

Interdisciplinary strategy to educate for environmental sustainability

By

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Introduction:

Today the natural phenomena are exhibiting catastrophic dimensions in their effect on the land and the life of the planet. Consequently, terms like 'global warming', 'climate change' have become colloquial across the globe. Government organisations, environmentalists, social groups and individuals are forced to act to preserve and conserve nature. Yet there is a huge gap that exists between environmental awareness and environmental consciousness:

Environmental awareness is conceived as the totality of cognitions, attitudes and action. Many studies made in the 1980s and 1990s, had very positive attitudes towards conservation, but when speaking about concrete action and personal sacrifices they have become rather reserved (Sairinen 1996)¹.

It has also been shown that a high level of environmental knowledge does not necessarily imply environmentally-friendly behaviour (e.g. Poferl et al. 1997; Brand 1997)¹ It is in such a context that we adopt the dimensions of environmental consciousness as psychological acceptance and imbibitions of environmentally sustainable practices which later on become a natural way of life – 'Sanskar' - (principles imbibed through practice in Sanskrit) rather than working for implementing them under the constant threat of a 'doomsday.'

The means to achieve an environmentally sustainable society is to breed environmentally-conscious citizens. Universities are centres for developing cultural meccas, innovators, economists (Kogan Linda 2006)². Ignatian Pedagogical Paradigm (IPP) believes that education alone can sustain moral and ethical values in society by dovetailing these values with every subject we teach.(Vas Jessie 2007)³. Even today, education plays an important role in shaping society. The United Nations has declared 2005-2014 as an international decade of education for Sustainable development, requesting all nations to integrate sustainable development into their education systems at all levels from pre-school to higher education and in non-formal

as well as formal education, in order to promote education as a key agent for change:

Like businesses, independent schools may be called to demonstrate their missions and actions their commitment to social responsibility and environmental sustainability” (NAIS SURVEY 2005)⁴.

Today’s challenge is to translate sustainable concepts into action (UCCS educational vision statement)⁵. Integrating environmental education into the science curriculum through land-based learning showed that learning environmental education is not the same as learning science.(O. Bartosh et.al.2005)⁶.

The key components of learning for environmental sustainability are identified as Systemic thinking, critical thinking, reflection, participation and partnership for change, while the key approaches are identified as facilitation of learning by the learner, participative inquiry, and action-learning and action research. (National Review of Environmental Education and its contribution in Australia)⁷ we find these components as well as approaches embodied in the IBO mission and IB learner’s profile.

Two major concepts influence people’s behaviour in improving environmental management (Land care Research Lincoln 2002)⁸. These concepts stand parallel to the core components of the IB curriculum as shown below:

Key concept (LRL)	Core component of IB
The importance of getting people together to establish a shared understanding of any problem situation and the potential pathways for action.	The TOK component of the IB curriculum perpetuates this philosophy.
The participation of different groups with their ideas, skills and knowledge can contribute heavily to sustainability, and make environmental activities more effective. They must catalyse change within their immediate membership first	The CAS Programme of the IB offers a dynamic platform for such participation and practice.

and spread that culture to others in their communities over the longer term.	
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This correlation suggests that the IB philosophy and curriculum stands within the framework of educating for environmental sustainability. Therefore we state that the International Baccalaureate Diploma Programme can easily integrate learning for environmental sustainability within its system.

How can we integrate Educating for Environmental Sustainability into IBDP?

Challenges faced by students and educationists: The students thought knowledge of what comprises the environment was important; however, they could not understand the repercussions of the deteriorating environment in its totality. Surprisingly, they were aware of the fact that if others are not conscious they will have to suffer, according to the theory of the problem of non excludability and free riders. The students were extremely unhappy with the fact that no incentive or accolades are given to students who practice environment-friendly measures. “Our elders”, they felt, “do not set role models for us to follow and do not abstain from conspicuous consumption, they preach but do not practice”.

The teachers felt that educating for the environment deals with altering the mindset and therefore the change is extremely slow and sometimes frustrating. Indeed, they found the reinforcement boring at times.

“If everybody is accountable, nobody is accountable,” Mrs. Ahluwalia, the Principal of a leading educational institution, strongly felt.

Jamnabai Narsee School has initiated sensitisation programmes on environmental issues since the early 1980’s by integrating these topics into the subjects of Geography and History. Concepts were clarified through workshops and they were reinforced through field visits to Nature hotspots. A few children have undertaken stewardship for the environment in their future careers, while it did not have any impact on others.

“Environmental values imparted in school were not reinforced either by parents or by society. Even the regulatory bodies do not impose these values. Therefore the school’s mission remains incomplete”, said Mrs. Jessie Vas, the Principal of Jamnabai Narsee School.

Our Strategy: Based on the above perceptions and a study of the adaptability of the IBDP curriculum, we recommend that Educating for Environmental Sustainability (ESD) should be made an interdisciplinary approach at par with TOK. As TOK forms the core of learning in all the disciplines, ESD should be all-pervading. As TOK skills can be reinforced only through some topics within a discipline, ESD can likewise be integrated with a few topics within a discipline.

In the present project we aim to study the feasibility of integrating ESD with all the Groups and Core component of IB hexagon through a two-year period. A pilot project was initiated in Jamnabai Narsee School, Mumbai from July 2007 to September 2007.

Methodology:

Our methodology involves a three stage approach: Perceive, Practice and Preach which will be entirely student-led. The teachers and the school will function only as facilitators.

Perceive

This stage will enable the students to perceive the need for environmental sustainability through the subjects of the languages, Economics, Business Management and Environmental Systems.

Practice

Students will design working models of their own to transform their school into a community based on sustainable living by taking any selected resource such as waste, energy or water. They will monitor this model for a period at least of one month.

Preach

This is an extension of the CAS activity where each group consisting of parents and students would together work to mobilise awareness regarding sustainable living in their immediate neighbourhood.

Step 1: To identify a group of teachers with aligned thinking towards our objective of study, an online questionnaire was mailed to the teaching faculty of JNS IB ([Appendix 1](#)). The aim of this questionnaire was to find out the inclination of the teachers towards environmental consciousness and the principle of sustainability.

Research Findings: The IB faculty advocated that environment sustainability could be addressed as an issue in certain subject areas with ease. They agreed to participate in the pilot project initiated by us.

