of pollution:

Chemical pollution - toxic substances released into ecosystems (acid rain, pesticides etc.).
Thermal pollution - varying the temperature above or below normal conditions (power plant cooling systems).

Organic pollution - oversupplying an ecosystem with nutrients (fertilizers, organic run-off).

Ecological pollution - increasing the amount of naturally occurring substances (salt water in freshwater ecosystems; an increase in sediment; altering the concentration of biological or physical components of ecosystem).

Natural pollution - volcano, high tide, hot springs, wild fire.

Drinking polluted water can cause diseases. Waterborne diseases caused by discharge of human and animal waste include: Salmonellosis, Cholera, Hepatitis A, Typhoid fever, etc. High nitrogen concentration caused by agricultural run-off can result in the "blue baby" disease. Metals and other toxic chemicals released by industry can cause mental problems, cancer and birth defects. Pollution is often called a chosen disease, because people accept risks related to pollution because it increases the short-term economic gains.

Activity: Show five glasses with water (one with clean pond water, one with a some oil in it, one with dirt, one with a diluted teaspoon of sugar and one with a piece of ice) to the class. Explain that water in the glasses is from a pond and some glasses contain some kind of pollutants. Can students tell just by looking?

Students form work-groups and identify the glasses with polluted water and explain why they think the water is polluted. The groups compare their results. Ask if it is enough just to look at the water to tell if it is polluted. What makes water polluted? Encourage students to define pollution.
Brainstorm where pollution comes from. What types of pollution do students know? How is human waste treated? How can agriculture pollute water? How do industry and cars pollute water? What consequence does pollution have on our environment? What kind of human diseases are related to poor water quality?

Ask students to classify pollution sources in two groups: one with a known place of entering the environment, and one that does not have a point of entering the environment. Which one is easier to prevent and why?

Elaborate by asking why pollution became such a big problem in this century. Are people aware that using some chemical processes is dangerous to health and to the environment? Why is pollution called a chosen disease? Are the short-term gains of allowing pollution worth the long-term effects?

Evaluate by asking students to propose ways of reducing pollution. What can be done in the community? What can students do?

Where is Electricity Coming From?

(modified from activity Flip the Switch for Wildlife modified in Project Wild)

Objectives: students trace electricity from the source of production to use; explore different sources of energy; describe the impacts of energy developments on the environment; and evaluate their own energy use habits.

Skills: critical thinking, problem solving.

Modern society is very energy intensive. Electricity is virtually everywhere and is used in industrial processes and in domestic chores. Electricity itself does not affect the environment, however, its generation has a significant impact. As our society becomes
more and more dependent on energy resources, the development of coal, hydro, nuclear, oil, and natural gas power plants is increasing, as well as their impact on the environment. Different ways of generating electricity have different types of effects. Dams alter river habitat; nuclear plants produce nuclear waste; coal power plants cause acid rains; etc. Alternative sources, such as solar, wind and geothermal, can provide clean energy.

Activity: Engage students in the exploring of energy consumption impacts. Where is your energy coming from? What other types of power generating plants do students know?

Students form groups and discuss one of the power plant types. What are its advantages and disadvantages? In a big group discussion, students share their thoughts.

Elaborate by asking which type students think is environmentally safer. How can consumers affect the development of new power plants? How can we minimize our energy consumption? What are the trade-offs?

Evaluate by asking what solutions students see for satisfying energy needs in their community and preserving the environment.

Alternative Transportation

Objectives: students summarize the environmental impact of cars and investigate solutions for reducing the amount of fossil fuel powered machines by designing their own environmentally friendly transportation.

Materials: pictures of car accidents, traffic jams, road construction, road kills, air pollution, petroleum spills, etc.
Skills: investigation; brainstorming; and design.

Activity: Ask students how many of them want to own a car and why. Pass the materials around and ask them to think about what is going to happen in the future when everybody will have a car? Brainstorm the possible consequences of the assumption that in the future every person will have a car.

What solutions do students have for these problems? Divide students in small groups and ask them to design alternative methods of transportation. Every group will present their ideas to the class.

Ask which of these solutions will meet the requirements of saving non-renewable natural resources, preventing pollution and traffic difficulties.

