A program for teaching environmental issues in Taiwanese junior high schools

Ruen-Ting Huang

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A PROGRAM FOR TEACHING ENVIRONMENTAL ISSUES IN TAIWANESE JUNIOR HIGH SCHOOLS

A Project
Presented to the
Faculty of
California State University,
San Bernardino

In Partial Fulfillment
of the Requirements for the Degree
Master of Arts
in
Education:
Environmental Education

by
Ruen-Ting Huang

June 2004
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ABSTRACT

This project is designed for junior high school teachers who wish to implicate environmental issues-based education in Taiwan. Through environmental issues, students will acquire an understanding of humans' impacts on the natural environment. This in turn will create future citizenry with positive environmental behaviors. This project addresses the current education at junior high schools and important environmental issues in Taiwan. Additionally, this project presents the module and instructional strategies for teaching controversial environmental issues. The appendix of this project is of an original design for a systematic environmental issues and a curriculum for Taiwan junior high school. The curriculum includes student-centered and teacher-centered activities and could be integrated into related subjects, such as: geography, biology, and society. Lessons include the training of environmental knowledge, issues analyzing skills, research skills, debate practice, negotiation practice, and action project.
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CHAPTER ONE
INTRODUCTION

Few environmental educators would argue the importance of dealing with critical issues as a major component of instruction. Modern life is filled with social issues having environmental dimensions. These issues originate as problems when something or someone is at risk as a result of natural events or human activities. Subsequently, problems become issues when there are controversies about their solutions. Thus, an environmental issue is a socially or ecologically significant problem, somehow related to the environment, about which there are differing human beliefs and values (Ramsey, Hungerford, & Volk, 1989). Thus, by teaching issues of environmental importance, students will acquire an understanding of their impacts on world resources and become responsible consumers. This in turn will create a future citizenry that will make positive choices toward the environment (Howry & Reynolds, 1997).

Relevant issues enhance students’ environmental awareness and the motivation for learning environmental knowledge and skills. Furthermore, by getting involved in a community project, students have an opportunity to
refine their own value system as they listen to what others feel and think about similar issues (Stoner, 1995). However, students in Taiwan don’t know much about local environment issues around them. According to the P. Wu’s research, the self perception of “local” environmentally related knowledge by senior high school students in Taiwan is below other environmental knowledge, such as: ecology, environmental science, national environmental problems, and even the “global” environmental problems (2001, p. 84-86).

It appears to this author that students in Taiwan do not have many sources from which to obtain local environmental information. One of the reasons for this may be that many students have limited chances to observe their local environment because most of their activities after school are indoor. Another reason may be that the main source from which students in Taiwan obtain environmental information is mass media (N. Chang, 2001, p. 43-44; Wang, 1997, p. 57; P. Wu, 2001, p. 56). Most of the environmental issues that mass media report are national and global ones and students ignore their community because they cannot get local information.

The Ministry of Education, Republic of China (Taiwan) required the concept of environmental issues within
education in junior high school with its 2002 educational reform. Thus, every school in Taiwan presently needs to develop the environmental curriculum to include environmental issues education. The Taiwan junior high school educational system does not have proper curriculum to teach about issues. Also, the Ministry of Education has not provided teachers with an environmental issues-based curriculum and teaching models. Thus, teachers in junior high must spend extra time designing proper lesson plans on their own, and only a few teachers have issues training.

This project is of a design for a systematic environmental issues curriculum for junior high students in Taiwan. As a result, teachers in junior high schools who teach environmental issues could use this guide. Teachers might have to modify some details to fit the situation of their local environment and community. Yet, teachers would have a guidebook that can be utilized easily even if they do not have environmental issues education training. The highlights of this project are as follows.

1. First stage: This stage, including lesson one and lesson two, is mainly designed for the seventh grade. Lessons emphasize the environmental knowledge and skills that are needed for local
environmental issues, such as the issue of stray dogs. Students learn environmentally related knowledge, issue analyzing skills, different values and beliefs, and research skills.

2. Second stage: This stage, including lesson three, is mainly designed for the eighth grade. Lessons emphasize student engagement in real environmental projects. Students learn democratic process, deal with different values and beliefs, make decisions, and build confidence in improving in their environment.

3. Third stage: This stage, including lesson four to lesson six, is mainly designed for the ninth grade. Lessons emphasize on the national issues. Students become familiar with major environmental issues in Taiwan, understand that cultural differences would induce different values, and know how to express issues to others.
CHAPTER TWO
LITERATURE REVIEW

The following literature review begins with the definition and goal of environmental education. To implement environmental education, a clear understanding of its definition and goal is necessary. Next, the current environmental education in Taiwan is presented. Teachers who implement environmental education in Taiwan will understand the role of environmental education in junior high school. Subsequent section is the explication of the essentials over environmental issues. To develop students' environmental skills, it is necessary to implicate the issues-based education.

Definition and Goal of Environmental Education

To solve increasing environmental problems arising from population explosion and modern industry after World War Two, environmental education evolved quickly, especially in developed countries. Since the United Nations Conference on the Human Environment in 1972 promoted the concern of the environmental issues, environmental education became an important part of the education. The World Commission on Environment and Development, set up by the United Nations in 1982,
published *Our Common Future* in its 1987 report. In 1992, Earth Summit stated *Agenda 21*, and prompted environmental education as the important course all over the world (Ministry of Education, R.O.C., 2000).

Scientists have brought to our attention urgent and complex problems which are bearing on our very survival: global warming, threats to the Earth’s ozone layer, and deserts consuming agriculture land. In 1987, the United Nations World Commission on Environment and Development published the frequently quoted book *Our Common Future*. The Commission observed (as cited in Engleson & Yockers, 1994, p. 8) that "the environment does not exist as a sphere separate from human actions, ambitions, needs, and attempts to defend it in isolation from human concerns have given the very word 'environment' a connotation of naivety in some political circles." The only solution to this crisis is sustainable development that seeks to meet the needs and aspirations of the present without compromising the ability to meet those of the future.

The field of the environmental education evolves continuously and environmental education experts have stated various definitions of environmental education. One of the definitions quoted frequently was created by William Stapp in 1969:
Environmental education is aimed at producing a citizenry that is knowledgeable concerning the biophysical environment and its associated problems, aware of how to help solve these problems, and motivated to work toward their solution (p. 31). Through the Environmental Quality Education Act, commonly called the Environmental Education Act in 1970, the U.S. Office of Education offered another definition (as cited in Daudi & Heimlich, 1997):

"Environmental education" means the educational process dealing with [man’s] relationship with [his] natural and manmade surroundings, and includes the relationship of population, conservation, transportation, technology, and urban and regional planning to the total human environment.

Since the early 1970s, environmental educators tended to emphasize similar points to those at the Nevada Conference of the International Union for the Conservation of Nature and National Resources in 1970 (as cited in Das, Jangira, & Sinha, 1985, p. 8):

Environmental education is the process of recognizing values and clarifying concepts in order to develop skills and attitudes necessary to understand and appreciate the interrelatedness among man, his
culture and his biophysical surroundings.

Environmental education also entails practice in decision-making and self-formulating of a code of behavior about issues concerning environmental quality.

In 1972, Stockholm Conference on the Human Environment identified why we need environmental education (as cited in Daudi & Heimlich, 1997):

Creating citizenries not merely aware of the crisis of overpopulation, mismanagement of natural resources, pollution, and degradation of the quality of human life, but also able to focus intelligently on the means of coping with them.

The 1977 Tbilisi Conference is known to have clarified the nature of environmental education. This conference defined the basic aim of environmental education in the Tbilisi Declaration (as cited in Daudi & Heimlich, 1997):

... to succeed in making individuals and communities understand the complex nature of the natural and built environments resulting from the interactions of their physical, biological, social, economic, and cultural aspects, and acquire the knowledge, values, attitudes, and practical skills to
participate in a responsible and effective way in anticipating and solving environmental problems, and in the management of the quality of the environment. 

A Guide to Curriculum Planning in Environmental Education described the goal of environmental education:

The goal of environmental education is to help students become environmentally aware, knowledgeable, skilled, dedicated citizens who are committed to work individually and collectively, to defend, improve, and sustain the quality of the environment on behalf of present and future generations of all living things (Engleson & Yockers, 1994, p. 14).

A recent definition was written by Robert B. Seaman in the Encyclopedia of Environmental Issues (Allin, 2000, p. 281).

Environmental education involves structured instruction of environmental topics at all levels of learning. Such programs are designed to inform students about issues associated with natural and built environments and to teach them how to use this knowledge to achieve balanced and sustainable habitats.

From every definition and goal of environmental education, it's easy to find that environmental education
is a multidisciplinary education and involves teachers from different academic fields. In fact, one of the challenges that environmental educators face frequently is how to make meaningful the complex field of environmental problems and issues at the students' individual level (Allin, 2000, p. 281).