Step 2

Adoption of an interdisciplinary approach:

From the Hexagon and Core of IB curriculum at least one subject was selected per group for the three stage approach. The theme of the paper was briefed to the respective teachers to facilitate the selection of the module. The teacher was also given a format for the lesson plan. ([Appendix 2](#)) Group I, II & III subjects were aimed at developing the right perspective on environmental sustainability, while Group IV and V and TOK were integrated at the second stage i.e. practices. CAS was designed to be the platform for preaching.

Selection of the sample of students: We resorted to stratified sampling to select a total of twenty students from grade XI, all of whom had similar subject combinations.

Step 3:

Modules integrated in various groups:

Group – 1

English

In the English lesson, we analyzed a passage from Giles Foden's novel, "Zanzibar" which is set in Africa and reveals the tremendous exploitation – economic as well as cultural, ecological and environmental – that the continent has suffered through centuries at the hands of colonizers. The lesson plan is enclosed in [Appendix 3](#).

GROUP - 2 French

French B SL and abinitio students were asked to deliberate on issues pertaining to the environment. The students were asked to expand and add on to their language tool kit and vocabulary bank so that they are trained to become well equipped and are able to confidently put across their points of view. The lesson plan is enclosed in [Appendix 4](#).

Group 3 - Economics

In the Economics lesson the students were made to understand the existence of externalities resulting in market failure resulting in inefficient utilization of existing resources. The lesson plan is enclosed in [Appendix 5](#).

Group 3 - B & M

The lesson was to enable the students to look at the whole issue of 'Corporate Social Responsibility' in a holistic manner and to the objective of environment sustainability. The lesson plan is enclosed in [Appendix-6](#).

Research Findings

Learning outcome in the English session: The students demonstrated an awareness of the economic, social, political and ecological interdependence in social and urban areas. They realized the extent of the damage and were concerned about the reefs

One student termed it as "inhuman and evil" act to "to exterminate other organisms for personal gain". He perceived it as an "injustice meted out to innocent animals."

Another student commented on man's "exploiting nature to fulfill his selfish desires", unaware that "he is part of nature himself. Destroying nature will henceforth be harmful to him in the long run.

Business management and environment sustainability;

The students were excited about coming up with a new entrepreneurial idea of an eco-friendly product, creating a mascot, a brand name, a mission statement and an advertisement as well as realizing the enormous benefits of an eco-friendly, socially responsible business to its stakeholders.

Most of all, the students really believed that in their endeavor to excel, they could always make a difference in their future ventures to sustain the environment!

Economics and environment sustainability

The discussion in the economics lesson on how the market fails to take into account the externalities that exist in the production or consumption of a commodity culminated in a host of observations. There were written responses giving a widespread individual views on the importance of government initiatives. Ideas such as "enforcing", "regulations", compulsory", "strong political incentives", "take control", "radical policies/steps" and "high taxes" were repeatedly used by these respondents in describing government initiatives. For instance, one student wrote, "we are now entering into an era of facing consequences. If the government procrastinates all of us will have to suffer."

Visual arts;

Deep concern, even some pessimism, about the future of the earth was expressed by the group of students who were in visual arts. Most of the artists felt that natural catastrophes are inevitable and that mankind will awaken only when they are on the brink of disaster. They were able to perceive that if we do not practice the principles of sustainable living soon, the earth will wear out. Some students expressed the balance of their feelings towards conflicting future scenarios in slogans with, despair and hope at the two ends.

Research Findings: Research results were collated and were indicative of the degree of perception of the concept of environmental sustainability.

Step 4:

Group 4- EVS

Students were asked to calculate their ecological footprint using online www.ecofoot.org. Activities were conducted to appreciate the need for environmental sustainability. The activity plan is included in [Appendix 7](#).

Students have selected electrical energy as a resource in the school to transform the school into an environmentally sustainable community. Students have measured the energy consumption of the school by counting the number of lights, fans, electrical gadgets. Light intensity was measured using a luxmeter in every room with and without light. Energy consumption per electrical gadget was measured using an ammeter.

Group 5 – Maths

Data collected was processed for calculation of energy consumption, and expenditure incurred and the savings were projected using energy saving attachments on an excel worksheet. The calculations are included in [Appendix 8](#).

TOK and environment sustainability it was the culmination of practice sessions to brainstorm the outcome due to the above sessions and pave the way towards the 'preach' stage.

Using the TOK methodology of linking ways of knowing and areas of knowledge, the select group of students had a session that dealt with celebrating religious festivals in an Indian context with special reference to the Ganesh Festival in an environmental sustainable manner.

Research findings: The response during the EVS activity of Balloons reflected that students realized that a nonrenewable resource depletes with generations, if it is overutilised. During the second activity of water collection, the IIIrd generation stated

that they left a little water for the IVth generation, because they experienced the deficit during the first activity. At the end of the activity, students had realized the significance of the concept of sustainable use. Energy measurement findings and the students' proposition regarding energy saving measures for the school are documented in the research findings.

Step 5:

The students CAS Dance team have tried to bring it to life through their performance. The ebb and flow of the tide, the soaring of birds, the blowing of the wind, and even the fluttering of leaves has been captured by their movements.

The students published a newsletter reflecting the environmental initiatives undertaken by them to spread the message in their immediate neighborhood.

View Video of CAS Dance team

Step 6 Summative Assessments:

A questionnaire was developed in September 2007. Open-ended questions were included in order to elicit a fuller expression of student views.

It was decided that no definitions should be included so as not to influence students' own understandings and definitions of the terms. . Although the response rate was low, it is nonetheless significant that they were voluntary student responses.

Responses to open-ended questions were read a few times and coded and categorized by emerging themes. A content analysis was undertaken.

The key research questions are as follows:

RQ1. What does the term environment sustainability mean to you?

RQ2. "What I do changes the world" Do you agree?

RQ3. What are the two life style practices that you adopt /change to contribute towards environmental sustainability?

The questionnaire is included in [Appendix 9](#).

Research Findings:

Most of the respondents were familiar with the term sustainable environment and were clearly able to state what that term meant to them.

The keywords used in the responses were indicative of the fact that the students were aware of the difference between sustainability and sustainable development. It was quite evident from the responses that they understood that environment sustainability was efficiency as well as an equity issue.

The majority of the students felt that their individual action could pave the way for bringing about a radical change in the thinking of their peer group, family members and the community at large.

The responses were also indicative of the fact that mere environmental awareness is not going to help now. What we need is a proactive approach without any procrastination. A great degree of optimism was reflected in the responses and they were extremely futuristic.

