

Philippines
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1. Community-Based Solid Waste Education

Background: The land area of the Dilliman Campus of the University of the Philippines is 500 hectares. In addition to the academic buildings and college grounds, it has several residential areas for the families of staff and faculty. Students are housed in large dormitories.

As in all other communities, a major problem in the university campus is solid waste disposal. The University's dumpsite is at the boundary of its Arboretum. There are five open dump trucks doing the garbage round up, collecting 80 to 100 cu m of mixed waste per day. The garbage collected is currently dumped openly and burned. There are several squatter families living near or within the dumpsite; they are mostly engaged in scavenging activities. Some junk dealers come once a week to buy recyclable waste materials from the scavengers.

The garbage situation in the campus is far from satisfactory. It was felt that there was a need to set up a model community education program on solid waste management for the university campus.

Role of Environmental Education: Environmental education is important to make people aware of environmental problems, to make them more knowledgeable about them, to provide them with skills and motivation to resolve those problems and to prevent new ones from occurring. As part of a community education program on solid waste management, environmental education is expected to develop the knowledge, skills and attitudes of the members of the community towards proper handling of wastes.

The development of a community-based educational program on solid waste management should consider the following significant aspects (Stapp, 1976):

- The program should increase awareness of and knowledge about solid waste management, impart positive attitudes, and motivate action about it.
- The program should provide continuity and progression, such that understandings developed in one level should be elaborated on and expanded in the subsequent levels.

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- The program should be linked with community realities, and cater to community solid waste management problems as best as it could do so.
- The program should provide a comprehensive in-service training program for program implementers. Such training should be directed at helping implementers increase their understandings, interest and skills in solid waste management.
- The program should be evaluated periodically.

The Project: The project leader and principal researcher was Elenida del Rosario Basug of the Environmental Management Bureau (EMB) of the Philippine government's Department of Environment and Natural Resources (DENR). The study sought to evolve a developmental model of a community education program on solid waste management for a university community. It specifically investigated (1) the waste management scheme at selected sites of the campus prior to the study's educational interventions, (2) the community response to the suggested waste segregation strategies, and (3) insights from the study that can be used to develop a model of an educational program on community solid waste management for the chosen university.

The study sample consisted of residents of all ages – children, teenagers, househelpers, mothers, fathers and the elderly – at five selected sites inside the university campus. In this paper, they are referred to simply as Sites A, B, C, D and E.

Several instruments were used in the study; a survey questionnaire, seminar tests, an attitude scale and an interview guide.

The educational interventions employed included (a) holding of community meetings and seminars; (b) showing of educational videos and transparencies; (c) distribution of brochures, handouts and fliers to the residents; and (d) putting up streamers, billboards, labels, stickers and neon signboards. The significant events of the study were photo-documented.

Key Players, Activities and Funding Scheme: The project operation was made possible through a working arrangement with a local non-governmental organization that goes by the acronym AKKAP, with some assistance from the EMB Presidential Task Force on waste management, in coordination with the Local Government Unit (or *Barangay*) and the University Administration.

Coordination with the project sites was done with the help of AKKAP and the respective area leaders through community letters and house-to-house visits.

An initial survey questionnaire was administered in order to determine basic information on the households (such as number of occupants, pets, if any, their current waste disposal practices, *etc.*) to characterize the respondents. Observations were also recorded and analyzed.

An attitude scale was administered to determine the respondents' attitudes towards garbage and solid waste management.

Evaluation sheets were periodically administered in order to elicit from the respondents factors that must be considered in developing a model of an educational program on community solid waste management.

Evaluation of the data was primarily concerned with the relative attainment of the following subgoals of education on solid waste management.

- *Cognitive*: helping the participants acquire basic understanding of solid waste management,
- *Affective*: helping the participants acquire strong feelings fundamental to developing a concern for solid waste management and a motivation to participate in activities for improving the quality of the environment,
- *Psychomotor skill*: helping the participants develop the skills for proper solid waste management.

Accomplishments: The waste management scheme at the residential areas of the University prior to the study's educational interventions was found to be generally limited to mixed waste collection and disposal activities. Waste segregation attempts were not effective since all collected garbage – biodegradables and nonbiodegradables alike – ended in the same garbage truck anyway. It was only when the AKKAP Solid Waste Management Project started biodegradable wastes collection in 1998, which was later picked up by the trailer truck of the University's Campus Management Office for the Monday-Wednesday-Friday schedule, did residents of the selected sites feel less frustrated about the waste segregation effort.

Three waste segregation strategies were proposed by the project for the selected sites and were accepted by residents during separate community meetings at the sites. The residents generally responded favorably to the respective strategies tried out for each: (a) separate collection schedules of biodegradable and nonbiodegradable wastes for Site A and Site D; (b) separate triple bins/containers for respective types of wastes - biodegradables, recyclables and disposables – for Site B and Site E; and (c) proactive drop-in scheme (meaning, already segregated wastes) with a waste segregation center at Site C.

The center in Site C has a composting area, a recycling section and a bin for recyclable wastes, maintained by two eco-aides of the *Barangay*. Participating residents, old and young alike, come with their segregated wastes in the morning of Monday to Saturday, willing to pay PhP1.00 for the processing of every kilo of biodegradable wastes. A garbage truck collects disposable garbage from the center once a week. Some residents do not participate in the drop-in scheme, and instead rely on garbage trucks that occasionally pass by or drop their biodegradable wastes in a transfer station nearby. Majority of the residents, however, have expressed acceptability of the drop-in scheme. Waste recovery is observed to be high, and the wastes are generally segregated because of strict monitoring by the *Barangay* eco-aides; they do not accept mixed wastes. Since the biodegradable wastes are immediately composted in the nearby composting area, there is no problem with foul smell.

The implication is that any of the three waste segregation schemes – *i.e.*, separate collection schemes for biodegradable and non-biodegradable wastes, separate bins for respective types of wastes, and proactive drop-in scheme (of already segregated wastes) at a segregation center – may be applied for solid waste management in a university community setting, as long as the residents are properly trained in waste sorting.

Educational materials used in the project include print materials (posters, primers, fliers, brochures, handouts, stickers, survey instruments, memoranda), outdoor signs (streamers, billboards, neon signboards, labels, *etc.*), educational videos, community seminars/fora and ringing bell (announcing garbage collection)

Of these, specifically cited as useful by the residents are the print materials, outdoor signs, garbage bins, community seminars/fora and bell ringing.