Environmental Education at Junior High School in Taiwan

In the past, environmental education in Taiwan did not play an important role in formal education. Environmental knowledge was not integrated systematically but as minor topics in different subjects (T. Chang, n.d.). In 1992, the Taiwan Executive Yuan issued Outlines for Environmental Education (Executive Yuan, R.O.C., 1992). To reach the goal of resource sustainability and preserve healthy environment for present and future generations, these outlines propel environmental education and state the essential to enhance the public to be knowledgeable about environmental problems, to understand and concern relationships between resource and living environment, and further, to be executants to maintain ecological balance and environmental quality. In the view of the public, these outlines propel each level of executive administrations to develop the environmental education
unit to form an integral environmental education system. In the view of formal education, these outlines ask all the college students to take general environmental classes and to develop abilities of primary analysis and evaluation and to enhance environmental protection behavior. High school students should be introduced to the concepts of society, politics, economics, and global ecological system. For elementary and high school students, they should learn about natural environment and historical heritage through direct experience, knowing regional environment, and valuing environment and historical culture.

The term "environmental education" didn’t appear in Taiwan curriculum standards until 2000. To prepare the latest education reform, the Taiwan Ministry of Education issued the Compendium of Elementary and Junior High School Curriculum (Ministry of Education, R.O.C., 2000) as new curriculum standards. Except for the subject areas such as science, language, and society, the Ministry of Education listed “Six Major Issues” to reflect present social situations and to supplement the insufficiency of subjects. The “Six Major Issues” include environment, gender, human rights, information, career development, and home economics, and they are supposed to be integrated into
each subject by teachers. The definition of environmental education in the compendium is similar to the definition stated by International Union for the Conservation of Nature in 1971.

The environmental education curriculum objectives listed in the compendium are: 1) Environmental perception and sensitivity, 2) Environmental concepts and knowledge, 3) Environmental ethics and values, 4) Environmental action skills, 5) Environmental action experiences. Other than the objectives, the Compendium of Elementary and Junior High School Curriculum provides environmental education curriculum guides for elementary and junior high school teachers to follow. An excerpt from the junior high school part is listed (Ministry of Education, R.O.C., 2000) because this project is written for junior high schools.

1. Environmental awareness and sensitivity
   • Through observing and experiencing the nature, students express the beauty of the natural environment and concern about the environment in forms of compositions, art, music, and drama.

2. Environmental concepts and knowledge
• Know domestic and international environmental issues and their effects on human beings’ societies.

• Understand the interaction among economic systems, media, political organizations, and environmental manage behaviors.

• Understand global environmental issues and cultural differences behind them.

3. Environmental values and attitudes

• Know the interdependence and interaction between environment and human beings and cultivate active environmental attitude and environmental moral.

• Develop concern for minority groups and their living environment.

• Cultivate the active thinking about domestic and international environmental issues and participate actively.

• Develop concern for the future generations’ surviving and sustainability.

4. Environmental action skills
• Develop the ability to listen or read others' reports and question rationally when facing environmental issues.

• Develop various arguments objectively and neutrally and take others' corrections humbly.

• Can utilize various media to actively collect domestic and foreign environmental issues and strategies.

• Can utilize scientific methods to inquire into the possible strategies to solve environmental problems.

• Can utilize scientific tools to identify, analyze, and understand the circumstance and the change of the surrounding environment.

5. Environmental action experiences

• Participate in the environmental protection relative activities that are held by community and student association on campus.

• Have the experience in participating in the local and international investigation, research, and problem solving of environmental issues.
• Hold or participate in environmental protection and minority groups concerning activities in school or community.

• Can group with colleagues to learn and design the solutions of environmental issues through democratic processes.

The Ministry of Education executed the Compendium of Elementary and Junior High School Curriculum (Ministry of Education, R.O.C., 2000) which contains environmental issue education for the latest education reform in elementary school (since September 2001) and in junior high school (since September 2002). Yet, even though the Ministry of Education held some environmental issue education seminars for teachers, it's a problem that there is no systematic "Major Issues" training program for both in-service and pre-service teachers. The spirit of the "Major Issues" would be sacrificed if the teachers do not have enough training or do not know how to implement them.

Essentials to Teach Issues in Environmental Education

An engaged, informed citizenry is central to the dream of democracy as most of the modern countries envision. Civic competence requires that students understand how they can engage in civic practice (Lee,
To reach this object, many researchers and educators propose issues-based or issues-orientation education (Chen, 2002; Pedretti, 1999; Ramsey & Hungerford, 1989; Ramsey, et al., 1989; Stoner, 1995). Environmental issues-based education develops students' skills in information gathering, evaluation, critical thinking, resolution, communication, cooperation, and the ability to integrate complex information from science, technology, and society.

An environmental issue is a socially or ecologically significant problem on which human beliefs and values differ (Ramsey & Hungerford, 1989). In other words, most of the environmental issues are science-technology-society (STS) ones. Comparing to the direct instruction with lecture-type class, issues-based education tends to engage students in a real world to make learning relevant (Allin, 2000, p. 281-282). A common series of steps of the issues-based learning are: choose topic, gather information, analyze and evaluate information, group discuss, find a solution, and then take an action. Integrating experiential learning with collaborative activities on environment instills in students a feeling of "I need to know." During the discussion, students will find that they will never gather enough information about the topic. This
feeling in turn enhances students' desire to learn more environmental knowledge. Students also gain insight about cooperative working arrangements, the respect for different values and beliefs, and a strong sense of personal control over issues in their lives (Stoner, 1995, p. 10). Researchers also found that students' environmental attitudes and behaviors will tend to maintain environmental sustainability after they evaluate the benefits and the costs of the environmental problems (Pedretti, 1999). Moreover, through the process of interacting with their surroundings, students will develop a relationship with the land around them, thus learning to care about their communities and further to make them better places to live (Folstad, Heimlich, & Hofmann, 2002).
CHAPTER THREE
TEACHING ENVIRONMENTAL ISSUES IN TAIWAN
JUNIOR HIGH SCHOOL

Design of Project

According to Hung's research on elementary and secondary teachers, "no proper environmental curriculum" is one of the barriers for educators to implement environmental education (as cited in Pan, 2003, p. 14). To improve this situation, this project offers a well-designed environmental curriculum as a reference, which teachers can immediately use in junior high schools. The issues-based lessons have the following objectives:

1. To provide students a chance to practice social skills, critical thinking, and scientific method. Integrating experiential education with classroom learning also will enable students to combine practice and theories together.

2. To reinforce and supplement the first to third environmental education objectives which are listed in the Compendium of Elementary and Junior High School Curriculum: "environmental perception and sensitivity," "environmental concepts and knowledge," and "environmental ethics and values."
These parts are carried out by various subjects especially science and society.

3. To carry out the fourth and fifth environmental education objectives which are listed in the Compendium of Elementary and Junior High School Curriculum, including "environmental action skills" and "environmental action experiences."

It's a problem that these objectives are not regularly included in present junior high school textbooks. Executing these two objectives is the most important focus of this curriculum, because junior high school teachers will be supported in their teaching about issues.

The lesson plans of this project are designed for junior high school and are divided into three stages. To carry out this curriculum, the most difficult part would be insufficient time. Junior high school is of six semesters and there are six "Major Issues" that are needed to be carried out. This implies that in the optimum situation, teachers have only one semester to teach environmental education. Reflecting on this problem, it is suggested that:
1. Integrate the first stage lesson plans “critical thinking and local issues” into the seventh to eighth grade subjects, such as science and society.

2. After the first stage, it is better to take a whole semester to carry out lesson plans in the second stage, “environmental action skills and experiences,” so the students will know how to distinguish and analyze an environmental issue. Moreover, it’s better not to put this stage in the ninth grade. Ninth-grade students have to prepare the entrance exam for entering senior high school and would not have time and energy to engage in a real environmental project.

3. Integrate the third stage lesson plans “national issues and cultural differences” into the eighth to ninth grade subjects, such as science and society.

Differences Between Environmentalists and Environmental Educators

Most environmental educators are also environmentalists on issues of personal concern. Before beginning an environmental curriculum, it is important for educators to understand the differences between being an environmental educator and an environmentalist.
Any citizen who advocates with action that "wrong against our environment must be stopped" is an environmentalist (PCEE, n.d., p. 6). An environmentalist often has some characteristics (PCEE, n.d., p. 6):

4. An expert who researches the environmental events, problems, or issues.
5. Advocate the importance of the nature environment.
6. Advocate a certain solution to the environmental problem or issue, which he/she believes it is the best one through the research.

An environmental educator is one who "uses information and educational processes to help people analyze the differing points of view usually present on a given environmental issue so that they can arrive at their own solution (Bridenbecker & Stoner, 1999, p. ix). An environmental educator should have these characteristics (American Forest Foundation [AFF], 1998, p. 377):

1. Be a developer of environmental skills and information analyst for learners who will participate in environmental decision making.
2. Need to be as "value fair" or "value free" while working as an environmental educator.
3. Get the facts scrupulously, examine and illuminate different vie of points, and "keep from letting their own particular position (as an environmentalist) from mixing with their educator role.

It is not true that the roles of environmental educator and environmentalist are always conflict. In fact, an environmental educator has "the right and the duty to be an environmentalist" (PCEE, n.d., p. 6). As an environmental educator, the dual roles must adhere to the original premise- take a neutral stand in the class and keep from sharing personal position on issue before students explore the topic.