Ask which of them could be used for local and long distance transportation? What kind would students prefer? Ask students to justify their answers.

Evaluate by asking students if they plan to buy a car and explain their answers. Ask if today’s class made them think about changing the way they commute.

5.7. Guest speakers

Guest speakers can motivate students, encourage discussions, and bring new points of view into the classroom. It is important to have speakers who will represent different sides of the issues. Guest speakers can be farmers, doctors, scientists, local authorities, public officials and professors. Guest speakers give students practice in creating and asking questions. Before the speakers arrive, students need to think and write down possible questions they will ask (Braus and Wood, 1993).
This is an example of a guest speaker activity:

Environmental Legislature

(*modified from activity Know Your Legislature in Project Wild*)

Objectives: students learn legislative process from the bill to law; explore stages in the legislature process where citizens can have an impact; evaluate the effectiveness of legislation; and learn environmental laws.

Skills: critical thinking, moral reasoning, activism.

Materials: drafts of environmental laws and copies of current laws.

Letter writing and lobbying represent the direct ways citizens can affect the legislative process. Although high school students cannot vote, they will eventually become voters. This activity can prepare students to become active citizens. Direct contact with a public official can have a great impact on student’s citizen activism. Invite a guest speaker who is an expert in the legal domain to share his/her experience and answer the students’ questions.

Students, as well, can select legislation of their interest, research it and write a letter to an elected official. This can be a real-life experience that allows students to study and participate in legislative process.

Activity: Prior to the arrival of the guest speaker discuss with students the creation and enforcement of laws. How do the laws become laws? How effective are the laws and the law enforcement? How can the legislative process and enforcement be improved? What environmental laws do students know? Ask students to prepare questions for the guest speaker.
Invite a public official (an environmental protection department representative) to talk about environmental laws. Give students a chance to ask questions. After the guest speaker's visit, ask students to write a collective thank you letter.

Elaborate: Based on the information shared by the guest speaker, encourage students to write a letter expressing a concern about a problem.

Evaluate: How would students change the legislative process? What do you feel about the political process? Why?

5.8. Action group projects

Environmental education stresses community-based learning and gives students an opportunity to participate as active citizens in helping to tackle an environmental or social issue. By taking part in an action project students can act on their value decisions about the environment and work to improve environmental quality. Action group projects help students to gain knowledge about local issues and social skills, such as group cooperation and political participation. Examples of projects students could participate in include:

1. Implementing water saving strategies at home and in school;
2. Writing letters to officials, newsletters and magazines;
3. Forming litter patrols;
4. Organizing recycling drives;
5. Joining and supporting local environmental organizations;
6. Preparing booklets about toxic chemicals for consumers;
7. Sponsoring debates on environmental issues;
8. Planting trees, adopting streams, lakes and forests;
9. Monitoring water quality and sharing data, etc.

Before starting an action project, it is important to check with school administrators, parents, colleagues and public officials. They can provide help, make the
project successful and give students useful feedback. Even if it is a simple project, students need to work on the topic ahead.

First, the issues need to be investigated through research of information, interviews and surveys to find out more about the problem.

Second, students need to make a list of problems and discuss which of them they will tackle. Criteria for selecting a problem can be: 1) importance of the problem; 2) interest for students to solve it; 3) people affected by the problem; 4) period of time the project going to last; 5) potential results, etc.

Third, students need to decide what kind of project could solve the problem and set real objectives accordingly. Possible projects should be evaluated, and the most feasible one selected for further planning.

Fourth, students need to develop a plan of action. Brainstorm things that can be done and answer the questions:

1) Who from the community needs to know about the project?
2) Who from the community can get involved and support the project?
3) How much time and how many people are needed?
4) How much it is going to cost?
5) Who will pay the expenses?
6) How can we insure the success of the project?

Fifth, students need to take responsibilities and divide their roles for implementing the plan. Students need to understand that they need to be flexible and not get frustrated if something is not going as planned. Without organization, however, even the best thought out plan will not succeed.