Fumiyo Kagawa's⁹ studies on "Dissonance in students' perceptions of sustainable development and sustainability Implications for curriculum change" found that more than 90 per cent of respondents held a positive attitude towards sustainability, identifying sustainability as a "good thing" or declaring themselves as passionate advocates for sustainability

.
Actions/adoption of life style practices towards a more sustainable living;

The student stake holder group was asked to list out two life style practices that they would adopt or like to change that would in fact contribute towards environmental sustainability. Responses predominantly included:

- 1) Using eco friendly articles.
- 2) Using alternatives to plastic bags.
- 3) Switching off fans and lights when the room is vacant.
- 4) Using the air conditioner only for two hours at night.
- 5) Minimizing energy consumption.
- 6) Using a bicycle for traveling short distances.
- 7) Adoption of car pools.
- 8) Using public transport instead of private cars.
- 9) Using a bucket of water instead of the shower for bathing.
- 10) Using waste water to water plants.
- 11) Exclusive use of locally produced food.

Many students favored supporting and celebrating environment significant days in the school along with their parents.

In terms of lifestyle change toward sustainability, some respondents honestly expressed their dilemmas. Personal preference, convenience and/or comfort seem to

get in the way of being 'sustainable'. In totality, the above results showed that respondents generally support pro-sustainability inclinations.

Slogans on environment sustainability were varied on account of their passion, rhyme and crispness. Some of the responses were vague whereas many were inspiring. "Live and let live", "clean world, green world", "reduce, reuse, recycle" were some of the most lukewarm of all responses and were not indicative of any individual action. "Speed is irrelevant if you are going in the opposite direction"--this slogan was indicative of the confusion between sustainable development and environment sustainability.

The students were able to appreciate the multifaceted nature of the concept, they were ready to change attitudes and adopt life styles that would foster environmental sustainability.

Details of research findings are included in [Appendix 10](#).

Conclusions:

- 1) Teachers, through their proactive approach, were able to ignite the minds of the students towards understanding in a holistic way the multi-faceted nature of the concept.
- 2) The existing structure of the IBDP curriculum permitted the teaching of the concept of environmental sustainability. Examples are included in [Appendix 11](#).
- 3) The teaching of environmental sustainability can be incorporated as a core component in the IB hexagon similar to TOK.

Suggestions:

- 1) The IBO mission statement should be revisited.
- 2) The student learner profile should be enhanced to incorporate the term environment conscious.
- 3) Educating for environmental sustainability should be incorporated as a core component in the IB hexagon similar to TOK.
- 4) International bodies like the UN should work in collaboration with regional and local educational institutions to further the objective of the curriculum review and moderation according to the evolving role of education encompassing environment consciousness.
- 5) Teacher training workshops should emphasize upon processes that catalyze the delivery of such integrated curriculum.

- 6) Around thirty percent of CAS activity can be made mandatory on educating, practicing and propagating environment sustainability.
- 7) The IBO should encourage the students to take up interdisciplinary extended essays and should award points to it.

Appendix 1: Questionnaire

Dear friends,

We look forward to your valuable inputs through this questionnaire to present our ideas on the above topic on behalf of JNS-IBDP team at IBAP Conference in Singapore.

We appreciate your comments and suggestions. Feel free to add the same at the end of the questionnaire.

a) What does “environment’ mean to you?

b) How do you gauge its importance?

c) Are you environmentally aware or environmentally conscious?

d) Do you think we need to spend more effort to practice this consciousness?

e) In our curriculum, should EVS remain a separate subject area or should it be integrated as a concept across all disciplines?

f) Cite reasons or arguments for your stance taken.

g) Give one concrete example of how would you integrate EVS as a concept with your subject curriculum.

h) Which are the other methods that u would like to introduce or share. .-----

i) How will you assess the learning and practice of these values taught.

Your valuable suggestions:

Name of the Teacher

Subject:

Appendix 2: Lesson Plan Format

Format of the lesson plan

Definition of environment sustainability adopted ;

Subject :

Class :

Name of the teacher :

Topic under discussion :

Module of the syllabus :

Learning objectives :

Methodology adopted :

Skills and competencies developed, related to the IB student learner profile :

Resources used :

Learning outcome :

Reflections :

Signature of the teacher

Appendix 3: English Lesson Plan

Format of the lesson plan;

Definition of environment sustainability adopted;

According to the Environmental Stewardship Initiative environmental sustainability refers to meeting the needs of the present without compromising the ability of future generations to meet their needs. (<http://www.p2pays.org/ref/38/37967.pdf>).

Subject: English

Class: Grade XI

Name of the teacher : Sabiha Al -Issa

Topic under discussion: Prose passage from the novel 'Zanzibar' by Giles Foden pertaining to coral reefs .

Module of the syllabus: Commentary writing

Learning objectives :

1. To write a commentary on the given passage according to IB assessment criteria ;
2. To foster clear awareness of, and concern about , economic, social, political and ecological interdependence in urban and social areas.

Methodology adopted:

1. The procedure for commentary writing was followed.
2. Awareness and concern about economic, social, political and ecological interdependence in rural, urban and social areas was also fostered as the passage refers to damage to coral reefs due to the irresponsible practices of fishermen who were unaware of the ill-effects of their actions .
3. The students were made to realize that the balance of natural ecosystems and Cultural heritage can be affected by unplanned or unwise human use of resources. The resulting problems can be so severe that changes in management Practices and human lifestyles are necessary to protect the cultural environment or Allow ecosystems to, if possible, rebuild their ecological balance. Poor choices may affect the wellbeing and lifestyle of future generations.

Skills and competencies developed, related to the IB student learner profile:

1. Developing commentary writing skills ;
2. Awareness and concern for the environment in its totality – natural, cultural, technological and social;
3. Create new patterns of behavior of individuals, groups and society as a whole towards the environment.

Resources used; Power point presentation on coral reefs and their importance.

The approach to literature that deals with man's relationship to nature is Ecocriticism. This approach analyses the response of the writer to the environment, as well as the attitude and awareness of the protagonists in the literary work towards nature. It deals with the subject in many ways – for instance, the impact of industrialization on nature that William Wordsworth was concerned about. In his novel, 'Things Fall Apart', Chinua Achebe focuses on the self-sustaining richness of the African forest.

Learning outcome: The students have shown an understanding and awareness of the economic, social, political and ecological interdependence in social and urban areas. They realize the extent of the damage and are concerned about the reefs

One student terms it an "inhuman and evil" act to "to exterminate other organisms for personal gain". He sees it as an "injustice meted out to innocent animals ."

Write a commentary on one passage only. It is not compulsory for you to respond directly to the guiding questions provided. However, you are encouraged to use them as starting points for your commentary.

1. (a).