Instructional Strategies of Teaching Controversial Environmental Issues

Conflicts of ideas can make controversial issues. In an environmental educator’s point of view, conflict of ideas can be positive ways of advancing one’s thinking (AFF, 1996, p. 13). Sometimes, it’s uncomfortable for people to discuss controversial issues because the conflict of beliefs and values. Yet, controversy tends to be intellectually stimulating for learners and which provides students the opportunity to increase the ability

To teach environmental issues, educators should focus on the process of clarifying different viewpoints through debates and reflection. During the process of value clarification, students understand that environmental issues are "too complex to have clear-cut 'right' and 'wrong' situations" (AFF, 1996, p. 13). While environmental educators have to be "value fair", teachers still can share their value and belief as being one way to view an issue in an open discussion (Hungerford, Litherland, Peyton, Ramsey, & Volk, 1996). Yet, to prevent to affect the students' opinion and creativity, it is better for teachers not to share their opinions with the class until students make their own environmental decision.

To engage students in learning environmental issues, some instructional strategies should be considered. These include direct instruction, indirect instruction, cooperative learning, encouraging the expression of ideas, and learning from conflict.
Direct Instruction

Direct instruction is "teacher-centered instruction that involves sequenced and structured activities that are clearly goal directed with the intent of transmitting knowledge from the teacher to the student" (Doolittle, 2001, p. 3). The direct instruction strategy is more effective for learning when teachers provide information or develop step-by-step skills (Approaches to instruction, n.d.). This strategy includes methods such as: key concept introduction and vocabulary, lecture, demonstration, reading, didactic questioning and discussion, building charts or lists, and practice and drill ("Approaches to Instruction," n.d.; AFF, 1996, p. 11). Generally speaking, direct instruction methods are efficient teaching methods which are widely planed and used by teachers, particularly in the higher grades.

Indirect Instruction

In contrast to the direct instruction strategy, indirect instruction is mainly student-centered. That is, the educator operates as a facilitator, supporter, and resource person. The teacher "arranges the learning environment, provides opportunity for student involvement, and, when appropriate, provides feedback" ("Approaches to
Instruction," n.d.). This strategy includes methods such as reflective discussion, concept formation, concept attainment, cloze procedure, problem solving, student-directed projects, and guided inquiry ("Approaches to Instruction," n.d.; AFF & CEE, 1996, p. 11). In contrast to the direct instruction, indirect instruction is efficient to develop the students' understanding of the material and ideas, creativity of thinking, and interpersonal skills and abilities. Students often achieve a better understanding of a concept. Yet, indirect instruction has some disadvantages, such as: it is more time consuming, teachers relinquish some control, and outcomes can be unpredictable and less safe ("Approaches to Instruction," n.d.).

Cooperative Learning

Cooperative learning is an instructional method in which students work together in small heterogeneous groups to achieve common goals. With the spirit “everyone participate,” cooperative learning can help motivate students, promote active learning and team work, enhance learning skills of cooperation and communication, and accept and respect individual differences (AFF, 1996, p. 11).
Encouraging the Expression of Ideas

Students should share and examine their thoughts and opinions without pressure of "right" or "wrong". Teachers need to pay attention and respond to the students especially the one who is afraid to voice personal beliefs. If a student can't express an idea with proper words, use questioning strategies to clarify and advance the student’s idea (AFF, 1996, p. 13). After a student expresses an idea, reiterate it slowly or write it on the blackboard, so every student can get the idea.

Learning from Conflict

When a conflict arises, tell students to take time to observe their own group, describe what they observe, and tell them what you observe. After students understand the point of the conflict, engage students in conflict resolution techniques such as reversing roles in arguments or negotiating a way that everyone can accept (AFF, 1996, p. 13). The teacher has to support every student because many people will be uncomfortable with other’s disagreement. Moreover, after the students solve the conflict, encourage students praise another group member’s contribution in conflict process.
The Module of Teaching Environmental Issues

Environmental education is more than a static or monolithic practice; instead, it encourages and promotes diversity and changes in learning styles and practices. The issues-based and problem-based learnings are very similar in strategies but different on topic. Many activity guides, teaching module, as well as frameworks are designed to develop the skills to make a decision about an issue. This issues curriculum is based on three modules: 1) Investigating and Evaluating Environmental Issues and Actions: Skill Development Program (Hungerford, et al., 1996), 2) A Guide to Curriculum Planning in Environmental Education (Engleson & Yockers, 1994), and 3) Taking Action: An Educator’s Guide to Involving Students in Environmental Education (Stoner, 1995). This module is flexible and the teacher does not have to go through all these steps in a class hour. As the class is proceeding, teachers can modify steps to cater to the circumstances. The steps of this issue curriculum module are as follows.

1. Select an topic that students are interested in and is relevant to them
   - Teach and remind students that an environmental issue arises when individuals or
groups hold opposite views on how the problem should be corrected (Engleson & Yockers, 1994, p. 43).

- Ask students to collect their interested environmental issues. They may get ideas from the mass media, parents, friends, books, or their own experiences.
- Encourage students to present ideas in class.
- If students need to practice handling an issue by taking actions, they should select a local issue.

2. Clearly identify and state the environmental issue

- Write down the issue and use proper words.
- List key terms and the process of gathering the information of issues.

3. Collect different opinions and environmental knowledge concerning the issue

- Internet: A) use “search engines” and “subject directions” to search companies to find related websites, such as government agencies, professional organizations, business and enterprises, colleges and universities, and
personal homepages; B) collect the information from the BBS (Bulletin Board System), IRC (Internet Relay Chat), or NetNews.

- Mass media: A) newspapers, B) magazines, C) television programs, D) broadcasts, and E) advertisement.

- Library: A) textbooks, B) general books, C) journals, and D) encyclopedia.

- Interview by telephone or in person, or conduct a mail survey: A) parents, B) neighbors, C) teachers, D) friends, E) experts, and F) the population who are most concern over the issue.

- Acquire firsthand information through field trip.

4. Study relevant environmental knowledge and evaluate the collected information (Bernards, 1991).

- Understanding words in context: If students do not know contextual words, they will not fully understand the sentences they are encountering. Consult a dictionary or encyclopedia if necessary.
• Distinguishing bias from reason: Distinguish between statements based upon emotion (bias) and conclusions based upon a rational consideration of the facts (reason).

• Distinguishing fact from opinion: Distinguish between statements which appear to be factual and those which appear to be based primarily on an individual or a group’s opinion.

• Recognizing deceptive arguments, such as the arguments with a) bandwagon- the idea that “everybody” believes something; b) scare tactics- the threat that if you don’t do/believe something; something terrible will happen; c) strawperson- distorting other’s idea to make one’s own seem stronger; d) personal attack- criticizing an opponent personally instead of debating the ideas; e) testimonial- quoting an authority/celebrity to support one’s view point; f) over deductive reasoning- the statement that since idea A is true, the idea B must be true; g) slanders- to persuade through inflammatory and emotional language instead of reason; or h)
generalizations- using the facts of a certain individual/region to generalize about the public/wide place.

• Evaluating the source of information. The document is more credible if it is a) a report as primary source from eyewitness or people involved; b) collected or analyzed data from experts in the relevant field; or c) written by the authors who have involved with or studied issues for a long time.

5. Critically analyze the issue (Bridenbecker & Stoner, 1999, p. VI 2-3)

• Distinguish different players and positions. Players and positions are how the individuals and groups are involved in an issue, and where they stand on the issue,

• Distinguish different beliefs of the players. A belief is an idea that is held by a player and the player believes the idea is true.

• Distinguish different values of the players. These include aesthetic, ecological, economic, educational, egocentric, environmental, ethic/moral, health and safety, legal,
political, recreational, religious, scientific, social, or technological value.

- Encourage students to think about other points of view through activities, such as simulation, role play, story telling, or debate.

6. List what is known and what further knowledge is needed (Pennsylvania Centers for Environmental Education [PCEE], n.d., p. 17)

- Summarize the information under the heading “what do we know?”

- After summarizing the information, students may find some missing gaps and the need for wider or deeper information for specific concepts. List “what do we need to know?” and search the answer.

7. Search for solutions (PCEE, n.d., p. 11)

- Cite information that was researched on the issue.

- Considering how the vested interests in the issues would like it solved.

- Creating original ideas to solve the issue.
8. Evaluate solutions (PCCEE, n.d., p. 11)

- Evaluate the values and interests each solution carries.
- List the possible outcomes and ecological/cultural impacts from each solution.
- For each solution, consider constraints that might stand in the way of desired outcomes.
- Evaluate if the solution directly relates to the problem in this environmental issue.
- Estimate the sources and the time that would be needed to carry out the solution.
- Try to find "win-win" solution instead of the "win-lose" one.