Certain factors appear to be indispensable for setting up a community education program on solid waste management. In the order of importance, they are:

- site-specific waste segregation and collection system (Such a system has to be agreed upon by the residents and pilot-tested. This is important because the educational interventions must be closely synchronized with the site-specific waste segregation and collection system.)
- top-level commitment and endorsement of the program (by both the local government, *Barangay* and the University Administration)
- availability of print campaign materials
- use of outdoor signs
- conduct of community seminars/fora
- use of survey instruments

A model based on experiences, observations and insights gained from the study is proposed in Figure 1.

Figure 1. Generic Model of an Educational Program for Community Solid Waste Management

Problems Encountered: Initially, the biggest stumbling block to waste segregation was the existing garbage collection practice of having one truck pick up all garbage – segregated or not. In other words, it was clear to everybody that there was no point in segregating wastes.

In 1998, the collection of biodegradable wastes at two sites (D and E) followed a paying scheme of PhP1.00 per kilogram of biodegradable wastes to serve as income for the out-of-school pedicab boys who were collecting them on a Monday-Wednesday-Friday morning schedule. By the end of 1998, however, as personnel maintenance, operations and materials cost for such a collection scheme turned out to be too high and could not be sustained by the “PhP1.00 per kilogram” rate, this was discontinued.

In other words, the scheme was not cost-effective. Hence, the collection strategy had to be revised, accompanied by an intensive education campaign.

Reflections, Lessons Learned And Future Prospects: Insights gained from the experiences and observations during the entire project and findings of the research point to the advisability of doing the following in the future, the sooner, the better. (See Table 1 for success criteria).

Even only within its campus, the University should strengthen its implementation of the public education and information aspects of the Ecological Waste Management Act of 2001 (Republic Act No. 9003, Sections 55 and 56) that, among others, will “*aim to develop public awareness of, and the community-based solutions to, the solid waste problem; concentrate on waste reduction, resource conservation and recovery, recycling, segregation at source, reuse and composting activities; encourage the public... to endorse and patronize environmentally acceptable products and packaging materials; and strengthen the integration of environmental concerns, particularly on solid waste management, in the school curricula at all levels.*”

The University should strengthen its Task Force on Waste Management, under the Office of the Vice-Chancellor for Community Affairs, with sufficient manpower and resource allocation to catalyze expansion of the activities of this project to all residential areas in the campus.

The University should institutionalize the periodic monitoring component of its Community Solid Waste Management Program (*i.e.*, this project). The monitoring can be done by an appropriate community body (the membership of which should be decided by the residents themselves) and by an *Ad hoc* Committee to be designated by the University Chancellor and/or by the *Barangay* Captain.

Table 1: Success Criteria for Evaluation of a Community Solid Waste Management Program (Basug, 2001)

Criterion	Indicators
1. Participation rate	University Chancellor's/Barangay Captain's endorsement of the program (presence or absence) Number of residents participating in the program Number of committed implementers Description of participants' involvement in the program (active or passive)
2. Residents' knowledge and understanding level of the elements of solid waste management	Scores on written evaluation instruments to be administered (increase or decrease in scores in pretests/post-tests).
3. Attitude toward (a) waste management/ materials and (b) conservation among participants	Scores in attitude survey instrument
4. Integration of solid waste management concerns in the community planning and purchasing programs	Number of Barangay activities launched for the program
5. Resource mobilization for the program	Money/materials of the Barangay mobilized for the program (increase or decrease) Money/materials of private sector support to the program (increase or decrease)
6. Preparatory organizing work for participants of the program	Number of orientations/seminars/fora conducted Number of information materials (such as fliers, handouts, brochures, etc.) issued Number of outdoor signs prepared Number of surveys/interviews conducted Number of residents and other program implementers trained
7. Sustainability of the program	Number of months of uninterrupted program implementation

The University should initiate an external evaluation of its Community Solid Waste Management Program to be undertaken periodically by an independent group outside of its Task Force on Solid Waste Management, and/or non-officials of the local *Barangay*. In the conduct of such an evaluation, the success criteria proposed in Table 1 may be used.

The University's Task Force on Waste Management should (a) try out other forms of information and education campaigns such as the possibility of a category on the yearly Chancellor's Award for the best (campus site/area) in community participation in waste segregation; and (b) issue incentives to communities that have high levels of participation, such as the grant of free compost materials, stickers for garbage bins and the like.

Likewise, the Task Force should employ penalization schemes for nonparticipation in the program such as noncollection of unsegregated wastes.

The Task Force should establish satellite composting stations in strategic areas in the campus with large vacant lots.

The Task Force should conduct community surveys periodically for an update on problems being encountered and suggest improvements, if necessary.

Finally, in the spirit of goodwill and community service, the University may share with other universities and similar communities the generic model of an educational program for community solid waste management (Figure 1) that evolved from the processes and events of more than two years of operation of the project.

2. GIS for Watershed Management

This is a case study about the use of geographic information system (GIS) in watershed management. What is interesting about the project is the unique kind of environmental education (the informal and nonformal levels) involved, whereby the people (with their thorough knowledge of details about bodies of water, surface features and built structures on the land they live in and with their own traditional/indigenous resource management practices and institutions) and the research team (with their skill in computer technology, in interpreting aerial photographs and satellite images, in mapping and data management) engage in extensive dialogue, thereby learning together in their multi-actor analysis of problem situations in the Ifugao watershed management.

Background: The project was undertaken in the province of Ifugao, located high in the Central Cordillera mountains in northern Philippines. The province has a land area of 2,518 sq. km. It is the site of the world famous Ifugao rice

terraces. The terraces, which drape a very extensive area of mountain slopes and reach an amazing altitude of 1,600 meters, were constructed by the Ifugaos centuries ago using only wooden spades, crowbars, digging sticks and bare hands. In 1995, this magnificent engineering feat was inscribed in the UNESCO World Heritage List of cultural and natural properties. And in 1997, the American Society of Civil Engineers unveiled a marker in the town of Banaue, in recognition of the Ifugao rice terraces as an “engineering marvel”.

The Problem: Behind the majestic view of the terraces lurk environmental and economic problems that require immediate attention. Based on the research team’s interviews, personal observations and official documentation, the underlying environmental problems of Ifugao are: (Gonzalez, 2000)

- thinning forests as a result of heavy demand on local wood supply,
- intensification of slash-and-burn farming,
- erosion and landslides,
- abandoned and crumbling terrace walls (a problem deeply tied up with a larger social problem) and a growing preference of many Ifugao’s young people to move to the lowlands where there are opportunities.