And sixth, after completing the project students need to evaluate it:

1) Were the objectives accomplished?
2) Why, or why not?
3) What did you like about it, what not and why?
4) What did you learn from it?
5) What would you change if doing it again?
6) What feedback did you get from the community?
7) Did you feel that you did something significant? (Braus and Wood, 1993)

This is an example of action group project:

Biodiversity Project

*(modified from activity Improving Wild-Life Habitat in the Community in Project Wild)*

Objectives: students describe a suitable for biodiversity habitat; define activities compatible and incompatible with it; design and implement a community project to improve local habitat.

Note: This activity is more successful after students evaluate local environmental problems.

Skills: research; community action; problem solving; creativity; teamwork.

Activity: Engage students in the activity by asking how their community would benefit from improved biodiversity. How can the biodiversity in their community increase? In-groups, ask students to create a map of their community with a better wild species habitat.

How can this idea become a reality? Ask students to collectively design a project by brainstorming ideas. After the brainstorming go over the project again: What is important here? What seems realistic and what not? How much is it going to cost? Who will pay? What species will benefit? Who will maintain the area? What permissions do they need?
Put the ideas together and ask students to show the proposal to a public official. Ask advice on legal perspectives needed to be considered. Find community members who can cooperate in the project. Who else in the community can help?

Divide responsibilities within the class; create a time frame and involve community members in the project.

At the end of the project students evaluate the results and effectiveness of the project, find mistakes, propose improvements and monitor the results.

5.9. Value clarification activities

Presenting situations, which enact a moral conflict, is a way to stimulate students' personal growth through internal analysis of their own values and beliefs. It provides experience in using higher level moral reasoning skills. As an example, such an activity can be based on an issue facing a person, a family, community and environment. A landslide threatens a person's house. However, people from the community still cut trees from the hillside. People are forced to cut trees because they can not afford to buy firewood. What should the person do? In debates students take sides on the issue, research it, prepare arguments and try to convince others of their position. In structured controversies students argue both sides of the issue and work in teams to come up with collaborative solutions. At the end students summarize what they learned from this activity. Before the debates or discussions, however, David and Roger Johnson (1984) recommend discussing some rules for participating in a classroom controversy:

a) be critical of ideas, not people;
b) focus on making the best decision, not winning;
c) encourage everyone to participate;
d) listen to all ideas, even if you do not agree;  
e) ask clarifying question if not sure about what somebody said;  
f) bring out all ideas and facts and then try to put them together;  
g) try to understand all sides of the issue;  
h) change the position if the evidence indicates that it is correct to do so.

While leading such activities teachers need to stay neutral and encourage students to interact with each other, listen to their opinions and raise questions and respond to other student responses. Teachers should encourage students to defend their positions and discuss differing beliefs openly (Braus and Wood, 1993).

These are examples of moral development and value clarification activities:

Environmental Ethics

*(modified from activity Enviro-Ethics in Project Wild)*

Objectives: students distinguish actions that are beneficial and harmful to the environment; evaluate the appropriateness and feasibility of making changes in their own behaviors related to the environment; and develop and use a personal code of ethics.

Skills: critical thinking, moral reasoning, and problem solving.

The purpose of this activity is to provide students with encouragement and the opportunity to look at their own lifestyles in light of their impact on the environment and natural resources.

Activity: Engage students in a conversation about their personal impact on the environment. How do things we use, such as food, clothing, housing and transportation affect the environment? What actions are harmful and beneficial to the environment? (Note to students that we will always have an impact, but we can make a choice about what type of impact and its extensiveness.)
Ask students to create a personal code of ethics. Later, students share their personal codes of ethics with the group. Encourage students to improve their personal codes of ethics. Avoid criticizing - let students correct themselves.

Elaborate by encouraging students to think about their own future: what things should we have, what transport type should we use, food type, etc. Ask students if this life map matches their personal coded. Dare students to live by their codes.

Evaluate students by asking, if they think they can live by the code they developed. Why, or why not?

Moral Dilemma: Consumption

Objectives: students will learn about the relationship between material desires and their effect on the environment.

Skills: investigation; critical thinking; moral reasoning.

Materials: pictures of industrial pollution, habitat destruction, department store in a more developed country and in a less developed country.

Over-consumption is one of the major environmental concerns. Increasing consumption causes increased production that accelerates resource depletion, causes habitat destruction, and increases water and air pollution. Although the number of people in more developed countries is smaller than in less developed countries people consume many times more manufactured products than people in less developed countries and cause much more pollution.