9. Create an action plan

- Ecomanagement: Any physical action which is taken by an individual/group that improves or maintains some part of the environment (Engleson & Yockers, 1994, p. 48), such as starting 3R’s (recycle, reuse, and reduce).
- Persuasion: "A logical or emotional appeal to motivate other people to modify their values and take positive environmental action"
(Engleson & Yockers, 1994, p. 47). Students can: a) prepare flyers that can be mailed or delivered to others; b) write petitions to obtain written support; c) prepare a display in schools, communities, or local malls; d) prepare and send news release (Bridenbecker & Stoner, 1999, p. VII 5).

- Consumer action (Engleson & Yockers, 1994, p. 47-48): An individual or a group takes economic actions (to support or refuse to buy some products) to motivate a company to take positive environmental actions. These include: a) Direct boycott (consumers bring economic pressure by refusing to buy the products of negative environmental impact in order to decrease, even stop producing); b) Indirect boycott (consumers exert economic pressure by refusing to buy the products, which were made by a company with a bad environmental record); c) Conservation (reducing consumption of a product to conserve the resource); d) Monetary and volunteer support (donate money or do volunteer work for companies that make effort to maintain and enhance environmental quality);
E) Economic patronage (buying certain products that are able to reduce or eliminate negative environmental impacts in early production).

- Political action: This refers to any mode of action that brings "pressure on political or governmental agencies and/or individuals in order to persuade them to take positive environmental action" (Hungerford, et al., 1996). By mail and telephone students persuade the elected official or executive governmental agency to support or against a particular solution to a certain environmental issue.

- Legal action: "An coercive legal/judiciary action taken by an individual and/or organization that is aimed at some aspect of environmental law enforcement or a legal restraint of some environmental behavior perceived as undesirable" (Engleson & Yockers, 1994, p. 48). Yet, students in junior high school are still teenagers and it's not easy for them to have direct experience of legal action.

10. Deciding if action is warranted
- Students have to evaluate the action plans from different viewpoints, make sure they have the abilities to take the action, and decide if the plan should be immediately implemented, delayed, abandoned, or modified (Engleson & Yockers, 1994, p. 48).

- Before the students put the plan into action, teachers, as the adult facilitator, should assess their plan and discreetly think about community concerns and constraints (Stoner, 1995).

11. Assess

- Assessment should include various aspects, such as students' action plan, team spirit, and the degree of their understanding on the issues.

- It is important for students to self-evaluate their findings and make plans to improve performance next time (Stoner, 1995, p. 19).

- Often, the impact of the actions may not be as complete as students expected. However, students can learn a lot during the process even though the result of the action is
incomplete. Moreover, “students must be helped to understand that often the most that can be expected is a partial victory” (Engleson & Yockers, 1994, p. 49).

Important Taiwan Environmental Issues for Teaching in Junior High School

To implement the environmental education in Taiwan, teachers should be familiar with important environmental issues in Taiwan. This section provides four important national environmental issues in 2003 so teachers can use the information to teach environmental issues. The issue “The Request for Prohibiting Trading in Dog Meat and the Slaughter of Pets for a Variety of Purposes” and “The Policy of Limiting the Use of Plastic Bags and Plastic Dining Utensils” are the issues that affect every person; both of them are a good way for student to learn the differences of their beliefs and position. The issues “The Construction of Suao-Hualien Freeway” and “The Request to Open the Pinglin Interchange for Regular Passengers” have been the lead stories for many months; both of them are a good way for student to learn the differences between different regions and cultures.
Animal Protection Law was enacted in 1998 and it prohibits slaughtering pets for a variety of purposes, including eating and use of their furs. The law also defines all dogs and cats as pets. The Legislative Yuan revised the law on December 16, 2003 into a more strictly enforced one. Both trading in dog meat and slaughtering pets for a variety of purposes are illegal. Violators will be fined between USD$ 1476 and USD$ 7381, a sharp hike from the old fine, USD$ 59 to USD$ 295. Andrew Wang, an official from the Council of Agriculture’s Animal Industry Department, said that 54 restaurants with dog trade had closed before the law was enacted in 1998 (Chiu, 2003 November). A recent survey by animal-welfare groups suggests that one-third of strays or abandoned dogs in shelters were sold to restaurants and one-tenth to laboratories. No restaurant in Taiwan sells cats because Taiwanese do not eat cats. The question under the debate usually aims at the dogs.

Why are animal-rights activists advocating revising the law to prohibit trading in dog meat and slaughtering pets? The reasons they claim are: 1) As civilized human beings, we should not allow people eating or trading pets’
meat (Agence France-Press, 2001). 2) Most western countries believe the behavior of eating dog is barbaric, so Taiwan will be degraded for this behavior. 3) When dogs are regarded as a meat source, people slaughter them inhumanly. 4) Most the slaughtered dogs are stray dogs. Due to absence of the routine inspection, people eating these dogs may be at risk of sickness.

People who object to the ban on the trade of dog meats and the slaughter of dogs believe that there is no difference between dogs and other animals that are raised by human beings. These opponents claim: 1) Pigs, chicken, and kangaroos can be the pets just like dogs. On the other hand, a dog is also an animal just like a pig, chicken, or kangaroo. 2) According to traditional medical recipes, eating dog would improve the constitutional infirmity and then prevent symptoms of cold hands and cold feet in the winter. 3) People will slaughter the dogs humanly if the government approbates the factory slaughter for dogs. 4) Dogs will have routine inspection if the government approbates the public to raise dogs for a meat source.

From this event, two issues can be discussed in class: 1) Stray dogs, which often make a mess on the street and scare children, are a serious environmental problem in many communities. Is it a good way to solve
this environmental problem by encouraging the public to capture dogs as a meat source? 2) Do you think dogs should have animal rights more than other animals?

**The Policy of Limiting the Use of Disposal Plastic Bags and Plastic Dining Utensils**

To change consumers' habit of using something disposable and for the sake of Taiwan's sustainable development, in 2002 the Environmental Protection Administration (EPA) introduced a highly controversial policy to limit the use of plastic bags and disposable tableware.

The first stage of the policy was launched on July 1, 2002, in all government-run stores which were banned from providing free plastic shopping bags to customers. Three months later, this ban was imposed at schools, hospitals, government-operated grocery stores and restaurants. According to the EPA, the first stage of the policy led to a drop of 90 percent in plastic bags consumed (Chiu, 2003, January 6).

The second stage was launched on Jan 1, 2003. The ban was extended to department stores, supermarkets, fast-food restaurants, convenience stores and almost every type of retailer, except street vendors. About 76,000 stores in
the nation are estimated to have been affected by the policy (Chiu, 2003, January 1).

EPA has been criticized by the plastics industry since it planned details of the policy in 2002. The plastics industry claims that the policy will eventually affect 50,000 workers. The EPA estimated that the policy would only lead to about 10,000 unemployed workers. In fact, official records pertaining to the plastic industry did not reflect the real situation because many small plastic manufactures may not register with the government (Chiu, 2003, January 1). The way the Taiwanese Cabinet resolved the problem was to spend about NT$1.58 billion (about USD$46.7 million) in 2004 to create 8,400 jobs for laid-off workers in the plastics industry. According to the EPA, only 319 workers had filed an application, and 19 affected workers have been successfully transferred to either recycling or dining-utensil-cleaning industry as of March 1, 2003. Besides creating jobs, the Cabinet had allocated NT$100 million (about USD$ 3 million) to pay part of the accrued interest on outstanding bank loans to companies in the plastics industry (Chiu, 2003, February 25).

Thousands of workers and employers from the plastics industry marched on the streets of Taipei on
January 19, 2003, to demand an immediate halt to the newly implemented environmental policy that limited the use of disposable plastic shopping bags and dining utensils. Protesters said that the image of plastic materials had been tarnished because the EPA did not provide the public with correct scientific information: some of the materials could actually improve the efficiency of incinerators, and polyester (PE), the component of plastic bags, will not produce dioxin during combustion. Executive-General of the Taiwan Plastics Commercial Association Union said that the EPA should take advantage of human resources to recycle plastic materials rather than create unemployment problems (Chiu, 2003, January 20).

Affected workers were disappointed when EPA reiterated that the policy would not be overturned. A demonstration by plastics-industry workers started out as a peaceful sit in on Feb 25, 2003. The protest turned dramatic on Feb. 28, when a female worker threatened to jump from a high building while other demonstrators threw dozens of eggs at the gate of EPA building. The female worker said her monthly salary has been cut down to about NT$ 10,000 (about USD$ 296) due to the implementation of the plastics policy (Chiu, 2003, March).
Meanwhile, some environmental groups said that the EPA should have banned the use of all materials containing polyvinyl chloride (PVC), which produces dioxin during combustion. Amid the controversy, the EPA chief reiterated that the policy is aimed at changing consumers' habits and was not intended to harm the plastics industry. One example often cited by EPA officials to illustrate the disadvantages of using plastic bags was the clogged drainage systems of Taipei City during the floods caused by Typhoon Nari in September 2001 (Chiu, 2003, January 6).

The policy was welcomed by some environmental groups, which believe that less consumption of plastic materials will help improve the environment. Some groups, however, worry that if paper substitutes are readily available, people will still waste resource by using disposable products (Chiu, 2003, January 6). Another opinion against the EPA's stance is that the government should encourage the use of biodegradable plastic, instead of prohibiting the use of all disposal plastic bags.