He pulled down the mask and dived.

Sea light. Sea life, too, but not much of it. He looked from side to side through the oval mask. The first thing he saw was a starfish, clinging to a rock. They never failed to make him think of someone's hand, fingers outstretched. Then: nothing, just the white bed of sand, dotted with more rocks. He felt ghostly, knowing again that pull of the waves in his blood – an immemorial, homeland sense that went beyond words, beyond explanation.

He spotted something intriguing. Below him on the seabed were two glassy green lumps: as if somebody had taken a couple of spoonfuls of jello and, very carefully, half covered them with sand. Taking a breath through the snorkel he swam down, enjoying the familiar pressure in his head. He was about half way to the lumps when the sand abruptly levered up beneath him – lifted up flat before dispersing in a fizzing cloud. Out of the turbulence – slowly appearing, then sliding away at some speed – came a black rubbery triangle. Two meters across, it tapered to a long, thin tail. Excitedly, Nick watched the ray scoot across the sand, tail dragging behind it like an old-fashioned radio aerial.

It took him about a quarter of an hour to reach the reef. Every minute, as he approached the line of battered coral, was like a revelation. As the skeleton of the main reef came closer, fish of every description began to weave around him. Some were breathtakingly beautiful, with names that told their story – butterfly fish, parrot fish, angel fish. Others were unlovely, but no less fascinating; and, once again, deserving of their names: gropers, puffer fish, goatfish, grunts... At the reef itself, a school of blue-lined yellow snappers enveloped him, some hundred strong. The way they brushed him tenderly with their fins was almost like a greeting.

He felt blessed. It wasn't just the fish. The reef itself was no less absorbing. It had the massive, accumulated energy of a great building. Like something in Rome or London. Maybe it was the way a reef built up, trapping sunlight over hundreds of years to produce calcium carbonate, a cathedral of light. The skeleton itself was fantastically complex: staghorn, plate, table, brain. Every type of coral he knew was here. Distinct yet conjoined, mainly white but streaked with the remnants of plant pigments, it really was like an edifice, the battlements of some elaborate castle out of a legend of doubtful authenticity.

Round him now in shafts of sunlight were species of living soft corals, transparent, or the faintest pink and lilac. He watched where the polyps reached out to collect plankton, flailing like a blind person or a baby in its cot. Only they weren't blind. They knew. And the sponges knew, and the anemones, and the

Appendix 4: French Lesson Plan

Format of the lesson plan;

Subject ; French B SL
Class; IBDP
Name of the teacher ; Ruma Sengupta
Topic under discussion ; The Environment
Module of the syllabus Report / interview / debate

Learning objectives ; - To learn vocabularies related to the above topic.
- To be able to write, understand and reproduce orally and in writing their opinion regarding the environmental issues – problems and solutions.

Methodology adopted - Students were introduced to texts and articles from newspapers and magazines. was discussed, new terms explained and they were encouraged to speak on what they feel about it, what their suggestions etc.

- Once the ground work (i.e. all new words/jargons were presented to them done, they were asked to do presentations on the environmental issues.

Skills and competencies developed, related to the IB student learner profile

- Ability to read, understand and write on the issue.
- Ability to interact and put forward one's opinion on the issue.

Resources used - Articles and pictures.

Learning outcome - Students were able to appreciate the importance of the issue.
- How and why it is a global concern.

Reflections - They were able to appreciate how life style, habits can Add to the problem or help in reducing the problem.
- They suggested certain practices which could be propagated as part of their CAS activity and some small habits which they should adopt as part of the solution.

Suggestions if any

signature of the teacher Ruma Sen Gupta

Appendix 5: Economics Lesson Plan

Format of the lesson plan;

Definition of environment sustainability adopted; Environmental sustainability refers to meeting the needs of the present without compromising the ability of future generations to meet their needs. (<http://www.p2pays.org/ref/38/37967.pdf>).

Subject; Economics

Class ; XI

Name of the teacher ; Charu Srivastava

Topic under discussion; Market failure

Module of the syllabus; Section -2

Learning objectives ; to make the students understand the conditions under which the market fails to accomplish optimal allocation of resources as a prerequisite for sustainability. The students should also understand the need for active government intervention to modify the existing mechanism of price determination.

Methodology adopted; Role of price mechanism in allocating resources —recapitulated.

Why does the market fail? —discussion

How can we correct market failure —power point presentation

Skills and competencies developed, related to the IB student learner profile; Analytical and critical thinking skills were furthered along with fostering a global perspective.

Resources used; article on the aviation fuel emitted which is a threat to the environment.

Power point presentation

Learning outcome; The students were able to understand the reasons leading to market failure and its impact on the allocation of resources. They were able to understand the multifaceted nature of this concept and were able to link it to efficiency in resource allocation.

Reflections; They were able to appreciate the existence of externalities and how it is important for us to take them into account if we have to cater to the objective of environment sustainability

Charu srivastava

✍ signature of the teacher

Appendix 6: B & M Lesson Plan

Format of the lesson plan :

Definition of environment sustainability adopted:

Environmental audit [Oxford]

- An assessment of the extent to which an organization is observing practices which seek to minimize harm to the environment.

Subject: Business and Management - Higher Level

Class: Grade XI

Name of the teacher: Ms. Nirmala Mary Rego

Topic under discussion: Corporate Social Responsibility

Module of the syllabus: Unit 1 Subject Guide Business & Management HL

Learning objectives :

- Awareness : To encourage students to become aware of the enormous responsibility of business to sustain the environment.
- Understanding : To develop a deeper understanding of the link between Business Management through Corporate Social Responsibility, Business Ethics, Stakeholder Analysis, Mission Statements, Brand Image, Advertising, Competitive Advantage and CAS, TOK, and Environmental Sustainability.
- Application and Exploration : To challenge students to think futuristically on entrepreneurial ventures that can be eco-friendly and profitable, thus sustaining the environment for future generations. [Paradigm shift towards third generation CSR]

Methodology adopted:

- Brainstorming
- Power point presentations
- Case study; hand outs
- Group discussion on film 'Erin Brockovich' and Bhopal Gas Tragedy
- Cooperative learning through Chart making and presentations

Skills and competencies developed, related to the IB student learner profile _____:

- Enquiring and reflecting on the impact of business decisions on the environment.

Appendix 7: EVS Activity Plan

Activity on Environmental Sustainability

Form yourselves into groups.

Let's name them as Gen I, Gen II, & Gen III

Each group will have a spokesperson to reflect on the activity.

Instructions :

Activity No : 1

A set of balls and other articles are placed in the centre.