Activity: Begin with an introduction, by asking students to name things average people use in their households in a more developed country and things people use in an
average household in a less developed country (bigger house, car, dishwasher, air conditioning, washing machine, dryer, TV, etc). Write the list on a blackboard.

Ask students to form small groups (4-5), and to write next to each of the above things: what kind of natural resource and energy was used to produce them; what type of energy they need to function.

Ask students to point out how the production by which things directly or indirectly cause pollution or habitat destruction. Write “+” if it is not polluting or “-” and the pollution type.

Ask students to discuss in their groups the question: Can people use things that help them in everyday life though their production causes damage to the environment? Should people stop using these things? Why, or why not? What should they do?

Give students some time, and then ask them to present their thoughts and opinions. Let students take a stand on this dilemma. Group people who have similar views together.

Ask students in these groups to make a list of the pros and cons of their position regarding this dilemma. Ask each group to support their position and explain it to class.

Elaborate this activity by asking students to name other luxury things that can cause unnecessary environmental damage (jewelry, collections of furs of rare animals, collections of eggs and feathers of rare birds, clothing made of rare animal skins, etc.).

Wrap up by asking students how they feel about this activity and what they have learned.
Environmental Perspectives

Objectives: students learn about anthropocentric and biocentric perspectives on the environment and clarify their own position regarding the environment.

Skills: critical thinking; communication; moral reasoning.

Materials: handout.

Handout:

Anthropocentric (A) and Biocentric (B) worldview:

(article adopted from Environmental Science: An Introduction, by Tyler Miller)

Role of human beings on earth:

A. Human ingenuity should be used to develop technologies to promote an economy based on ever-increasing production and consumption of material goods.

B. Human ingenuity should be used to develop technologies for working with nature to promote kinds of economic growth that sustain rather than deplete and degrade the earth’s life supporting systems.

Severity of environmental problems:

A. Environmental problems are nor serious and can be cured by increasing economic growth and technological renovations.

B. Environmental problems are serious now and could become more serious if many present forms of economic growth and technology are not replaced with forms that place less stress on the environment.
Population growth and control:

A. Population growth should not be controlled because people are the most vital source of new technologies that will solve the world's problems.

B. Population growth should be controlled because adding billions of poor and malnourished people in poor countries (people overpopulation) will not solve the world's problems and condemn millions to premature deaths, allowing wasteful resource consumption to continue in reach countries (consumption overpopulation) will increase regional and global pollution and environmental degradation.

A. Economic development will lead to lower birth rates and a stabilized population in poor countries as it has in rich since industrial revolution

B. Economic development cannot slow population growth in time to avoid greatly increased famine, an environmental degradation in the poorer countries unless it is coupled with a well-funded, well-planned program for population control.

A. Many forms of birth control go against some individuals' religious beliefs and are an infringement to people's freedom to have as many children as they want.

B. People should not be forced to control the number of children they have, but have easy access to any form of birth control they find acceptable. People should understand that lower population size will help to reduce environmental problems, famine, poverty, social tension, war and erosion of individual freedom.

Resource depletion:

A. We will not run out of renewable resources; as resources are degraded, price increases will lead to better management or a switch to alternatives.
B. There are no substitutes for renewable resources like topsoil, grasslands, forests and fisheries that are already overused and converted to nonrenewable resources.

A. We will not run out of scarce nonrenewable resources because prices will stimulate people to invent ways to mine lower grade deposits or find substitutes.

B. Once a renewable resource is about 80% depleted it is usually uneconomic to use what is left; substitutes for some resources may not be found or take too long to develop without economic hardship.

A. Developed countries are not suffering from consumption overpopulation; since 1970 economic growth has produced industrial products, technology and knowledge to control pollution, find new resources to help under-developed countries economically and to increase average life expectancy.

B. As a result of high rates of resource use and unacceptable regional and global resource depletion, environmental degradation and pollution, can wipe out short-term gains in life expectancy; when adjusted to inflation, real income in under-developed countries decreased since 1960.

Resource conservation:

A. Renewable resources should be used and managed efficiently to leave them in reasonable shape for future generations, but not at the expense of short-term economic growth by the present generation.