According to Article 51 the Waste Disposal Act, from Feb. 16, 2003, businesses which fail to abide by the ban would be given a warning notice first and then face fines between NT$60,000 (about US$1,727) to NT$300,000 (about US$6,635) if they continue to ignore the warning a month
later. EPA assists all affected stores by offering subsidies to stores that install tableware-washing facilities and encourage consumers to bring their own utensils. Stronger opposition to the new measures was expected because, for many storeowners, NT$60,000 exceeds their monthly income (Chiu, 2003, February 11). Many retailers complained about unfairness since street vendors in traditional markets are exempted from the policy. For shopping convenience, many chain stores and retailers charge customers for reusable, thick plastic bags.

The Construction of Suao-Hualien Freeway

Due to its often steep and difficult natural terrain, eastern Taiwan has lagged behind the western part of the island in development. The Cabinet approved in 2002 a plan to build the long-talked-about Suao-Hualien Freeway. With a view to boosting economic and tourist development, Suao-Hualien Freeway would be expected to improve traffic conditions, attract investment, and boost economic development in eastern Taiwan. Construction of the 86.5km freeway linking Suao in the northeastern county of Ilan to Hualien County's Chian in eastern Taiwan was scheduled to start in late 2003 and be completed by 2011. This four-lane freeway, which will cost more than NT$60 billion
(US$1.71 billion), would be the first freeway in eastern Taiwan (Central News Agency, 2002, July).

The idea of constructing a freeway in eastern Taiwan was first proposed by the former Chinese Nationalist Party (KMT) government in 1990 as part of a plan to build an island-wide freeway system. The KMT government mapped out the plan for the Suao-Hualien Freeway in January 2000, two months before the Democratic Progressive Party (DPP) won the presidential election. The environmental impact assessment was passed by the Environmental Protection Administration on March 15, 2000, and the DPP administration announced in December 2002 that construction would start in December 2003 (Lu, 2003).

Situated to the east of the Central Mountain Range, the counties of eastern Taiwan, Hualien and Taitung, are dubbed by environmentalists as the "last clean soil on the island" thanks to their low development and tourism-oriented industries (Ko, 2004). Since transportation is a key element for the prosperity of a region, it is not a surprise that many residents in East Taiwan welcome the freeway project. People eagerly await the business opportunities and local development that will come after the completed constructed freeway ("Editorial: Freeway halt deliberately ambiguous," 2003, December). Others,
however, are afraid that the freeway will become a blot on the county's unique landscape, exacerbate the county's traffic problems and cause more trash to be littered around (Ko, 2003). East Taiwan is a place with high biodiversity and spectacular steep landscapes. In general, it preserves much more natural landscapes and habitats than western Taiwan and has a great potential to develop ecotourism-oriented industry. While the steep terrain keeps eastern Taiwan protected from exploitation, it also limits the growth of tourism.

The environmentalists have expressed their hope that the government will reconsider the plan to build the Suao-Hualien Freeway. They question the necessity of the project especially since Hualien already has a harbor, an airport, a recently widened highway and a newly electrified railway. A 10km tunnel, part of the freeway plan, is prone to earthquakes and may be of worrisome construction quality. Besides this, the freeway construction will spoil the spectacular landscape of Hualien's Chinsuei Cliff (Central News Agency, 2003). Furthermore, the construction may hurt the mountain structure and may also cause more mudflows in Hualien. Underground water would have to be drawn to supply the great quantity of cement demanded by construction of the
freeway (D. Wu, 2003), and it will worsen the problem of land-subsidence and the lack of water. Many habitats may be devastated, including the habitats for rare species of snakes and butterflies (Chen, 2003).

"The defects environmental impact assessment for the construction of the Suao-Hualien freeway deserve careful review," the Director-General of newly formed Wild at Heart Legal Defense Association, Taiwan said. "It's terrible because the assessment lacks for comprehensive concerns over diverse issues, including water resources and ecological systems."

Secretary-General of the Green Citizens' Action Alliance said that the project needs to be treated seriously because "it will pass through 13 faults, 10 prehistoric sites, 17 environmentally sensitive areas, and along one of the most earthquake-prone areas in Taiwan."

Lee Yung-jaan, Professor of Chinese Culture University's Department of Architecture and Urban Planning, said the key problem in Hualien was the lack of infrastructure, and "building a freeway bringing more tourists to the rural county will just create more problems to sustainable development in Hualien" (Chiu, 2004).
A local Aboriginal tribe is unhappy about the freeway project because the road will divide their village in two (Chen, 2003). Hualien County Commissioner, who was under immense pressure from local environmentalists, claimed that the freeway may damage the environment and the county needs more time to map out supplementary plans (Ko, 2003).

Bowing to pressure exerted by local environmentalists, on Dec 11, 2003, Premier Yu Shyi-kun announced that the Cabinet will postpone construction of the Suao-Hualien Freeway for three months. Cabinet Spokesman said that it is necessary to give the county time to negotiate with local environmentalists and map out supplementary measures (Ko, 2003). The suspension has been welcomed by academics and environmentalists in eastern Taiwan, but members of the business community in Ilan and Hualien objected to the decision (Lu, 2003).

The Request to Open the Pinglin Interchange for Regular Passenger

Pinglin, a little-known rural township in Taipei County, held an advisory referendum on September 13, 2003, to request that the central government open to the public a proposed service ramp linking Pinglin and the Peiyei (Taipei-Ilan) Freeway, which is under construction. The
turnout rate in this advisory referendum was 64 percent and 98 percent of the voters, about 5,000 Pinglin residents choose the opinion "the service ramp designed for the exclusive use of highway workers and Pinglin residents should be opened to ordinary passengers who travel on the Peiyi Freeway" to boost tourism of the small mountain township ("Taiwan Quick Take: Pinglin holds own plebiscite," 2003).

Pinglin is a catchment area for Feitsui Reservoir, which is the water resource of Taipei County. A ramp will bring heavy traffic, many tourists, and various businesses. Furthermore, these activities will contaminate the protected water-resource area on which more than 8 million people depend for their drinking water.

The Environmental Protection Administration (EPA) refused the request to build an interchange for regular passengers. The head of the EPA said, "Public opinion should not override expert opinion" ("Editorial: Referendum law can't wait", 2003 September 16). He stated, "If all projects were reviewed by a referendum, we can foresee the beginning of a series of environmental catastrophes," and stressed that the freeway project should not be changed because the freeway's environmental impact assessment (EIA) had been passed. The Executive
Yuan Spokesman said that the construction of a Pinglin exit on the National Freeway is not a regional issue, so it cannot be decided via a regional referendum. After Pinglin's advisory referendum, six advisory referendums were held concerning environment-related issues, such as on building an incinerator in Taiwan (Chiu, 2003 September 25).

The EPA chief submitted his resignation on October 1, 2003 after Premier Yu Shyi-kun rejected his proposal that if the environment impact was proved to be of negative influences, the government should cancel referendum on Pinglin affair (Chiu, 2003 October).

From this event, two issues can be discussed in class: 1) Should the government accept demands to open the Pinglin interchange for regular passengers? Is there any alternate solution to this issue? 2) Should the public opinion override expert opinion or vice versa? When teaching this issue, as for the question of EIAs and referendums, teachers should be careful that it is wrong to think of this as an "either or" situation. While in the true spirit of democracy, the people ultimately should make the decision, their decision can only be made based on professional assessments of the all the problems and beliefs ("Editorial: Hau made the right decision," 2003)
October). Besides, students should be informed that the advisory referendum about Pinglin was not legally binding, and it should be regarded more as a way to represent public opinion than as a referendum itself.
Lesson 1:

Introduction of environmental issue

Activity 1: Dog: meat or friend? - Introduce the different points of view of an issue.

Objectives:

1. Students will understand the component of an issue.
2. Students will understand the meaning of different points of view, players, and positions.
3. Students can express their opinions with appropriate reasons.

Subject: Social science, language arts

Skills: Comparing and contrasting, interpreting

Background:

1. Students with non-mainstream thoughts might feel badly and can’t express their opinions with confidence. Therefore, don’t let student discuss issue with each other before they understand there is no “right” or “wrong” of a point of view.

2. Components of an environmental issue.

Problem: an environmental situation that people have to solve.

Issue: an problem that people have different opinions toward because of different points of view.
Player: The individual or group that is involved in an issue.
Position: The opinion that stands on an issue.
Belief: The idea which an individual or a group believes.
Value: The relative worth a player places on something.

This information is stated in chapter three.

3. The information on the issue "Dog: meat or friend" is stated in chapter three.
4. This issue "Dog: meat or friend" can be replaced by another issue without complicated beliefs.

Time: 45 min

Method:

1. Define the word "issue."
2. Ask: Do you know there is a law which forbids people eating or utilizing the fur or meat of dogs and cats?
3. Introduce the law that defines dogs and cats as pets and prohibits their use as economic animals.
4. Ask: Do you think we should have a ban to forbid people eating or utilizing dog meat?
5. Ask: Please write down your answer and reason on a piece of paper anonymously.
6. Gather the papers. Read and record the answers on the blackboard.
7. Explain: Every reason on the blackboard is a different point of view which is an important component of an issue.