Historical Perspective: The project stems from the rapid deterioration of the biophysical environment of Ifugao, with the specific problems cited in the preceding sub-section. The degradation of the majestic rice terraces that the Ifugaos have laboriously built and successfully maintained reportedly for over 2,000 years implies that the issue at hand is actually one of sustainability.

The system of terraces was built by the unique culture of a simple mountain people in response to the challenging conditions of their fragile mountain environment. Anything that would undermine that culture would likewise undermine the sustainability of the terraces.

Gonzalez (2000) believes that this was exactly what must have happened in Ifugao. Her search into historical materials pointed out that: *the problem can be traced to the incorporation of a once closed Ifugao society into a global economic order since 1900, with the arrival of American colonizers, who took over after Spain’s 350 years of failed domination. She suspects that the sudden exposure to economic competition as monetary exchange took over barter, the draw of new jobs at American mining sites and vegetable farms in the neighboring province of Benguet, the introduction of a colonial religion and educational system that are far removed from the realities of the place, the relegation of “backward and uncivilized” local knowledge to the backseat of community development, and the collapse of collective decision making through **ubbu** and **baddang** (which are traditional community workgroups crucial to terrace maintenance)...these changes were most probably among the social*

influences that brought about the current question of sustainability of the Ifugao rice terraces.

Confluence of Factors. As if the challenges to the sociocultural system underlying rice terracing agriculture in Ifugao, the growing population of the province that exerts pressure on the land and the degradation of its biophysical system were not enough, a great earthquake rocked northern Philippines in 1990 that triggered massive landslides. It accelerated erosion over vast areas and increased the sedimentation rate of Magat Dam (the major source of electricity and irrigation water of Luzon, the country's largest island), which receives water from major river systems in Ifugao. The result is a drastic decrease in the dam's years of service from 100 years to only about 43 (National Irrigation Administration, 1996).

Even at the local level, water is of great value to the Ifugaos, not just for their personal needs, but also for their agricultural practice of keeping the terraces filled with water, all year round if possible, to prevent erosion. To them, water is "*the main factor for the sustainability of terrace cultivation*" (Ifugao Terraces Commission, 1995). There is therefore an urgent need to address Ifugao's water problem through watershed management.

The Project: The research project started in 1998 when Prof. Rhodora Gonzalez of the University of the Philippines (then a doctoral candidate at the Wageningen University, The Netherlands) was tasked to explore the possibility of incorporating indigenous knowledge of natural resource management in a geographic information system (or GIS), to assist in community-based sustainable development programs being undertaken by the Philippine Rural Reconstruction Movement (PRRM), a non-governmental organization that has been doing development work in Ifugao since 1988.

The main objective of the research was to try the use of participatory methods and Ifugao farmers' participation in developing a GIS for facilitating multiple actor learning about their problematic situation in natural resource management at the local (*i.e.*, community and municipal) level and articulating the same at the provincial level.

The actual fieldwork was done in four adjacent *barangays* (communities) of the town of Banaue in Ifugao province, and lasted 13 months.

Key Players and Activities: Among the key players in the natural resource management are the Ifugao farmers, the principal researcher (Prof Gonzalez), the Department of Tourism (DOT), and the Ifugao Terraces Commission (ITC). ITC is in charge of the large-scale restoration and preservation of the rice terraces. It also collaborates with the local offices of the pertinent government

agencies such as the Department of Agriculture, the Department of Environment and Natural Resources, the Department of Agrarian Reform, the local government units as well as NGOs and local people's organizations.

The research itself included the following activities:

- Tracing the history of Ifugao's indigenous natural resource management in order to learn about the traditional spatial information system that the people used in maintaining their terrace ecosystem, and how it evolved into its present situation.
- Identifying the past and present actors in Ifugao's natural resource management in order to determine their corresponding interests, and/or changes in their interactions as a step towards understanding individual and mutual interests in natural resource management negotiations.
- Participating in and observing natural resource management activities of the different actors in order to better understand the processes and interactions involved and identify those with potential applications for GIS.
- Using participatory methods with GIS techniques in developing a natural resource management information system that integrates qualitative and quantitative spatial information in order to make visible the different knowledge processes and facilitate their interaction in natural resource management at both local and provincial levels.
- Assessing the present outcomes and the potential of the participatory GIS developed in Ifugao for effective natural resource management at the local level and for articulation with provincial managers.

The strategy used by the researcher to address the complexity of natural resource management is "joint learning". It is the interaction of knowledge from different perspectives in understanding and improving a problematic situation (Pretty, 1994). This kind of environmental education is special in the sense that the final "picture" of a problematic environmental situation evolves from the individual perceptions, assessments and interpretations of the multiple actors who happen to have their own individual motives and *Weltanschauung* (Checkland, 1993) or "world view" (Warren, 1975).

Accomplishments: With the support of PRRM and by using participatory methods with GIS techniques, the principal researcher was able to develop a GIS-assisted terrace monitoring system that is based on the traditional monitoring system (*mun-unod*) of Ifugao. It demonstrates how data about terrace problems can be put together to show the local situation in a *barangay* and, later on, further aggregated to show the overall situation in the province.

The project also established a new channel of communication between local and provincial actors of natural resource management. With GIS, local views (such as priority problem areas) can be communicated as mapped data for provincial actors of natural resource management to consider in conceptualization and planning projects. GIS facilitates this communication using the principle of data aggregation and integration by overlay operations.

Problems Encountered: With a number of government agencies (primarily the Department of Tourism, the Department of Agriculture and the Department of Environment and Natural Resources) and other groups doing development in the same area (Ifugao), overlapping of program activities can be expected.

Furthermore, the strategies that the agencies/organizations employ naturally depend on their respective development views and objectives. For instance, if a group is interested simply in repairing destroyed terrace walls, it will just hire anybody from the local menfolk for the job. On the other hand, if a group (say, PRRM) believes that the Ifugao tradition of cooperation and responsibility should be revitalized, it will utilize for the restoration job traditional workgroup called *baddang*. Clearly, there is a need for strong collaboration among the local offices of government agencies, local government units, NGOs and local private organizations in formulating and implementing their programs of action in Ifugao in order to minimize overlaps/conflicts and maximize the impacts of their programs.

As for the use of computerized geo-information technology in Ifugao, one will readily come to the conclusion that the greatest problem is poverty. Ifugao has been identified as having “*the highest poverty incidence, the worst underemployment rate, and the lowest life expectancy in the Cordillera Administrative Region*” (Provincial Planning and Development Office, 1996). The Ifugao terrace farmers have neither the financial capability to acquire computers nor the knowledge and skill to use them.