B. Renewable resources should be used and managed efficiently for people on earth today, but not at the expense of future sustainability on which long term economic stability depends.
A. Emphasis on recycling and reusing materials can reduce short-term profits and is unnecessary because we can substitute any scarce resource.

B. Recycling and reuse of non-renewable resources are necessary to stretch supplies, allow more time to find substitutes and reduce the environmental impact of finding, extracting and processing primary product.

Pollution control:

A. Pollution control should not be increased at the expense of short-term economic growth, which can provide funds for cleaning up the environment as needed.

B. Insufficient pollution control leads to long-term damages that will reduce economic productivity; cost of most products and services do not reflect their actual harmful environmental, economic, and health impacts, thus misleading consumers about the impacts of their lifestyles.

A. When pollution control is necessary, emphasis should be put on output control to clean up pollution that has entered the environment, or to burn, dump or bury waste materials.

B. Emphasis should be put on input control; preventing pollution cuts the amount entering the environment and is more effective and less costly; some pollutants should be viewed as valuable resources that can be recycled or reused.
Technology:

A. Large centralized technology, such as electric power plants, provide more profit for large corporations, enhances a country's short-term economic growth and provides a more reliable source of energy and other goods and services.

B. Smaller, decentralized forms of technology use and waste fewer resources, increase national security by making a country less vulnerable to attack and natural disaster, and give individuals more control over how they obtain goods and over the prices they pay.

Activity: Begin with an introduction telling students that humans have a variety of beliefs and values regarding everyday life. Tell students that in this activity they will study and compare two perspectives regarding the environment: anthropocentric and biocentric.

Pass around the handouts.

After reading, ask students to form groups of 4-5 and answer these questions:

1. What are the values of biocentric and anthropocentric positions?
2. How are their values and beliefs different?
3. Can you find arguments to support one of the above positions?
4. What political, economic, social and environmental advantages and disadvantages do you see in these positions?
5. Which of the above do you think is dominant in today's society? Why?
6. In your opinion, which position is more likely to help people to survive: anthropocentric or biocentric? Why?
After students answer the questions bring the groups together to discuss the answers. Wrap up the discussion with a conclusion that neither position is "bad" or "good"; people have a right to have different opinions and it is ultimately up to each student to decide to act accordingly to his/her priorities.

Elaboration: ask students to think how environmental problems in their community relate to anthropocentric and biocentric beliefs. What solution do students see for these problems from the perspectives of these positions?

5.10. Controversial issues

Introducing controversial issues in class that are directly relevant to the students' lives and interests can spice up the class, strengthen critical and creative thinking and moral reasoning skills. Controversial issues can help understand conflict resolution and develop a respect for peers. Issues can be introduced as debates or structured controversy resolutions (Braus and Wood, 1993).

Some benefits from participating in discussions of controversial issues are:

1) better communication skills;  
2) improved ability to collect and interpret information;  
3) improved ability to detect bias;  
4) improved ability to differentiate between fact and opinion;  
5) ability to respect the views of others;  
6) ability to work cooperatively with peers;  
7) ability to make logical conclusions;  
8) chance to examine their own values and beliefs and of others;  
9) greater understanding of the subject;  
10) ability to make better decisions and find more effective solutions;  
11) ability to see different perspectives;  
12) greater commitment to the problem-solving process.

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These are examples of controversial issue activities:

**Environmental Issue Analysis**

*(adopted from A Technique for Analyzing Environmental Issues, by J. Ramsey H. Hungerford and T. Volk)*

Objectives: students learn to discriminate between problems and issues; identify the players, their positions and underlying beliefs and values; and evaluate solutions for environmental problems.

Skills: critical and creative thinking; tolerance of different values; problem solving; solution evaluation.

Most of today's social issues have environmental dimensions. Natural events or human activities can cause situations where human health and the stability of life-supporting systems are under risk. Issues arise over controversies about the problems and their solutions. Environmental issues represent problems related to the environment and involve the presence of different systems of values and beliefs. It is often very confusing to understand environmental issues because of their complexity.