One group at a time walks to the centre and pick up the items (no conditions applied)

After all the groups have picked up, record the status of the articles in the centre.

Comment on the articles acquired.

Activity No.2

There is a well in the centre of amphitheatre.

Fetch water for your group . (One group at a time)

See-

How much water is left?

Whether all the groups have got enough water.

Is the water adequate for future requirement?

Draw a parallel to the planet earth and comment based on your observations.

Appendix 8: Energy Consumption Calculations

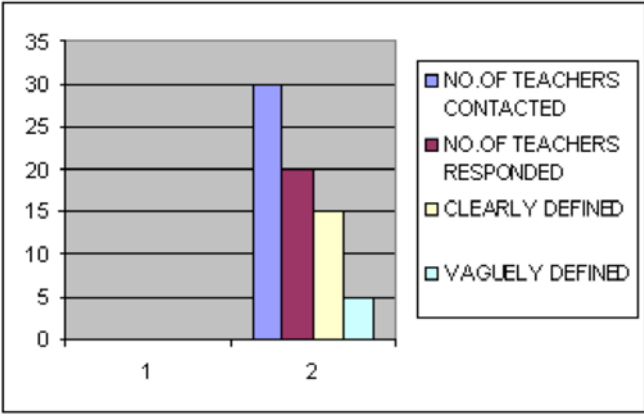
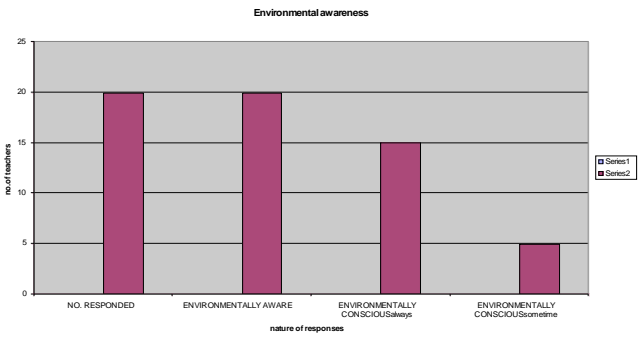
The Actual Load

West wing		Equipments												
Room No.		Lights						Fan						
	Type	Lumens Avg	Qty	Wattage	Hrs usage	KWH	Type	Qty	Wattage	Hrs usage	KWH	Total KWH	Power in Rs. @ 6 per unit	
Ground	W-1	Tube 40 w	149	6	40	7	1.68 36"	6	120	7	5.04	6.72	40.32	
	W-2	Tube 40 w	149	6	40	7	1.68 36"	6	120	7	5.04	6.72	40.32	
	W-3	Tube 40 w	180	6	40	7	1.68 36"	6	120	7	5.04	6.72	40.32	
	W-4	Tube 40 w	170	6	40	7	1.68 36"	6	120	7	5.04	6.72	40.32	
	W-5	Tube 40 w	160	6	40	7	1.68 36"	6	120	7	5.04	6.72	40.32	
	W-6	Tube 40 w	170	6	40	7	1.68 36"	6	120	7	5.04	6.72	40.32	
1st Flr	W-11	Tube 40 w	145	6	40	7	1.68 36"	6	120	7	5.04	6.72	40.32	
	W-12	Tube 40 w	149	6	40	7	1.68 36"	6	120	7	5.04	6.72	40.32	
	W-13	Tube 40 w	166	6	40	7	1.68 36"	6	120	7	5.04	6.72	40.32	
	W-14	Tube 40 w	149	6	40	7	1.68 36"	6	120	7	5.04	6.72	40.32	
	W-15	Tube 40 w	180	6	40	7	1.68 36"	6	120	7	5.04	6.72	40.32	
	W-16	Tube 40 w	190	6	40	7	1.68 36"	6	120	7	5.04	6.72	40.32	
2nd flr	W-21	Tube 40 w	150	6	40	7	1.68 36"	6	120	7	5.04	6.72	40.32	
	W-22	Tube 40 w	149	6	40	7	1.68 36"	6	120	7	5.04	6.72	40.32	
	W-23	Tube 40 w	162	6	40	7	1.68 36"	6	120	7	5.04	6.72	40.32	
	W-24	Tube 40 w	175	6	40	7	1.68 36"	6	120	7	5.04	6.72	40.32	
	W-25	Tube 40 w	168	6	40	7	1.68 36"	6	120	7	5.04	6.72	40.32	
	W-26	Tube 40 w	192	6	40	7	1.68 36"	6	120	7	5.04	6.72	40.32	
3rd Flr	W-31	Tube 40 w	184	6	40	7	1.68 36"	6	120	7	5.04	6.72	40.32	
	W-32	Tube 40 w	195	6	40	7	1.68 36"	6	120	7	5.04	6.72	40.32	
	W-33	Tube 40 w	200	6	40	7	1.68 36"	6	120	7	5.04	6.72	40.32	
	W-34	Tube 40 w	181	6	40	7	1.68 36"	6	120	7	5.04	6.72	40.32	
	W-35	Tube 40 w	190	6	40	7	1.68 36"	6	120	7	5.04	6.72	40.32	
	W-36	Tube 40 w	173	6	40	7	1.68 36"	6	120	7	5.04	6.72	40.32	
4h flr	W-41	Tube 40 w	186	6	40	7	1.68 36"	6	120	7	5.04	6.72	40.32	
	W-42	Tube 40 w	180	6	40	7	1.68 36"	6	120	7	5.04	6.72	40.32	
	W-43	Tube 40 w	190	6	40	7	1.68 36"	6	120	7	5.04	6.72	40.32	
	W-44	Tube 40 w	170	6	40	7	1.68 36"	6	120	7	5.04	6.72	40.32	
	W-45	Tube 40 w	180	6	40	7	1.68 36"	6	120	7	5.04	6.72	40.32	
	W-46	Tube 40 w	175	6	40	7	1.68 36"	6	120	7	5.04	6.72	40.32	
					7				7			0	0	
Central wing					7				7			0	0	
Ground	Canteen	Tube 40 w	83	6	40	7	1.68 36"	6	120	7	5.04	6.72	40.32	
	C-2	Tube 40 w	160	6	40	7	1.68 36"	6	120	7	5.04	6.72	40.32	
	C-3	Tube 40 w	180	6	40	7	1.68 36"	6	120	7	5.04	6.72	40.32	
	C-4	Tube 40 w	185	6	40	7	1.68 36"	6	120	7	5.04	6.72	40.32	
	Mandir	Tube 40 w	190	6	40	7	1.68 36"	6	120	7	5.04	6.72	40.32	
	1st Flr	C-11	Tube 40 w	112	6	40	7	1.68 36"	6	120	7	5.04	6.72	40.32
C-12		Tube 40 w	109	6	40	7	1.68 36"	6	120	7	5.04	6.72	40.32	
C-13		Tube 40 w	158	6	40	7	1.68 36"	6	120	7	5.04	6.72	40.32	
C-14		Tube 40 w	150	6	40	7	1.68 36"	6	120	7	5.04	6.72	40.32	
C-15		Tube 40 w	180	6	40	7	1.68 36"	6	120	7	5.04	6.72	40.32	
C-21		Tube 40 w	150	6	40	7	1.68 36"	6	120	7	5.04	6.72	40.32	
2nd flr	C-22	Tube 40 w	155	6	40	7	1.68 36"	6	120	7	5.04	6.72	40.32	
	C-23	Tube 40 w	144	6	40	7	1.68 36"	6	120	7	5.04	6.72	40.32	
	C-24	Tube 40 w	150	6	40	7	1.68 36"	6	120	7	5.04	6.72	40.32	
	C-25	Tube 40 w	140	6	40	7	1.68 36"	6	120	7	5.04	6.72	40.32	
	C-31	Tube 40 w	170	6	40	7	1.68 36"	6	120	7	5.04	6.72	40.32	
	C-32	Tube 40 w	109	6	40	7	1.68 36"	6	120	7	5.04	6.72	40.32	
3rd Flr	C-33	Tube 40 w	145	6	40	7	1.68 36"	6	120	7	5.04	6.72	40.32	
	C-34	Tube 40 w	182	6	40	7	1.68 36"	6	120	7	5.04	6.72	40.32	
	C-35	Tube 40 w	105	6	40	7	1.68 36"	6	120	7	5.04	6.72	40.32	
	4h flr	Hall	Tube 40 w	186	8	40	7	2.24 36"	8	120	7	6.72	8.96	53.76
		Hall	Tube 40 w	180	8	40	4	1.28 36"	4	120	4	1.92	3.2	19.2
		Hall	Tube 40 w	190	8	40	4	1.28 36"	4	120	4	1.92	3.2	19.2