However, the saving grace is the fact that there are now NGOs (such as People’s ACCESS and PRRM) that propagate the use of computers, computerized information systems and electronic communication among themselves in order to facilitate their development work. They share among themselves their databases about social and environmental information and use them in drawing up local development plans.

Reflections, Lessons Learned and Future Prospects: Geographic information system is generally described as “*a computerized database about spatially referenced (or geographic) phenomena on earth that provides the following four sets of capabilities to handle the data: input, management (storage and retrieval), analysis and display*” (Burrough, 1986; Aronoff, 1989; Goodchild

and Gopal, 1989; Frank, 1993). Among various applications of GIS, one is to provide data for decision making in natural resource management. Maguire, *et al.* (1991) report, in fact, that GIS is now widely used in land use planning, forest monitoring, biodiversity conservation and habitat protection in other parts of the world. GIS technology, therefore, is not a solution by itself but, instead, a valuable tool for several natural resource management actors learning together about the environment or resource to be managed. Thus, the basic problem of this research was: “*Can GIS provide a mechanism that would facilitate thinking, negotiation and active social construction of natural resources in shared learning and concerted decision making for natural resource management?*” This research was not an attempt to prescribe a solution to Ifugao’s deteriorating forests, water supply and terrace walls but, with the help of GIS technology, to speed up the process of joint learning by the various NRM actors, regardless of their respective *world views*.

The issue of sustainability in this case has two fronts: that of the terraces and that of utilization of GIS for natural resource management in Ifugao. Considering the economic value of the Ifugao rice terraces to the country’s tourism industry as well as their cultural value to the world (UNESCO, 1995), the protection/preservation of the terraces is more or less assured.

Regarding the project output *i.e.*, the GIS-assisted terrace monitoring system based on the traditional monitoring system of Ifugao, the principal researcher reports that “*the provincial government appreciated this approach, and has decided to go ahead with this setup...*” (Gonzalez, 2000, p.162). It must again be pointed out, however, that although GIS has made use of participatory methods (*i.e.*, participation of multiple natural resource management actors and the Ifugao farmers themselves) this is simply a tool for the construction of a realistic picture of the environment to be managed; it is not the solution to the problem at hand. Its utilization will depend largely on the understanding, vision and determination of local and provincial natural resource managers. PPRM, for one, will definitely use it. PPRM has, early on, expressed the need to harness modern technology such as GIS to help organize the yearly collected data about resources to be managed, particularly for planning and periodic assessment of development projects. In fact, this research was intended to be the pilot phase of a wider project where it will guide its replication in other PPRM branches across the country.

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3. Bantay Palawan

Background: This is a case study about a resource project that has a unique environmental education component at the informal and nonformal levels. This project relies heavily on the philosophy that management of natural resources will be sustainable only if the people participate directly in the management effort

The environmental education strategy employed is total immersion in the project, *i.e.*, the people are *actors* and/or *participant observers*, observing the situations and events from inside the circle of action rather than from outside.

Locale: Palawan is an island province at the mid-western part of the Philippines. It consists of many islands and islets with a total land area of 14,896 sq. km. It enjoys the reputation of being one of the very few places in the country where pristine forests and coral reefs still abound; it has been called an island paradise.

Underlying Problem and Conceptualization of a Possible Solution: In the early '70s, as the country's largest province (in terms of total land area) with a low population density of 49.5 persons per sq km and, as mentioned, blessed with marine and forest resources, Palawan proved very attractive to new settlers and in-migrants who wished to start life anew. Unfortunately, the province also became a magnet for unscrupulous persons who wanted to get rich quick, regardless of whatever environmental damage their activities would incur.

During the 80s, Palawan experienced the mounting problems of illegal logging, slash-and-burn farming, indiscriminate burning of forests, squatting on public and private lands and highly destructive fishing practices. Sad to say, the local police and the military could not effectively apprehend the offenders, constrained by limited logistical support and by the vastness of the territory to patrol.

The “light at the end of the tunnel” came in the early ’90s. The rapid decrease in the province’s forest cover, from 98% in 1968 to 48% in the early ’90s, or an annual average vegetation loss of 19,000 hectares, made the people of Palawan realize the gravity of the situation and the need for them to take a direct hand in solving the problem. At the same time, environmental disasters in other areas such as the Ormoc City flashflood in 1991 (which killed close to 7,000 persons in the city in a span of just 20 minutes and almost wiped out the entire population of 2,000 in the adjacent small island of Isla Verde), a major cause of which has been traced to severe forest denudation of Ormoc’s surrounding watershed, dramatically awakened the people to what could happen should Palawan’s forests become denuded. Thus, *Bantay Palawan* (or Palawan Watch) was conceptualized.

The Project: *Bantay Palawan* is essentially a movement for the protection, conservation and sustainable utilization of Palawan’s natural resources. It puts together under one umbrella organization the efforts of various local and national agencies, private voluntary groups, non-governmental organizations and the general public in the promotion of sustainable resource use and protection. It involves a continuing environmental education primarily at the informal/nonformal level to develop environmental awareness, recognizing the reality that a long-lasting campaign for the environment is possible only when the citizens are environmentally literate, responsible and committed.

The project came into official existence on January 18, 1993 upon the issuance of Local Executive Order No. 04 by the Governor of Palawan. Its establishment was guided by the provisions of the Local Government Code (Republic Act 7160), mandating that “*local government units shall share with the national government the responsibility in the management and maintenance of the ecological balance within their territorial jurisdiction*” as well as “*enhance the right of the people to a balanced ecology.*” The promulgation of Republic Act 7160, therefore, enabled the provincial government to take direct action to save its marine and forest resources. These resources serve as the foundation of Palawan’s tourism industry as well as its lifeblood, inasmuch as the province has no significant industrial or manufacturing base of its own.

The project has a three-pronged set of objectives:

- to minimize if not totally eliminate illegal and destructive extraction of Palawan's natural resources;
- to develop among the people awareness of the need for resource protection and conservation; and
- to promote and enhance coordination between the government and the people in mutually beneficial endeavors concerning the protection and conservation of the province's natural resources.

Description of Activities: At *Bantay Palawan's* inception, an Executive Committee and six operational committees were created to carry out the project's mandate. These were composed of people from both the government and private sectors. Notable among the participating NGOs are the Tubattaha Foundation, Environmental Legal Assistance Center, Palawan NGO Network, Palawan Nature Conservation Foundation, and *Nagkakaisang Tribu ng Palawan* (or United Tribes of Palawan). Also included are some private volunteer groups and the business sector.