8. Analyze the opinions on the blackboard into different positions and beliefs.

9. Explain the definition of position and beliefs.

10. Analyze each reason on the blackboard. Ask: Is it a rational description, a passionate description, or a personal attack?

11. Explain: There is no "right" or "wrong" of a point of view because everyone has own belief.

12. Ask: Do you change your opinion during this class?

13. Ask: Does anyone want to share own opinion and belief?

14. Review the definition of issue, position, and belief.

15. Explain: Environmental issue means an issue that relates to environment.

Assessment/ Homework:

1. According to the worksheet "Dog: meat or friend?" investigate an adult’s opinion on the law which forbids people eating or utilizing the fur or meat of dogs and cats.

2. Write down an environmental issue on our campus, community, county, or nation.
Dog: meat or friend?

Student: _______________

Survey

The age of interviewee: _____

The gender of interviewee: _____

Question for interviewee:

Do you think we should forbid people eating or utilizing the fur or meat of dogs and cats? (position)

Why? (belief)

(Remember to thank the interviewee who answered the question.)

Homework

Analyze the answer of interviewee. Does the answer depend on fact or emotion? Why?

________________________________________________________________________

________________________________________________________________________

Write down an “environmental issue” on our campus (or community, county, nation).

Answer: ________________________________________________________________

________________________________________________________________________
Activity 2: Suao- Hualien Freeway: A hope brings prosperity or a monster brings incurable wound. - Introduce the skills to analyze an issue.

Objectives:
1. Students can identify the “players/positions” and their “beliefs” of an issue.
2. Students can discuss an issue with respecting different point of view.
3. Through group discussion, students can work together to find out a possible solution of an issue.

Subject: Social science, geography, biology, language arts

Skills: Group discussion, analyze, comparing and contrasting, interpreting

Materials: 10 pens each color (green, yellow, brown, red).

Background:
1. The information of the issue “Suao-Hualien Freeway” is stated in chapter three.
2. This issue “Suao-Hualien Freeway” can be replaced by any issue that interests students.
3. All the values can be simplified into three categories: society, economics, and ecology. A point of view on an issue might be generated from more than two values.
4. The solution of this dilemma might: a) strengthen the structure of the construction of freeway; b) promote
flight travel; c) promote railway travel; and d) promote sea travel.

**Time:** 45min

**Method:**

1. **Ask:** Do you remember what are the term “issue,” “player,” “position,” and “belief” mean?
2. **Write** the definition of each term on blackboard.
3. **Divide** students into groups of four students.
4. **Hand out** the story “Suao-Hualien Freeway” in chapter three.
5. **Give** students time to read the story.
6. **Show** the students a Taiwan map and ask them to point the line that “Suao-Hualien Freeway” will be.
7. **Encourage** students to ask questions to understand the story.
8. **Give** each group four color pens: green, yellow, brown, and red.
9. **Ask** students to underline the words with the rules:
   - **Green**- The positions and players who “agree” to develop Suao-Hualien Freeway.
   - **Yellow**- The reasons and beliefs to “develop” Suao-Hualien Freeway.
   - **Brown**- The positions and players who “disagree” to develop Suao-Hualien Freeway.
Red- The reasons and beliefs “not” to develop Suao-Hualien Freeway.

10. Ask students to provide players/positions and the reasons/beliefs. Record the answers on the blackboard.

11. Ask: Have you been to Hualien County? What impressed you the most? Can you describe the geography, biology, or culture in Hualien?

12. Ask: Why does the geologist think that it’s not proper to develop a freeway through many faults?

13. Ask: Why does the environmentalist think that groundwater would be a problem when developing this freeway?

14. Ask: Read each belief on the blackboard. Please figure out the values that are contained in each belief. The values of an issue include aesthetic, ecological, economic, educational, environmental, moral, ethnocentric, safety, legal, political, recreational, religious, etc. If it’s difficult to be identified, select one of the simplified categories: economics, society, or ecology.

15. Ask students to share their own positions and reasons, especially the reasons that are different from the reasons on the blackboard.
16. Ask: Can you find a solution that will satisfy most of the players on the blackboard? Please discuss with each other. Ask teacher if you need any information.

17. Ask each group to share solutions.
Method:

Part A.

1. Divide students into groups of four students.
2. Guide the class to look around the campus or community.
3. General introduce characteristics of plants and animals.
4. Assign each group member the task: each group has 2 observers, 1 recorder, and 1 artist.
5. Ask: How can you measure the perimeter of a tree?
6. After the class looks around the school campus (community), ask every group to choose a plant to fill out the questions of worksheet "Who are you, green guy?"

Part B.

1. Invite the librarian to introduce the library on campus.
2. Ask each group to work together to get the information on their plant from field guide.
3. Ask each group to complete the worksheet.
Who are you, green guy?

Group members: ______________________________________________________

**Plant's Name:** ____________________

**Distribution:** ____________________

**Flower season:** ________________

**Fruit season:** ________________

**Origin Country:** ________________

What's the plant's shape? Use pencil to draw the shadow-cutting.

How tall is? ___________ (Remember to fill in the unit.)

Stem perimeter? ___________ ______________

Texture of the stem (bark)? ________________
Observe its leaf, flower, and fruit. Use a pencil to sketch them.

Circle or fill out the answer.

1. This green guy is with NEEDLES, BROAD leaves.
2. The texture of the leaf: HAIRY, SMOOTH, THICK, WAXY, ROUGH, other
   
3. If it's with broad leaves,
   The vein-type is PARALLED vein (can be torn in threads easily),
   RETICULATE vein.
   If the vein-type is reticulate vein,
   • Leaf tip: TAPERED, ROUNDED, other
   • Leaf base: HEART SHAPED, ROUNDED, other
   • Leaf margin: SERRATED, LOBED, other
4. The length of the leaf: 
5. The width of the leaf: 
6. Other characteristics:  

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Method:

• Warm Up

Tell students that a group of aliens from Andromeda Galaxy has moved to Earth. Ask them what kind of effect this might have on human beings. Have them create a quick sketch and explain the reasons. (Note: The imaginary relationship between aliens from outer space and human beings might not the most properly metaphor between invasive species and native species. It’s still a topic that can attract students to participate discussion in activity.)

• The Activity

1. Divide students into groups of three; give students the worksheet “Alliance—Invasive Species.”

2. Ask students to imagine the interaction between outer space aliens and human beings. Direct effects mean the direct interaction such as hunting, having a parasite, or helping each other. Indirect effects mean the indirect interaction such as taking the land or adding chemical materials into water. After explaining and giving examples to students, ask them discuss with each other and write down the answers.

3. After 10 minutes, ask for students’ answers and write them on the black board.
4. According to the answers, explain that animals and plants also have various weapons to attack enemies, armors to protect themselves, and tools to change the environment. When a new organism joins the ecosystem, it would affect other native species and the environment. The disturbed ecosystem would rebalance and some of the species might be extinct.

5. Introduce some common invasive species in Taiwan, such as Brazil Turtles (巴西龜), Amazonian Snails (福壽螺), 琵琶屬魚 (Hypostomus spp.).

6. Have students discuss the way that invasive species arrive and spread.

7. Have students summarize the problems caused by invasive species.

8. Explain the reason that the naval office quarantines imported commodities.

9. Ask: Show exotic species receive the same protection as native species? Should exotic species be considered the invasive species that should be eliminated from our ecology? Is there a moral problem in eliminating an exotic species?

10. Have students share their opinions and their reasons with class.
Assessment:

1. Ask students: Is it a good way to increase biodiversity by releasing pets outdoors? Why or why not?
2. Ask students: Why can’t we carry fresh fruits from foreign countries?

Resources:

Exotic freshwater fishes
(http://fishdb.sinica.edu.tw/~fishdmp/fhNormal/page02-c3/intro.htm)
**Alliance— Exotic Species**

Name: __________, __________, __________  Date: __________

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<th>Direct Effects</th>
<th>Native species (simulation: human beings)</th>
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<td>Exotic species (simulation: aliens)</td>
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<th>Indirect Effects</th>
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<td>population decreasing</td>
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Activity 3: Field release - Liberate and live? Or liberate and die?

Objectives:

1. Students will learn the skill of gathering information from the internet.
2. Students will understand the reason that people do field release.
3. Students can analyze the issue of field release and work together to find out solutions.
4. Students can write down their own opinion to persuade people to accept the solution of the issue.

Subjects: Social science, language arts, biology

Skills: Comparing and contrasting, group discussing, interpreting, information gathering

Background:

1. Field release in far eastern countries has its origin from the common religion concept that people will be blessed by saving natural lives.
2. One problem of the field release in Taiwan is that people "buy" the animal for field release and it just stimulates the business to capture more.
3. The other problem of the field release is that people don't know where the animals were captured from and often don't liberate the animals in their own habitat.
The animals which are released might die or become invasive species.

Time: Two 45-min classes

Method:

Part A.

1. Ask: Do you have field release experiences? Have you ever seen a poster or advertisement of field release? Do you know any field release story to share with the class?