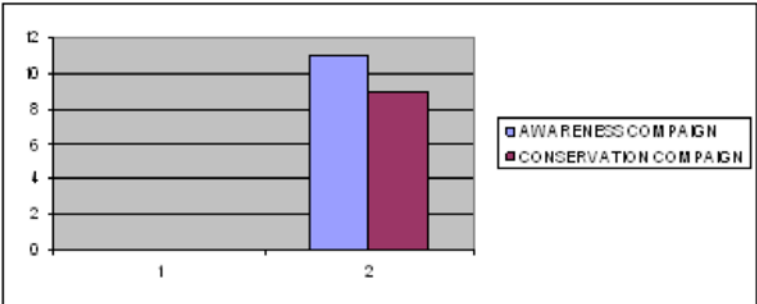
Energy Savings

West wing		Equipments													Power in Rs. @ 6 per unit	
Room No.	Lights							Fan						Total KWH	Power in Rs. @ 6 per unit	
	Type	Lumens	Av	Qty	Wattage	Hrs usage	KWH	Type	Qty	Wattage	Hrs usage	KWH				
Ground	W-1	Tube 40 w	149	4	40	6	0.96 36*	6	120	6	4.32	5.28	31.68			
	1 W-2	Tube 40 w	149	4	40	6	0.96 36*	6	120	6	4.32	5.28	31.68			
	1 W-3	Tube 40 w	180	4	40	6	0.96 36*	6	120	6	4.32	5.28	31.68			
	1 W-4	Tube 40 w	170	4	40	6	0.96 36*	6	120	6	4.32	5.28	31.68			
	1 W-5	Tube 40 w	160	4	40	6	0.96 36*	6	120	6	4.32	5.28	31.68			
	W-6	Tube 40 w	170	4	40	6	0.96 36*	6	120	6	4.32	5.28	31.68			
1st Flr	W-11	Tube 40 w	145	4	40	6	0.96 36*	6	120	6	4.32	5.28	31.68			
	1 W-12	Tube 40 w	149	4	40	6	0.96 36*	5	120	6	3.6	4.56	27.36			
	1 W-13	Tube 40 w	166	4	40	6	0.96 36*	5	120	6	3.6	4.56	27.36			
	1 W-14	Tube 40 w	149	4	40	6	0.96 36*	5	120	6	3.6	4.56	27.36			
	1 W-15	Tube 40 w	180	3	40	6	0.72 36*	5	120	6	3.6	4.32	25.92			
	1 W-16	Tube 40 w	190	3	40	6	0.72 36*	5	120	6	3.6	4.32	25.92			
2nd flr	W-21	Tube 40 w	150	4	40	6	0.96 36*	5	120	6	3.6	4.56	27.36			
	1 W-22	Tube 40 w	149	4	40	6	0.96 36*	4	120	6	2.88	3.84	23.04			
	1 W-23	Tube 40 w	162	3	40	6	0.72 36*	4	120	6	2.88	3.6	21.6			
	W-24	Tube 40 w	175	3	40	6	0.72 36*	4	120	6	2.88	3.6	21.6			
	W-25	Tube 40 w	168	3	40	6	0.72 36*	4	120	6	2.88	3.6	21.6			
	W-26	Tube 40 w	192	3	40	6	0.72 36*	4	120	6	2.88	3.6	21.6			
3rd Flr	W-31	Tube 40 w	184	3	40	6	0.72 36*	4	120	6	2.88	3.6	21.6			
	W-32	Tube 40 w	195	3	40	6	0.72 36*	4	120	6	2.88	3.6	21.6			
	W-33	Tube 40 w	200	3	40	6	0.72 36*	4	120	6	2.88	3.6	21.6			
	W-34	Tube 40 w	181	3	40	6	0.72 36*	4	120	6	2.88	3.6	21.6			
	W-35	Tube 40 w	190	3	40	6	0.72 36*	4	120	6	2.88	3.6	21.6			
	W-36	Tube 40 w	173	3	40	6	0.72 36*	4	120	6	2.88	3.6	21.6			
4th flr	W-41	Tube 40 w	186	3	40	6	0.72 36*	4	120	6	2.88	3.6	21.6			
	W-42	Tube 40 w	180	3	40	6	0.72 36*	3	120	6	2.16	2.88	17.28			
	W-43	Tube 40 w	190	3	40	6	0.72 36*	3	120	6	2.16	2.88	17.28			
	W-44	Tube 40 w	170	3	40	6	0.72 36*	3	120	6	2.16	2.88	17.28			
	W-45	Tube 40 w	180	3	40	6	0.72 36*	3	120	6	2.16	2.88	17.28			
	W-46	Tube 40 w	175	3	40	6	0.72 36*	3	120	6	2.16	2.88	17.28			
													0	0		
													0	0		
Central wing																
Ground	Canteen	Tube 40 w	83	6	40	6	1.44 36*	6	120	6	4.32	5.76	34.56			
	C-2	Tube 40 w	160	4	40	6	0.96 36*	6	120	6	4.32	5.28	31.68			
	C-3	Tube 40 w	180	3	40	6	0.72 36*	6	120	6	4.32	5.04	30.24			