Chaired by the Governor, the Executive Committee is composed of the WESCOM Commander as Vice-Chairman, the chairman of the Provincial Council's Environment Committee, the Provincial Administrator, the Provincial Attorney, the Executive Office of *Bantay Palawan* and its various committee chairmen as members. Its main task is to coordinate all efforts as well as plan the direction and approaches to make the program function most effectively towards its objectives. It meets regularly every quarter.

Various committees include (1) the Education, Information and Training Committee; (2) the Community Development Committee; (3) the Logistics and Finance Committee; (4) the Law Enforcement Committee; (5) the Monitoring and Evaluation Committee; and (6) the Prosecution and Adjudication Committee.

These committees implement the defined strategies of *Bantay Palawan* through specific projects and activities.

The Education, Information and Training Committee is concerned with developing, among the public, awareness on the importance of nature conservation, biodiversity and the dangers of deforestation, marine siltation and other threats to Palawan's forest and marine resources through information dissemination. It conducts training, and is also in charge of production of information campaign materials on various environmental concerns. It also documents and publicizes the project's achievements.

The main concern of the Community Development Committee is to reduce the temptation for people to commit illegal acts by offering alternative livelihood programs to deserving beneficiaries. Corollary to this function is that of

organizing the people in rural communities in accordance with the livelihood program requirements.

The Administrative Staff Office provides secretarial support to the Executive Committee. It coordinates the preparation of *Bantay Palawan's* annual plan and budget. The annual budget of the project, primarily for staff salaries and field operation expenditures, regularly comes from the 20% development fund of the province. The Administrative Staff Office also coordinates and documents the activities of the six operational committees. It also coordinates *Bantay Palawan's* field operations with the different municipal chapters.

Accomplishments: For eight years now, *Bantay Palawan* has been operating with a very significant degree of success, so much so that it has become a by-word among the people of Palawan. The concept of *Bantay Palawan* has also been copied or replicated by many local government units (LGUs) all over the country. So many missions to study the project has been received by the Provincial Government over the years that it has become possibly the most studied project on resource protection by any local government unit in the country so far.

The project's accomplishments include numerous cases of apprehensions involving various types of offenses, court convictions, and confiscation of illegally obtained lumber and tan bark.

Bantay Palawan has also contributed heavily to Palawan's *Clean and Green Program*, which garnered for the province top environmental awards for three consecutive years.

Problems Encountered: Bantay Palawan faced numerous problems, which are summarized below:

Initial lack of public acceptance: Prior to the implementation of the project, the people had the impression that the NGOs, idealistic and patriotic as they may be, were the only ones striving for environmental protection. The idea of the local government doing the same – and not just talking but actually doing something about the problem – was too incredible to them. However, reports of illegal logs confiscated and the loggers charged with the crime, illegally caught fish found, the fishermen incarcerated and the vessels impounded and other such accomplishments helped turn public opinion around, so that today the problem is more of the unreasonably high public expectations from the program.

Moreover, the project was perceived from the start as a police program specifically for law enforcement. As a result, some politically powerful individuals and groups with vested interests in the extraction of Palawan's

natural resources took an adversarial stance, and reacted by erecting obstacles in almost every manner possible.

Operational constraints: Palawan's large geographic size, archipelagic composition, thin population, and inadequate transportation and communications facilities make it difficult for a relatively small group to monitor efficiently. Moreover, the province's meager budget hampered the project's critical activities including operational expenses for hauling confiscated lumber, subsidies to witnesses *etc.*

Policy gaps: *Bantay Palawan* operates within the general framework of the Strategic Environment Plan (SEP) of Palawan (Republic Act 7611), which defines the general policies and operational framework and strategies for the sustainable development of the province. However, Republic Act 7611 in many instances overlap, come in conflict with or contradict other national laws such as those of DENR. Arguments have arisen, for example, between DENR and the Palawan Council for Sustainable Development (PCSD) on the apparent inconsistencies of the Strategic Environmental Plan with the National Integrated Protected Areas System (NIPAS Act of 1992), so that other agencies including *Bantay Palawan* have for a time failed to act decisively on matters, pending the resolution of the argument.

More importantly, however, the duplication of functions on the national and local levels, pertaining to the protection and sustainable management of forestlands and other areas for protection, engender policy conflicts within a given jurisdiction. It is not clear who or which should have the final and definitive say on any matter. Is it DENR or the local government? Thus, confiscated illegally cut lumber deposited with the local DENR offices are often released because of different interpretations of the same law or because of application of different provisions of different laws. The result is that the public is confused as to which or whom to follow.

Failure in prosecution and adjudication: Despite inadequate budget, *Bantay Palawan* operatives are able to arrest perpetrators of illegal logging and fishing, confiscate illicit materials and equipment and seize contraband products as evidence. But convictions of arrested suspects are few. This is due largely to the ability of big-time operators to provide experienced counsels for the defense of their accused henchmen as well as to offer 'incentives' to witnesses and even some prosecutors to withdraw from the case. As a result, some cases filed in court are dismissed even before a preliminary hearing is conducted or the accused are acquitted on technicalities.

Unsustained support by some municipal governments: The initial operations of the *Bantay Palawan* Municipal Chapters were given financial support, with the

understanding that the municipal local government units would eventually sustain the chapters through their local funds. But a number of local government units were not able to do this primarily due to financial constraints and thus, their municipal chapters became non-operational.

Reflections, Lessons Learned, Spin-Offs Initiatives and Future Prospects:

The people at the helm of *Bantay Palawan* have taken their job seriously with selfless commitment and dedication. Steering their ship through a rough sea of countless problems and obstacles (from apathy to harassment, if not downright opposition), they have persevered, and they continue to tackle challenges, one after another. Some problems were solved and some simply accepted as given factors in the equation. All along the way they have undertaken additional initiatives for greater effectiveness of the project. For example, they created *Bantay Bayan* (or Municipal Watch) and *Bantay Barangay* (or Village Watch) organizations all over the province to act as watchdogs against illegal logging, illegal fishing, poaching in municipal waters, trading on banned animal species and other activities harmful to the environment and deleterious to the welfare of the people.

Other related activities include, among others, the following: providing adequate funding support to priority environmental programs, creation of a multi-agency Technical Working Group on Resource Management that helps address some of the key policy issues affecting resource use, and establishment of stronger linkages with PCSD and DENR to harmonize both policy and procedures for the issuance of permits such as those related to the operation of municipal communal forests and sand and gravel quarrying.