2. Introduce the folk belief that field release is a kind of well-doing.

3. Explain: Before you really understand a social phenomenon, it is important to gather enough information. Ask students to remember the methods which were used to gather information (see the activity 1-1, 2-1A, and 2-1B).

4. Explain: One of the effective ways to know others' opinions and beliefs is to use the search engine on the internet.

5. Introduce the internet such as World Wide Web (WWW), website, search engine, web news, etc.

6. Write down several searching directions on the blackboard: a) What are the reasons to support field release? b) What are the reasons to against field
release?  c) Who holds or promotes field release activities?  d) What kinds of animals are released in field release activities?  e) The photographs of field release activities.

7. Divide students into five groups. Assign each group a group leader. Have each group choose a searching direction.

8. Ask students to record the search engine and search terms they use. Students have 20 minutes to do the search.

9. Ask every group vote to select 1 to 2 best web pages of their direction. Write the websites and search terms on the blackboard.

10. Ask students select one answer to each question and type it into an electrical document. Save the file and print it out.

**Part B.**

1. Ask students to share their opinions and reasons toward field release in Taiwan.

2. Have students discuss and find solutions to the field release issue.

3. Ask students to write a letter with reason of fact and emotion to persuade others to accept the solution. They can choose a) contribute to a newspaper or press, b)
write an E-mail to the groups who often hold the field release activities, or c) post the composition on the BBS or Discussion Board on WWW.

Resource:

1. An initial research of field release culture in TaiChung City. (http://ccbs.ntu.edu.tw/FULLTEXT/JR-AN/an018_05.htm)

Lesson 3 Environmental responsibility

Activity 1: Why should we preserve mother Earth? - Generally introduce environmental ethics.

Objectives:
1. Students will understand different point of view that why human beings should conserve the environment.
2. Students will understand the definition of environmental ethics.
3. Students will figure out their own reasons to conserve the environment.
4. Students will have the belief to take environmental responsibility.

Subjects: Language art, society

Skills: Discussion, comparison, decision making

Background:
1. Environmental ethic is the ethical responsibilities humans have for the natural world.
2. There are two main perspectives to conserve the environment: a) Human-centered philosophy (anthropocentrism): Environment is based on the practical value of the natural world for meeting human needs; b) Eco-centered philosophy (ecocentrism): Natural world, including all life forms and nonbiotic
components, has intrinsic value. Human being is a member of nature world and ought to respect for the mother Earth.

3. Based on the different perspectives, there are two main reasons for human beings to conserve the natural world: a) Human-centered philosophy (anthropocentrism): We conserve environment through effective environmental management to maintain the environmental values for present and future generations; b) Eco-centered philosophy (ecocentrism): Humans entail not only privileges but responsibilities for the mother Earth. We preserve the natural world because we don’t have the right to destroy natural environment.

4. There are many proverbs relative environmental conservation. For example:

孔子：斧斤以時入山林，則林木不欲勝用也 (Confucius: Log only in appropriate seasons, so timbers will be inexhaustible for use.)

**Time:** 30 min

**Method:**

1. Ask: Do you know any proverb or fable which tells us how to conserve the environment or manage the natural resource?
2. Explain: Environment conservation is not a new concept. It has existed and has been spread by wisdoms for thousands years.

3. Explain: Just like we have ethics between individual and individual, or individual and society, we also have the ethics between us and environment; we called this ethic "environmental ethics."

4. Explain: Environmental ethics is the ethical responsibilities humans have for the natural world.

5. Ask: Should we preserve the environment? Why?

6. Explain: If you don't know why you preserve the environment, you might never want to take the environmental responsibility.

7. Record students' answer on the blackboard.

8. Explain different point of view that makes people decide to reserve the environment.

9. Ask: Do you think we should preserve the Nature for ourselves or nature itself.

10. Explain the human-centered philosophy and eco-centered philosophy.

11. Ask: If we find a planet better than earth, would you agree to move to another planet and extremely exploit the earth?
12. Explain: There is no right or wrong of the philosophies but people often conflict because they have different philosophies which cause people have different ways to solve environmental problems and issues.

Activity 2: Take the environmental responsibility. - Take action.

Objectives:

1. Through the student-center curriculum, students will have direct experience of decision making, information gathering, information analyzing, democratic processes, communication skills practicing, negotiation, project executing, and environment protection.

2. Through the project, students can integrate knowledge of different subjects and practice them in the real world.

3. Through the project, students can make decision and take environmental responsibility reasonably.

4. Through the project, students will get the confidence to express their opinions and understand they can do something to make things better.

Subjects: Language art, society, fine art, science, geography

Skills: Discussion, comparison, decision making, information gathering, information analyzing, democratic processes, communication skills, and negotiation processes.

Background:
1. The steps to take action of environmental issue are listed in chapter three. If it’s too difficult to execute an environmental issue action project, exchange it with an environmental problem project.

2. The actions for environmental issue might be: a) Indirect actions: boycott, persuasion, news release and contribution, and e-mail writing. Indirect actions can be executed both individually and group and are easier for class if the students can’t negotiate to a consensus of position. b) Direct actions: make some changes to environment, such as trash cleaning, resource recycling, native plants plating, and “green campus” designing. The action project with direct action is better to be a local one.

3. During the action project, it’s necessary to let students have chance to regroup and reassign task every few steps.

**Time:** Fifteen 45-min classes
Lesson 4: Energy issues in Taiwan

Activity 1: Who lights up my house? - Electric source in Taiwan

Objectives:

1. Students will know main methods of electricity generation in Taiwan.
2. Students will know the advantages and disadvantages of different electricity generation methods.

Subject: Social science, language arts, natural science

Skills: Information gathering, comparing and contrasting

Background:

1. Main methods of electricity generation in Taiwan are coal, hydropower, and nuclear power.
2. To compare the advantages and disadvantage of each electricity generation method, there are several points:
   a) Cost of the fuel, electricity factory, maintenance, and operation; b) Risk of fuel transportation and electricity generator operation; c) The cost to treat the chemical and noisy pollutants from mining processes, machine components manufacturing processes, operating processes, and fuel waste; d) Stability of the electricity generation; c) Storage of the fuel if there is a war blocking the transportation.

Time: 45 min
Method:

1. Introduce main methods of electricity generation in Taiwan.

2. Give a general introduction of the coal power: Coal power generates more electricity than hydropower and nuclear power. The process to burn coal would emit carbon dioxide, the gas that will induce green house effect, and sulfur dioxide, the gas that causes acid rain. Coal mine often with sulfate which acidulate runoff and underground water when raining.

3. Give a general introduction of the hydropower: Most of the hydropower plants work with the development of dams or reservoirs, which change the environment and affect plants and animals in stream ecology.

4. Give a general introduction of the nuclear power: There are three nuclear plants in Taiwan but the public often doubt that if it’s safe to build so many nuclear plants since there are so many faults and earthquakes. People are afraid of uranium’s radioactivity, invisible light that can cause mutation, and don’t want the nuclear plant built in the neighborhood. There is no place for long-term radioactive waste storage yet in Taiwan and it’s hard to estimate the cost of long-term radioactive waste storage in the future.
5. Write "coal power," "hydropower," "nuclear power," "wind power," and "solar power" on the blackboard.

6. Divide students into six groups. Explain there will be a competition of information gathering.

7. Ask students to use the Internet to find out the advantages and disadvantages of each electricity generation method. Each student who raises his/her hand and speaks out one advantages or disadvantages of each electricity generation method can get a bonus for the group.

8. Record what the students find on the blackboard.

9. Calculate and announce cumulative total points of each group.

10. Guide the students to read the record on the blackboard.

Activity 2: What can we do? - Electric insufficient problems and solvents

Objectives:

1. Students will know how they can save energy.

2. Students will understand the general concepts that industry save the energy.

Subject: Social science, language art

Skills: Analyzing, information gathering
Background:

1. It’s a trend of industries to have waste heat recovery and cogeneration. Waste heat can decrease the cost of heating of water, greenhouses, and fish farms.

2. Many industrial processes need large energy inputs, such as: smelting of metals (particularly aluminum) and the refining of chemicals and fuels. Recycling will save basic resources such as aluminum and decrease the energy consumed. Another method to decrease energy consumption is to encourage the industry to invest newer and less energy-intensive technology.

Time: 45 min

Method:

1. Ask: To conserve energy, what can we do?

2. Explain the concept of natural light, energy-efficient appliances, and energy-efficient light bulb.

3. Explain the concept of energy conservation in industry and agriculture.

4. Decide which electricity factory to visit for next activity.

5. Watch the guiding video of the electricity factory which is published by Taiwan Power Company.

6. Remind the students about the disadvantages of electricity generation we discussed last class.
7. Ask: Did the video provide the solvent to improve them?
8. Ask: Integrate what you know and write down what you want to know. Find answers from the field trip next class.

**Activity 3: Power power - Field trip to electricity factory**

**Objectives:**
1. Students will have the experience of visiting a real electricity factory.
2. Students can ask the professional staff questions if they can't find the answers themselves.