	C-4	Tube 40 w	185	3	40	6	0.72 36*	6	120	6	4.32	5.04	30.24			
	Mandir	Tube 40 w	190	3	40	6	0.72 36*	6	120	6	4.32	5.04	30.24			
1st Flr	C-11	Tube 40 w	112	5	40	6	1.2 36*	5	120	6	3.6	4.8	28.8			
	C-12	Tube 40 w	109	6	40	6	1.44 36*	5	120	6	3.6	5.04	30.24			
	C-13	Tube 40 w	158	4	40	6	0.96 36*	5	120	6	3.6	4.56	27.36			
	C-14	Tube 40 w	150	4	40	6	0.96 36*	5	120	6	3.6	4.56	27.36			
	C-15	Tube 40 w	180	3	40	6	0.72 36*	5	120	6	3.6	4.32	25.92			
2nd flr	C-21	Tube 40 w	150	4	40	6	0.96 36*	4	120	6	2.88	3.84	23.04			
	C-22	Tube 40 w	155	4	40	6	0.96 36*	4	120	6	2.88	3.84	23.04			
	C-23	Tube 40 w	144	4	40	6	0.96 36*	4	120	6	2.88	3.84	23.04			
	C-24	Tube 40 w	150	4	40	6	0.96 36*	4	120	6	2.88	3.84	23.04			
	C-25	Tube 40 w	140	4	40	6	0.96 36*	4	120	6	2.88	3.84	23.04			
3rd Flr	C-31	Tube 40 w	170	3	40	6	0.72 36*	4	120	6	2.88	3.6	21.6			
	C-32	Tube 40 w	109	6	40	6	1.44 36*	4	120	6	2.88	4.32	25.92			
	C-33	Tube 40 w	145	4	40	6	0.96 36*	4	120	6	2.88	3.84	23.04			
	C-34	Tube 40 w	182	3	40	6	0.72 36*	4	120	6	2.88	3.6	21.6			
	C-35	Tube 40 w	105	6	40	6	1.44 36*	4	120	6	2.88	4.32	25.92			
4th flr	Hall	Tube 40 w	186	3	40	4	0.48 36*	3	120	4	1.44	1.92	11.52			
	Hall	Tube 40 w	180	3	40	4	0.48 36*	3	120	4	1.44	1.92	11.52			
	Hall	Tube 40 w	190	3	40	4	0.48 36*	3	120	4	1.44	1.92	11.52			
	Hall	Tube 40 w	170	3	40	4	0.48 36*	3	120	4	1.44	1.92	11.52			
	Hall	Tube 40 w	180	3	40	4	0.48 36*	3	120	4	1.44	1.92	11.52			
													0	0		
East Wing																
Ground	E-1	Tube 40 w	149	4	40	6	0.96 36*	6	120	6	4.32	5.28	31.68			
	1 E-2	Tube 40 w	149	4	40	6	0.96 36*	6	120	6	4.32	5.28	31.68			
	1 E-3	Tube 40 w	180	3	40	6	0.72 36*	6	120	6	4.32	5.04	30.24			
	1 E-4	Tube 40 w	170	3	40	6	0.72 36*	6	120	6	4.32	5.04	30.24			

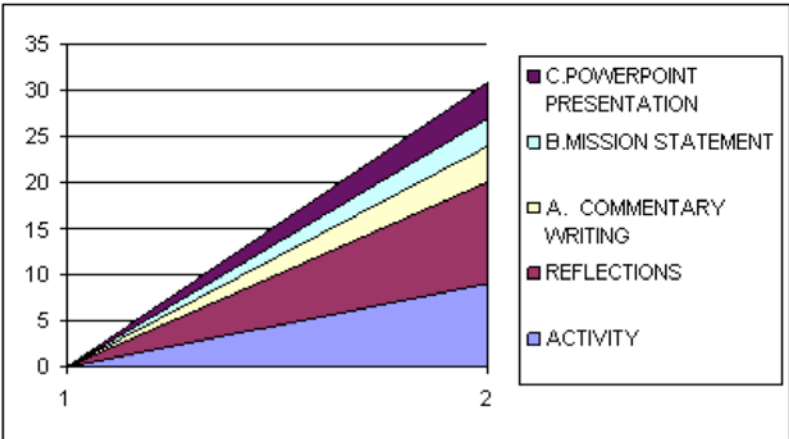
Appendix 10: Research findings

RESPONSES TO QUESTIONNAIRE NO 1			
Q.1	MEANING OF THE TERM 'ENVIRONMENT':		
	NO.OF TEACHERS CONTACTED	30	
	NO.OF TEACHERS RESPONDED	20	
	CLEARLY DEFINED	15	
	VAGUELY DEFINED	5	
			
Q.2	HOW DO YOU GAUGE ITS IMPORTANCE ?		
	NO. RESPONDED	20	
	GLOBAL WARMING	8	
	CLIMATE CHANGE	7	
	NATURAL DISASTERS	3	
	ANY OTHER RESPONSES	2	
Q.3	ARE YOU ENVIRONMENTALLY AWARE OR CONSCIOUS?		
	NO. RESPONDED	20	
	ENVIRONMENTALLY AWARE	20	
	ENVIRONMENTALLY CONSCIOUS	15	
	(ALWAYS)		
	ENVIRONMENTALLY CONSCIOUS	5	
	(SOMETIMES)		
			
Q.4	MORE EFFORTS NEEDED :		
	RESPONSES	20	
	YES, DEFINITELY	17	
	NO, (IT DOESN'T	3	
Q.5	SHOULD EVS BE SEPARATE OR INTEGRATED?		
	RESPONSES	20	