Aside from the monumental achievement of protecting the forest and marine resources of Palawan, *Bantay Palawan* has made a giant stride in environmental education. By participating in the various activities and directly observing the events during the long years of the project's operations, the people of Palawan have developed confidence in their ability to do something big for their province – the task of protecting and saving Palawan's natural resources. This attitude of stewardship is clearly evident even among school children and the youth. Visitors to Puerto Princesa (the provincial capital) never fail to notice it even among the tricycle drivers, who pick up candy wrappers, cigarette butts and other trash that some of them (the visitors) unconsciously throw on the street.

It seems that the sustainability of *Bantay Palawan* is, in itself, an achievement. The Provincial Government is committed to continue the project, despite the ever-present challenges, as a potent force for the protection and development of Palawan's patrimony for the coming generations. There is currently a series of consensus-building dialogues to review the mandate, redefine strategic

directions and streamline operations of the project. It is expected that the results of this review would provide *Bantay Palawan* a fresh mandate.

4. Environmental Sensitivity and Children

This is a study that (a) assessed the environmental sensitivity of elementary school pupils in the Schools Division of Aurora, (b) determined if certain personal factors such as age, sex, grade level *etc.* are related to environmental sensitivity, and (c) identified which of the home, school, experiential and media factors influence the development of environmental sensitivity.

Background: The study was conducted in Aurora, a province at the eastern side of Luzon (the largest island of the Philippine archipelago).

The Problem: One of the questions that intrigue Filipino educators involved in environmental education is this, “*At what age do most Filipino children develop environmental sensitivity?*”

What is *environmental sensitivity*? Peterson and Hungerford (1982) define environmental sensitivity as a set of affective attributes (*i.e.*, appreciation, concern, caring and valuing) that results in an individual’s viewing the environment in emphatic perspective. Agustin (1994) describes it as one’s emphatic view of the environment, encompassing the belief that humans must live in ecological harmony with the environment. Knapp (1997) associates it with environmental appreciation and Argury and Johnson (1987), with environmental concern. The phrase environmental concern is usually understood to comprise affective and inactive attitude toward the environment (Bordon & Schettino, 1979). Rabago (1988) identifies environmental sensitivity with (a) appreciation of nature and (b) concern for environmental protection.

Why *environmental sensitivity*? Most educators agree that the goal of EE is the acquisition of *responsible environmental behavior*, *i.e.*, developing learners who are knowledgeable about environmental issues/problems and who are willing and able to take necessary actions to resolve them (Sia, 1987).

Tomera’s (1986) study reveals that the best predictors of responsible environmental behavior are: (1) one’s level of environmental sensitivity, (2) his knowledge of environmental action strategies and (3) his skill in using those environmental action strategies. In Sivek and Hungerford’s (1989) study, these are: (1) the person’s skill in using environmental action strategies, (2) his level of environmental sensitivity and (3) his perceived locus of control. Thus, he recommends that these variables be addressed in formal and nonformal environmental education programs where appropriate. Similarly, Rogus (1997) recommends that (1) environmental sensitivity and (2) action strategies be

considered in a comprehensive environmental education program. Even the Tbilisi Declaration (1978) affirms that sensitivity to the environment must be the first category of objectives to be developed.

Hungerford (1986) equates responsible environmental behavior with *environmental literacy*. Thus, variables that promote environmental literacy would likewise foster responsible environmental behavior; these are: (1) one's knowledge of environmental issues, (2) his values and attitudes, (3) his beliefs concerning environmental issues (which affect his values), (4) his perceived locus of control, (5) his level of environmental sensitivity and (6) his knowledge of and skill in using environmental action strategies.

Roth (1992) defines environmental literacy as the capacity to perceive and interpret the relative health of environmental systems and take appropriate action to maintain, restore or improve the health of those systems. Almost parallel to Hungerford's variables cited in the preceding paragraph are Roth's specifics of literacy level: (1) knowledge, (2) skills, (3) attitudes and values, (4) environmental sensitivity, (5) personal investment and responsibility and (6) active involvement. Putting together No. 3 (attitudes and values) and No. 4 (environmental sensitivity) under the term "affects" while putting together No. 5 (personal investment and responsibility) and No. 6 (active involvement) under the term "behavior", Roth proposes that knowledge, skills, affects and behavior be addressed in education for environmental literacy.

The Project: The project leader and researcher was Mary Jane Aurelio Nicer, a science teacher (elementary level) in the Schools Division of Aurora. The study sought to gather basic data about the environmental sensitivity of elementary school pupils in Aurora. Specifically, it investigated (1) the level of environmental sensitivity of the pupils in central schools (*i.e.*, in towns/municipalities) and in barrio schools (*i.e.*, in the local communities); (2) the relationship between certain personal factors (*e.g.*, age, sex, *etc.*) and environmental sensitivity; and (3) the school factors, home factors, experiential factors and media factors that contribute to the development of environmental sensitivity as perceived by the pupils.

The sample consisted of 400 elementary school pupils (200 boys and 200 girls) of ages 9-12 (100 per age group) from 10 schools (5 central schools and 5 barrio schools) in the province of Aurora.

The needed data were obtained by using an information sheet, an Environmental Sensitivity Instrument (Rabago, 1988 and revised 1998), and a questionnaire-checklist.

As mentioned in Section I of this paper, the Rabago Environmental Sensitivity Instrument is based on two constructs: appreciation of nature and concern for environmental protection. It is a Likert-type scale with three options: *true of me*, *not sure*, and *not true of me*. It consists of 20 items. Each positive response gets a score of 1. A total score of 16 to 20 is interpreted to mean *environmentally sensitive*, 10 to 15 *moderately sensitive*, and 0 to 9 *not yet sensitive*, based on an arbitrary categorization of scores and validated (by expert judgment) by professors of environmental education at the University of the Philippines and by environmental education consultants at the Environmental Management Bureau (EMB) of the Philippine government's Department of Environment and Natural Resources (DENR).

The study was conducted during the academic year 1998-1999. The research data were processed (analyzed) using the following statistics:

- Descriptive statistics (*i.e.*, frequencies, percentages, means and standard deviations) were used to summarize and describe demographic variables and respondent's environmental sensitivity.
- One-way analysis of variance (ANOVA) was used to find out if there is a significant difference in the mean scores of the 10 respondent schools. And to compare the 10 schools in order to identify specifically which among them have significant differences in their pupils' mean environmental sensitivity scores, the Duncan Test was used.
- The t-test was used to find out if there is a significant difference in the level of environmental sensitivity between pupils from the central schools and those from the barrio schools.
- The chi-square (χ^2) was used to compare the observed and expected frequencies in each category and test whether all categories contain the same frequencies in relation to some selected personal factors (*e.g.*, age, sex *etc.*).
- The Pearson Product-Moment correlation coefficient (r) was further used to find out if environmental sensitivity scores have a significant correlation with the independent variables.