The Issue Analysis Technique helps break down the information about an issue into a structured framework. Components of the Issue Analysis are:

**Problem**: a situation that is threatening something or somebody.

**Issue**: a problem about which different values and beliefs exist.

**Players**: individuals or organizations that have a role in the issue.

**Positions**: the stand of players concerning the issue.

**Beliefs**: ideas held by players that determine their stand.
Values: a system of beliefs and attitudes that determine behavior.

Solutions: actions available to resolve the problem.

Examples of Value Descriptions:

Aesthetic: referring to appreciation of beauty through the senses.

Cultural: referring to the maintenance of the attitudes and practices of a societal unit.

Ecological: referring to the maintenance of the integrity of natural systems.

Economic: referring to the exchange of goods and services for money.

Educational: referring to the benefits derived from learning/instruction.

Egocentric: referring to a focus on self-satisfaction and personal fulfillment: an "I"-oriented value.

Legal: referring to the law and its enforcement.

Recreational: referring to the use of leisure time.

Social: referring to shared human empathy, feelings, and status; an interaction of the human condition.

Activity: Introduce the concept of problem and issue by asking students what environmental problems they know. Pick one problem and ask if everybody in the class thinks this is a problem. Ask also what solution exists for this problem, and if students can agree on it.

Write the issue on the middle of the blackboard, and ask students to name the players who participate in this issue and write them on the blackboard around the issue.

Ask students what the position is of the involved players. Students brainstorm the position of each player, and the teacher writes them on the blackboard by the player.
When complete, ask why players behave like that. What makes them take their positions? Students brainstorm what values are behind their positions, and write them down.

Explain to students that what is written on the blackboard represents a picture of the issue and can help them better understand environmental issues. Ask why there is a need of understanding environmental issues. Does it help in developing final solutions?

Outline possible solutions with the class and ask students which ones will be used when there is such a variety of interests involved in the issue. Discuss how decisions can be made.

As an evaluation ask students to compare an issue with a problem and give examples from their community.

Fact, Falsehood and Opinion

(*modified from activity Facts and Falsehood in Project Wild Aquatic*)

Objectives: develop criteria for evaluating the quality, balance, and fairness of an information presentation; evaluate the balance and fairness on the informational presentation designed to represent points of view about an environmental topic; distinguish fact and opinion.

Skills: critical thinking; comparing and discriminating information.

Materials: articles about an environmental problem that represent positions of different interest groups (for example: articles about illegal dumping sights from the perspective of the regulatory side and those that dump illegally).
Activity: Introduce the activity to the students by bringing up the issue discussed in the articles. Explain that in this activity, students will judge articles to determine their fairness.

Ask students to form several groups (by the number of articles that represent interest groups) and read the articles.

After reading students answer questions: Is the presentation of the issue in the articles a complete description? Does it acknowledge other perspectives? Is it factually based? Did students notice any distortion of information, or lack of completeness? If all articles are on the same topic, why are they different?

Ask students to outline concepts that they think are true and not true. How do students distinguish between fact, falsehood and opinion? Ask students to give some examples of false arguments that they have met in other issues.

Evaluate by asking how important it is to be able to distinguish between facts and falsehoods.

Repeating the Mistakes of the West: Is it avoidable?

Objectives: students critique the environmental mistakes made by the Western countries; find solutions to avoid them being repeated in Moldova; and discuss driving values in modern societies.

Skills: critical and creative thinking; defending a point of view; problem solving; teamwork.

Material: handout.
Activity: Engage students in the discussion by asking what kind of life standards they want Moldova to have and what quality of life people have in the Western countries. Ask them to list things that would bring Moldova on the same scale with the Western countries. Ask students to select things they named that cause an environmental threat and actually decrease the quality of life in the West. Let students compare Moldova’s environmental problems with the problems of the industrialized West.

Form smaller groups of students and let them read the handout. Ask them to explore this topic for several minutes. Later a student from each of the groups will express his/her group’s opinion to the class. Ask students to illustrate their answers.

Elaborate the discussion by asking students what Moldovans could do to avoid the mistakes made by the West. How quality of life in Moldova can become better than in the Western countries? What can be done in your community?

Evaluate students by asking what priorities people have in today’s societies. How these priorities can affect quality of life? What priorities do people need to have to forsake material wealth for the sake environment?

Handout:

Is it possible for the former Soviet Union states and Moldova to avoid the mistakes made by the industrialized West?