**Subject:** Social science, language arts, natural science

**Skills:** Interpreting, analyzing

**Background:** Ask electricity factory to provide educational support when making an appointment.
Lesson 5: To be or not to be

- Debate the issue of plastic policy in Taiwan.

Objectives:
1. Students will understand the difficulty to decide an environmental policy.
2. Students will know how to convince others and defend their own position efficiently.
3. Students will know the importance of group working.

Subject: Social science, language arts, natural science

Skills: Group discussing, analyzing, comparing and contrasting, interpreting, information gathering

Background:
1. In this lesson, debate is a chance for students to practice the way to convince others and defend their own position efficiently. Even though there are various debate rules, it's better for teachers to modify the sequence and the time of the debate rule until they fit the students' level. The sequence of the debate I suggest is listed:

   Ballot for the precedence (Assume the pro side has the precedence)

   Open comments by pro
Open comments by con
First cross-examination from pro
First cross-examination from con
First rebuttal from con
First rebuttal from pro
Second cross-examination from pro
Second cross-examination from con
Second rebuttal from con
Second rebuttal from pro
Closing arguments by pro
Closing arguments by con
Evaluation and comments

2. In this lesson, each part takes 45 minutes to go through.

**Time:** Five 45-min classes

**Method:**

**Part A.**

1. Ask: Have you ever seen the debate on television? It’s common especially during election.

2. Explain the spirit and rules of debate and how the debate will proceed.

3. Give the students “The Policy of Limiting the Use of Plastic Bags and Dining Utensils” in chapter three as background information.
4. After the students read the information, ask students to choose their side, "the policy should be continue" or "the policy should be postponed."

5. Ask each side to select a leader and assign the job for each subgroup:
   Draft open comments and record the opposite side speech: 5 students
   Draft cross-examination and rebuttal: 8 students
   Draft closing argument: 4 students

6. Ask: How you get more information about this policy? What "key word" can be used to find the information more easily? What kind of information do you need? In which direction would you want to do the research?

Part B.

1. Let students gather information from library, internet, and other teachers.

Part C.

1. Let students read and exchange their information.
2. Ask each subgroup to make their drafts: draft an open comment, cross-examinations, and a closing argument.
3. Remind the students that the cross-examination and the closing argument should be modified during the debate for stronger attack or defense.
4. Ask each group leader to invite a teacher or parent to evaluate the debate and give each group comments.

Part D.

1. Remind the students that they can support their group member by writing notes or passing the information.
2. Ballot for the precedence (Assume the pro side has the precedence)
   
   Open comments by pro (5 min)
   Open comments by con (5 min)
   Break (5 min)
   First cross-examination from pro (2 min)
   First cross-examination from con (2 min)
   Break (12 min)
   First rebuttal from con (5 min)
   First rebuttal from pro (5 min)

3. Provide students some suggestions to improve their skills.

Part E.

1. Second cross-examination from pro (2 min)
   Second cross-examination from con (2 min)
   Break (12 min)
   Second rebuttal from con (5 min)
   Second rebuttal from pro (5 min)
   Break (3 min)
Closing arguments by pro (5 min)
Closing arguments by con (5 min)

2. Ask the guests to grade the stage presence, content, logic, and cooperation of each group.
Lesson 6: Muddy and muddier - Wetland

Activity 1: The place between land and water - Visit the county library

Objectives:

1. Students will know the various aspects of wetland.
2. Students will know the human and physical geography of the local wetland.
3. Students will know the functions of wetlands for human beings and ecology system.

Subjects: Biology, geography

Skills: Information gathering

Background:

1. There are two main categories of wetlands: Salt marsh and freshwater marsh.
2. Salt marsh: Salt marshes are woody or grassy salty wetland habitats that include coast wetlands or estuary wetlands.

Benefits to wildlife: The energy input of salt marsh includes organic detritus from upstream and solar energy. There is much detritus from upstream, especially in estuary wetlands, which cause high capacity of salt marshes and then provide the nutrition for fish, crabs,
shellfish, sea worms, migratory birds, and larger animals.

Difficulties to wildlife: The alternative effect of pulsing action of tide and the fluctuation of the river cause the unstable salinity, humidity, sun blasted degree, and temperature for salt marshes.

Benefits to human beings: Salt marshes are often exploited to cultivate saltwater fish and shellfish. The vegetation on unexploited salt marshes can prevent coast erosion caused by tide and wind. As a buffer of land and ocean, salt marshes can filter out the organic detritus and pollutants from the rivers and runoff to maintain the clean of coast.

3. Freshwater marsh: Freshwater marshes are woody or grassy freshwater wetland habitats.

Benefits to livings: A water source for terrestrial species and habitat of semi-aquatic and aquatic species. Almost every terrestrial species can utilize freshwater marsh for their habitat, water, or food.

Difficulties to livings: freshwater marshes are often parched in the dry season and aquatic animals
have to migrate or be in dormancy during the draught.

Benefits to human beings: freshwater marshes are often exploited as paddy field. Unexploited freshwater marsh is the place to supplement underground water.

**Time:** Two 45-min classes

**Method:**

7. Divide students into groups of four students.
8. Guide the class to visit the city/county library.
9. Ask students to consult the books, journals, and internet in the public library and then fill out the worksheet.
The place between land and water

Group members: ____________________________ Date: _____

Salt marsh: Woody or grassy salty wetland habitats include coast wetland or estuary wetland.
The wildlife in salt marsh include plants
_________________________________________________________________________________
and animals
_________________________________________________________________________________

Freshwater marsh: Woody or grassy freshwater wetland habitats.
The wildlife in freshwater marsh include plants ____________________________
and animals ______________________________________________________________________

How wetlands benefit wildlife and human beings?
________________________________________________________________________________
________________________________________________________________________________

The nearest wetland is _______________________ and it’s a
SALT/FRESHWATER marsh (Circle the correct one).

Is the nearest wetland exploited? How is it exploited?
________________________________________________________________________________
________________________________________________________________________________

Is there an issue to exploit this wetland? What the issue is? Please describe.
________________________________________________________________________________
________________________________________________________________________________
Activity 2: Stand between land and water - Field trip to local wetland

Objectives: Students can observe the wetland directly to know the human and physical geography of the local wetland.

Subjects: Biology, geography

Skills: Information gathering, observing

Background:

1. If it’s a reserved wetland with educational purpose, ask the educational support and get the map of wetland from the concerned authorities.

2. If it’s not a reserved wetland, contact with the local government to check if it’s safe and if there is a landowner before exploring the place.

3. Ask students to wear rain boots, hats, and easy-cleaned clothes.

4. Hand on small shovels, buckets, and telescopes if they are available.
Stand between land and water

Group Members: __________________________________________

Date: __________ Weather: _________ Temperature: ________

The name of the wetland is ________________ and which is located in ____________.

It’s a SALT/FRESHWATER marsh WITH/WITHOUT a river passing through (Circle the correct one).

The evidence of our trip (photograph)
List one (or more) wildlife. If you don’t know the name, make a sketch.

Animal in/on the water:

Animal on the ground:

Animal under the ground:

Marsh Plants:

Is the wetland exploited? How is it exploited? Please describe.

________________________________________________________________________

________________________________________________________________________

Others stuffs which are worthy to be recorded (such as color and the texture of the ground, the color of the water, or the trash of the wetland).

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
Activity 3: If I am the boss - Develop a management plan

Objectives:

1. Students will create a management plan for the wetland they visited.
2. Students will experience the analysis and decision making that goes into wetland.

Subject: Social science, natural science

Skills: Identifying main ideas, comparing and contrasting, analyzing

Background:

1. The management plan can be diverse. Even we wish students consider the costs, benefits, and environmental impacts, it's the students' choice if they decide not to do any exploitation to prevent the visitors' disturbance or decide to exploit all the wetland for rice paddy.

2. The costs might from paving the path, designing the activities, hiring the staff, cleaning the trash and pollutant, advertising, developing the public facilities, and other actions to decrease environmental impacts.

3. The benefits might from visitors, restaurants and gift shops, souvenirs, summer camp, and donation.
4. The environmental impacts might include habitat fragmentation caused by paved path, litters and noise caused by visitors, air pollution and oil leakage from cars, underground water supplement decreasing caused by road and parking lot, and threaten wildlife because the environmental change.

**Time:** Two 45-min classes

**Method:**

1. *Ask:* Remember the wetland we visited? As your observation, what factor do you think that affects the environment?

2. *Ask:* What factor should a manager consider when developing a management plan?

3. *Explain the factors listed in the “Background.”*

4. *Divide students into groups of six. Give each group a guiding map (see background in activity 2).*

5. *Ask students to develop a management plan by drawing a designed map and mark out different regions.*

6. *Explain: No matter you tend toward anthropocentrism or ecocentrism, there is no right or wrong*

7. *Ask students to write down explaining sentences of the factories in three categories: costs, benefits, and environmental impacts.*
8. Let each group put their management plan on their table. Ask students to look other groups' work and compare to each other.

9. Ask: Which one is the best plan for our recreation? Which one is the best plan for making money? Which one is the best plan to reserve wildlife and natural ecology? Which one is the best one to consider both wildlife and human beings?
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