Key Players, Activities and Funding Scheme: The study was done in close coordination with the University of the Philippines (College of Education) and the Philippine government's Department of Education, Culture and Sports (DECS-Region IV), Division of Aurora.

The activities during the fieldwork consisted of the following:

- Getting official approval from the Schools Division Superintendent.
- Initial meeting with the school heads/principals of the 10 respondent schools – to present the communications from the Division Office and to solicit their approval of, and assistance to, the project.

- With the help of teachers handling Grades 3-6 in each of the schools, the subjects were selected at random --10 pupils (5 boys and 5 girls) from each age group of 9-12.
- Administration of the Personal Information Sheet and the Environmental Sensitivity Instrument in phase one.
- Administration of the questionnaire-checklist to the pupils who made it to the environmentally sensitive category in Phase One.

Accomplishments: In general, the level of environmental sensitivity of elementary pupils in the Schools Division of Aurora is moderate.

Environmental sensitivity is relatively higher among pupils from the central schools of ages 11 and 12 whose fathers are engaged mostly in skilled work like driving, carpentry, mechanic, *etc.* or professionals whose mothers are also engaged in skilled work or professionals whose fathers have at least some college education whose mothers are college graduates from families with relatively higher monthly income from farming and commercial communities

Majority of the respondents who fall under the category of environmentally sensitive are 11 years old. Thus, it can be said that, in terms of number, the age at which Filipino children in this study become environmentally sensitive is 11 years old.

However, in terms of the mean score of all the 11 year-old pupils, they still belong to the moderately sensitive category.

A significant correlation exists between age, grade level, parents' educational attainment, parents' occupation, family income and type of community, on one hand and environmental sensitivity on the other hand. Birth order and sex are not related to the pupils' environmental sensitivity.

Two factors identified by majority of the pupils in the central schools as most influential to the development of their environmental sensitivity, are parents and teachers.

On the other hand, the factor identified by the majority of the pupils in the barrio schools is parents.

As a whole, the top five factors identified by all the environmentally sensitive pupils in the sample are: (1) parents, (2) teachers, (3) camping, (4) brothers/sisters and (5) involvement in pro-environment community projects.

Problems Encountered: The researcher encountered two difficulties in undertaking this project: One is the difficulty of working with a large number of children (of ages 9 to 12) from 10 schools that are widely scattered over a large territory, and without a private vehicle at her disposal. The other difficulty is lack of financial assistance for the fieldwork.

Reflections, Lessons Learned and Future Prospects: Inasmuch as the majority of the pupils in this study have only a moderate level of environmental sensitivity (based on the arbitrary classification of levels of environmental sensitivity described in Section II of this paper), plus the strong influence of teachers in the development of environmental sensitivity, the school should make efforts to include in the teaching process some outdoor experiences (*e.g.*, walking tours around the school grounds, field trips, camping, *etc.*) where pupils are exposed to those factors that promote environmental sensitivity. Likewise, it would be beneficial if the school could provide the classrooms with television, books on nature/environment and periodicals in order to achieve the same end.

Inasmuch as parents were found to be most influential to the development of environmental sensitivity, the school and the community should take the initiative to organize pro-environment community programs where parents can join and acquire more scientific knowledge and practices significant to environmental protection, which they can later share with their children.

Again, inasmuch as teachers were found to be the second most influential to the development of environmental sensitivity, teachers should be given training in environmental education, including skills for community education.

The activities recommended above are not difficult to implement, and the expenses to be incurred are well within the capability of the school system and the local government.

5. Developing Critical Thinking

Background: The study was conducted in a public high school in one of the towns of Laguna Province, at the southern part of the island of Luzon, the largest island of the Philippine archipelago.

The Problem: To explain the special attention that the Philippine educational system is giving the higher order thinking skills, particularly critical thinking, Rabago and Mingoa (2001) cite the 1989 Enclosure No. 2 of the Philippine government's Department of Education, Culture and Sports (renamed Department of Education in 2001) that the New Secondary Education Curriculum (NSEC) shall put "*emphasis on critical thinking skills to promote creativity and productivity at all levels.*" This educational policy is in line with

the findings of various research studies including those of de Bono (1983), Beyer (1988), Hernandez (1990) and Reyes (1997) which recommend that thinking skills must not be left to chance but must be taught deliberately.

What some educators say about critical thinking: It refers to logical thinking that is focused on deciding what to believe in and do (Ennis, 1985). It is also said to involve mental operations of middle-level complexity used to judge, evaluate or assess (Beyer, 1987). It is usually used in the analysis of issues (Ramsey, 1989). In critical thinking, the person analyzes statements, claims or arguments (*i.e.*, their accuracy, validity, logic, *etc.*) before he decides on what course of action to take (Rabago & Mingo, 2001).

What science teachers can do to promote critical thinking: Rabago and Mingo (2001) recommend that science teachers can, and should, deliberately teach critical thinking through (a) laboratory work, (b) various teaching strategies during the lecture portion of the science class, and (c) tests that utilize high-level questions, both essay and objective types, as well as alternative/nontraditional forms of assessment of student learning.

For the lecture portion of the science class, the *inquiry approach* has been found to be most effective for promoting critical thinking. This refers to teaching in an investigatory mode by asking questions, and encouraging the students to ask questions using any of several *stimulus materials* including case studies, issues (*e.g.*, environmental issues), research findings, news items *etc.* “Teaching in an investigatory mode” is the opposite of teaching whereby “facts”/natural phenomena and definitions are simply presented to the class without giving them the opportunity to apply critical thinking skills. Stimulus materials such as those cited here are rich sources of excellent opportunities for applying critical thinking skills.

Norris (1989) and Moore (1992) add that, while teachers are advised to train their students to think critically, they are likewise reminded to explain to the students the importance of practicing it not only inside the class but also outside, because this is the practical justification for teaching it. Furthermore, one cannot assume that what is taught inside the class will automatically transfer to the life outside.