(article adapter from Ecoanthology by Gale Warner & David Kreger)

Some people argue that if Moldova is going to join the modern world; enter the global economy; raise the standards of living to a level comparable to the West and so on, then it is going to pay the same environmental price as the Western countries did. It is a
fate of developed countries to become commercialized free market societies; to be
dominated by advertising and billboards; to be polluted by factories; to be completely
dependent on automobiles; and to sacrifice natural resources, such as free flowing rivers,
forests and open land.

Fortunately, to build a successful economy and a comfortable life does not
necessarily require blindly repeating the mistakes of the West. There is a chance to learn
from these mistakes. There are many possibilities and options. A new society can be
built on energy efficient and renewable energy technologies. Preserving and improving
mass transit systems existent in Moldova, developing car pool and reliable taxi and car
rental, stimulating development of dachas and other environmentally sound solutions are
some of options. It is possible to have less pollution, less asphalt, less traffic jams, less
waste, less toxic waste. It is possible to have more open space, more forests, more
wildlife and comfortable, enriching lives with needs met and more. It is important to
start right. It is easier to prevent environmental problems than to fix them.

A free market is not a solution and can bring a new set of environmental
problems. Government regulation, community organizing and individual moral choice
represent solutions to preserving environmental quality and quality of life. Many Western
businessmen try to convince us that the Western way is the only way. However, they are
often interested in making profits at the expense of the local people and environment, by
using technologies that are outlawed in the West, running factories with fewer
restrictions, and having access to cheaper minerals and timber.
Nevertheless, many people say that they do not want to stay poor and want to follow the example of the West. This imitation of Western societies is expressed not only in a desire for a better quality of life, but also in an increased demand of material goods.

Discussion: Sustainable Society

Objectives: students learn features of a sustainable society, compare them to today’s society and explore ways to achieve sustainability.

Skills: critical and creative thinking; problem solving.

Materials: handout.

Activity: Tell students that in this activity they will try to imagine the future. Ask what they think about the future. How is it going to be?

Let students read the handout and ask them to write answers to the questions:
What do you think about this article? Do you think such a society is achievable? Why, or why not? How is modern society different from the one described in the article? What made you think in this article?

As a big group, students share and discuss their answers.

Elaborate: Ask students how they see the future of their country and community. How can their country and community become sustainable?

Evaluation: Ask students to write conclusions about this activity and read it to the class.
A sustainable society is one that satisfies its needs without jeopardizing the prospects of the future generations. Such a society is responsible for the each following generation. A sustainable society is ensuring that the next one inherits an undiminished natural and economic endowment.

Coal, oil and natural gas do not power the sustainable society. Society is less energy-intensive and less polluting. Direct solar energy is the cornerstone of a sustainable world energy system. It uses crops growing on marginal land to produce bioenergy. Houses are highly insulated and weather-tight, that makes them energy efficient. Co-generation (the combined production of heat and power) is widely spread.

Diverse transportation options exist. Bicycle is the main way of transportation. People live closer to their jobs and commute by bicycle. Cars in this society get 100 miles per gallon of fuel and are much smaller, less spread and used only for traveling. Telecommunications substitute much of travel: many people work at home or in a special satellite office, connected by electronic lines, similar to the Internet.

Waste reduction and recycling industries replace waste production. Waste reduction is related to the packaging reduction. There is a hierarchy of options to guide material policy: first, to avoid using any nonessential item; second, to directly reuse the product; and third, to recycle the product to form a new product. The waste is used to extract its energy. Last option is the landfill. Beverage containers are replaced with a set...
of standardized containers. Besides recycling of metal, glass, paper there is recycling of nutrients, sewage is used to fertilize. Households compost their organic waste and use it to fertilize as well.

Industry is widespread. Portable factories operate anywhere the resources are. Main sources of materials for industry are recycled goods. Steel mills use old cars. Industry has improved energy efficiency as well.

The photosynthesis remains the main biochemical process to meet the needs of people. Land use patterns abide by basic principles of biological stability, nutrient retention, carbon balance, soil protection, water conservation and preservation of species diversity. Harvest is rarely exceeding sustainable yields. Big efforts to arrest the deserts are implemented. The use of earth biological resources is put on a sound footing.

Rural landscapes are more diverse, with various strains of crops and agricultural technologies. The crops are rotated more extensively. Measures to curb the soil erosion and conserve soil moisture are significant. Pesticide and mineral fertilizer use is greatly reduced. Many farmers grow perennial grasses, similar to native prairies. There are more salt-tolerant and drought-resistant crops.

The rate of deforestation is dramatically slow and comes to a halt. Forests and woodlands are valued for more reasons than today. Rain forest clearing is stopped. There is no over-cutting or degrading of forests for lumber or other wood products. There is a wide network of preserves to protect forests. Paper is recycled, so the demand for pulp is smaller than today. There are many plantings on private farms as a part of agroforestry systems. Biological resources use is more equitable than today. Large land holdings are distributed among poorer majority.
People have new principles for their lives in a sustainable society. More people work in new energy enterprises, in recycling, agriculture and forestry. There are fewer mines, chemical factories, car manufacturers and more bicycle production, alternative fuel producers, solar architects, energy efficiency engineers, wind prospectors, etc. Many people are retrained for a job similar to the old one, but which is environmentally friendly. There are more rural than urban dwellers, which are reducing energy needs for transportation. Human settlements shifted to renewable energy resources.

The increase of gross national product is seen as a failure. The economic and social advance is measured by the sustainability criteria rather than in short-term growth output. Military budgets are a tiny fraction of today's expenditure. Global military spending are cut heavily because the environmental threats are more stringent. UN forces will be in charge of peace keeping. Nations will cooperate in all domains.

In a sustainable society values and individual priorities are transformed. Materialism will not survive. Public have a simpler and less consumptive life style. Shoddy appliances that need frequent repair are eliminated. It is not fashionable to own new clothes or fancy new cars. The amassing of personal and national wealth becomes less of a goal. Material incentives are fading and the tension between poor and reach is eliminated. Sustainability is eliminating ideological differences and is based on democratic principles, such as freedom, respect for human rights, and acceptance of diversity.
6. Conclusions

In the wake of economic and democratic reforms, Moldova faces numerous economic, political and environmental problems. The current economy crisis reflects hard on the society and education system and the level of social activism is low. Environmental problems threaten the health and well-being of the nation and burden the environmental educators with a serious task. Moldovan educators have to overcome the heritage of the communist society, develop new education programs and educate future citizens to become active promoters of developing an environmentally sustainable Moldova.

However, environmental education has its own problems. The education programs’ funding is not adequate; there is a lack of coordination and interaction between educators and the majority of educators involved in environmental education have insufficient psychological and methodological preparation. Teachers lack environmental information and literature. The focus of environmental education programs is on science and the efforts oriented on students’ social involvement in improving local environment are not satisfactory.

This guide can prepare Moldovan teachers to help students to become aware of environmental problems, give them knowledge about these problems, promote environmentally sound values and attitudes, and equip them with skills and motivation to participate in improving environmental quality. The focus of this guide is on developing environmental education programs oriented on problem solving and improvement of the local environmental situation. It provides step-by-step directions: 1) how to start such a program; 2) how to set goals and objectives; 3) what outcomes to focus on; 4) how to
incorporate such a program in a school curriculum; 5) what teaching strategies to use; and 6) how to evaluate the success. The role of moral education is also emphasized as an important part of an education program.

A separate chapter of this guide contains teaching methods and activities that help to illustrate the use of different methods. Through concept map building, surveys, research, debates, discussions and outdoor activities teachers can educate students about environmental problems and help to develop cognitive and practical skills and to become involved in community life. Value clarification activities and controversial issue analysis can help students to strengthen their environmental attitudes and to obtain a better understanding on how environmental issues emerge and can be solved.

Teachers and educators can make use of this guide to develop and improve their environmental education programs. It also can help teachers to apply new teaching methods and strategies and to obtain insight on environmental education process. By combining their personal experiences and experiences of others and incorporating them in class, teachers can significantly affect the future of their students, community and entire country.
7. Bibliography:


Engelson, David (1985). A guide to curriculum planning in environmental education. Wisconsin Department of Public Instruction. Madison, WI.


http://www.moldova.org: The webpage of the Moldovan Embassy in the USA.