The Project: The researcher was Lea Cabauatan Garcia, a teacher of high school biology and environmental science. The main objective of her study was to find out how critical thinking can be developed/improved in an Environmental Science class using local environmental issues as stimulus materials. Specifically, it tried to (1) determine if there is an improvement in students’ analysis of local environmental issues before and after class discussion; (2) find out the thinking processes that take place in the student’s

mind when an environmental issue is presented to him/her before and after class discussion on the topic; and (3) find out the teaching strategy that students find most helpful in analyzing environmental issues.

The study consisted of six case studies. The six students were selected based on stratified random sampling, that is, two each from the high, middle and low groups (in terms of grade point average).

The instruments used in the study included pre-test and post-test questionnaire, interview guide, researcher's journal and student's journal.

Data gathering procedure was done as follows: Three to four open-ended questions about four local environmental issues were administered to the students during the pretest and posttest, followed by an interview to verify their analysis.

The intervention was a form of class discussion involving the use of seven teaching strategies, namely issue analysis, lecture discussion, small group discussion, concept mapping, film showing, role playing, and combination of film showing and small group discussion.

Data analysis and interpretation were done in a descriptive manner. The study was conducted during academic year 2000-2001.

Description of Activities: The project has been divided into three phases.

Phase One: This phase consisted of four steps.

(1) *Identification of four local environmental issues:* This was based on personal interviews with key officials from the Regional Office of the Philippine government's Department of Environment and Natural Resources (DENR) and the municipal office of the town.

The local environmental issues recommended for this study, together with their corresponding teaching strategies are as follows:

- Burning as means of solid waste disposal (Teaching strategies included concept mapping through newspaper clippings of Philippine/global environmental issues (issue analysis) and lecture discussion).
- Illegal occupancy in the Mount Makiling Forest Reserve (Teaching strategies included small group discussion through newspaper clippings on the issue and lecture discussion).

- Laguna de Bay pollution from livestock (Teaching strategies included pollution film showing and small group discussion)
- Effects of the Mak-Ban Geothermal Plant/Philippine Geothermal Plant (Teaching strategies included role playing and lecture discussion).
- *Securing permit from the school for the conduct of the study.*
- *Coordination with the subject teacher and the case students.*
- *Classroom observation by the researcher.*

This was done for a week prior to the start of the intervention for the purpose of establishing rapport between the researcher and the case students.

Phase Two: This phase consisted of the following activities. Pre-test in which the students were asked open-ended questions on the local environment issues one week before each regular class schedule and immediately after the pre-test, a clinical interview with the case students on each environmental issue was conducted.

Intervention: Class discussion using seven teaching strategies, namely: issue analysis; lecture discussion; small group discussion, concept mapping, film showing, role playing, and combination of film showing and small group discussion.

For analyzing each of the four local environmental issues, the researcher used Ramsey, Hungerford and Volk's (1989) model of the components of issue analysis listed below:

1. *Problem* (A condition in which the status of someone or something is at risk)
2. *Issue* (A problem or its solution about which differing beliefs and values exist)
3. *Players* (The individuals or organizations having a role in the issue)
4. *Positions* (The positions of the players concerning the issue)
5. *Beliefs* (Those ideas concerning the issue, whether true or false, held by the players)
6. *Values* (Those guides that tend to reflect the relative importance of beliefs in a given situation)
7. *Solutions* (The various strategies available to resolve the issue)

Post-test: The same open-ended questions asked during the pre-test were given. The same interview questions asked after the pre-test were also asked.

Analysis of the students' responses before and after class discussion: To find out if there is an improvement in the student's analysis of the issues after having been exposed to the intervention, the researcher compared the pretest and posttest responses using an evaluation guide based on Freedman's (1994) Rubric Model for grading answers to open-ended questions. The evaluation guide assessed two general areas: (1) knowledge of the issue and (2) critical thinking strategy used. The starter questions for the rubric levels are as follows:

- *For knowledge of the issue:* What facts, concepts, illustrations, descriptions and examples have the student understood while studying the major idea?
- *For the critical thinking strategy:* What critical thinking strategies does the student employ?

And to determine if there is an improvement in the student's critical thinking skills, the researcher compared the number of critical thinking strategies employed by the student before and after the intervention, this time based on Freedman's list (Freedman, 1994) of thinking strategies associated with each critical thinking skill (see list below).

1. Perceiving several points of view
2. Weighing evidence
3. Making logical conclusions
4. Identifying relationships and patterns
5. Identifying main ideas
6. Identifying errors/detecting mistakes in logic
7. Making value judgments based on facts and figures, not on opinions and conjectures
8. Organizing information and making firm judgments
9. Clarifying issues and terms
10. Setting standards for judging the value or logic of ideas
11. Verifying means confirming or proving the truth of an idea
12. Recognizing a problem using a variety of courses
13. Synthesizing information
14. Clarifying issues and terms
15. Making generalizations

In Freedman's model, the critical thinking skill analysis employs strategies No. 1-6; evaluation, No. 1-11; and problem solving, No. 1-15.

Phase Three: In this phase, the students were asked to rank the seven teaching strategies used in the intervention according to their usefulness for analyzing environmental issues.

Accomplishments: Evaluation of the students' responses to the open-ended questions shows that the students analysis of environmental issues has improved after the intervention, demonstrating greater knowledge of the issues.

The students employ many critical thinking processes (strategies) in analyzing environmental issues in both the pre-test and post-test. Improvement in their critical thinking is noted as more concepts, ideas and reasons are observed after the intervention.

Based on the critical thinking strategies (processes) used by the students from the high, middle and low groups, it can be said that their ability to answer divergent questions does not depend on their academic standing.

Among the seven teaching strategies employed, the students ranked role playing as most helpful for analyzing environmental issues. This is followed by the combination of film showing and small group discussion, and then by film showing.

On the whole, the results of this study indicate that the use of local environmental issues in an Environmental Science class is indeed very effective in developing critical thinking in the students.

Problem (Difficulty) Encountered: What the researcher considers difficult in this project is having to deal with voluminous data, considering that this is a qualitative research about thinking that takes place in the student's mind as he/she studies an environmental issue.

Reflections, Lessons Learned and Future Prospects: Based on the researcher's observation of the students' positive reaction to open-ended questions and considering their effect on critical thinking, teachers should have more of these during class discussions as well as evaluation of student learning.

Since role playing has been found to be the most effective strategy for analyzing environmental issues, teachers should include this strategy in planning lessons, perhaps as culminating activity for each quarter.

School administrator should initiate seminar and workshops for teachers on strategies (*e.g.*, inquiry approach) for developing critical thinking in their students.