	REMAIN SEPARATE	5	
	INTEGRATED	15	
Q.6	THERE ARE AREAS IN THE IB CURRICULUM WHICH CAN ADDRESS THIS ISSUE. GIVE ONE CONCRETE EXAMPLE		
	RESPONSES	20	
	DID NOT GIVE EXAMPLE (VAGUE RESPONSE)	13	
	CONCRETE EXAMPLE	7	
Q.7	OTHER METHODS :		
	AWARENESS CAMPAIGN	11	
	CONSERVATION CAMPAIGN	9	

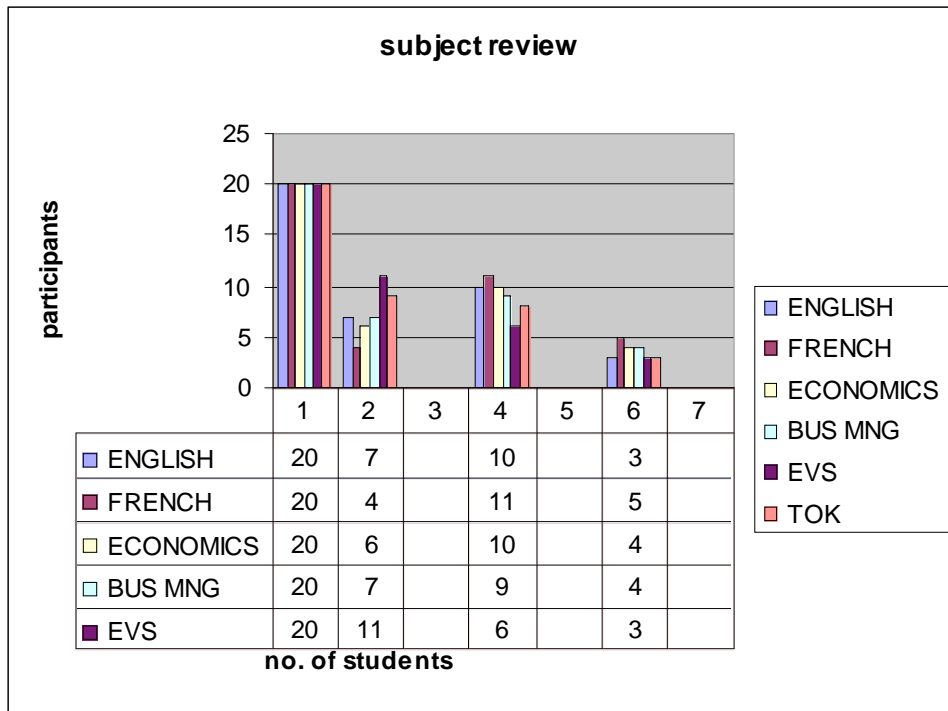


Q.8	ASSESS LEARNING AND PRACTICE :		
	ACTIVITY	9	
	REFLECTIONS	11	
	A. COMMENTARY WRITING	4	
	B.MISSION STATEMENT	3	
	C.POWERPOINT PRESENTATION	4	



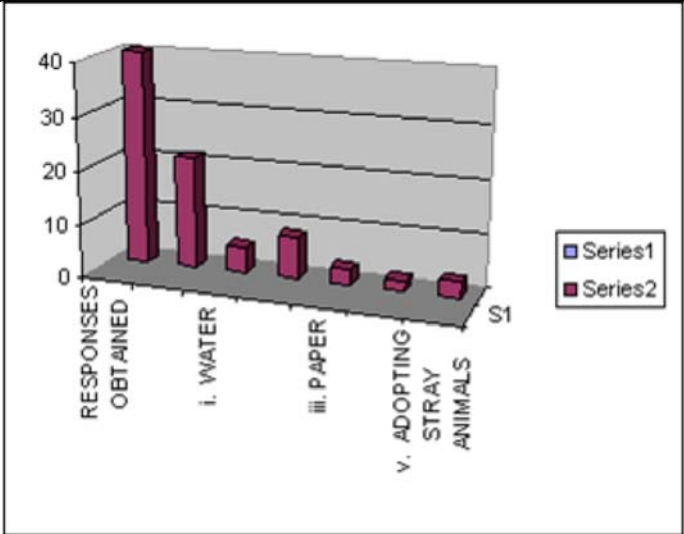
SUBJECT REVIEW :

Subject	NO. OF STUDENTS	COMPREHENSIVE UNDERSTANDING	MODERATE UNDERSTANDING	VAGUE UNDERSTANDING
ENGLISH	20	7	10	3
FRENCH	20	4	11	5
ECONOMICS	20	6	10	4
BUS MNG	20	7	9	4
EVS	20	11	6	3
TOK	20	9	8	3

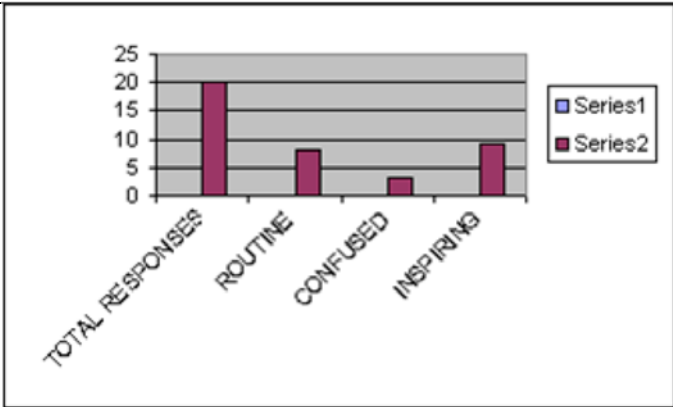


RESEARCH FINDINGS OF FINAL QUESTIONNAIRE POSED TO STUDENTS																	
1	MEANING OF ENVIRONMENTAL SUSTAINABILITY :																
	RESPONSE OBTAINED	20															
	USED MOST KEY WORDS/ GOOD UNDERSTANDING	13															
	USED SOME KEY WORDS/ PARTIAL UNDERSTANDING	5															
	CONFUSED RESPONSES/ VAGUE UNDERSTANDING	2															
	<table border="1"> <caption>Data for Chart 1: Meaning of Environmental Sustainability</caption> <thead> <tr> <th>Response Category</th> <th>Series 1</th> <th>Series 2</th> </tr> </thead> <tbody> <tr> <td>RESPONSE OBTAINED</td> <td>0</td> <td>20</td> </tr> <tr> <td>USED MOST KEY WORDS/ GOOD UNDERSTANDING</td> <td>0</td> <td>13</td> </tr> <tr> <td>USED SOME KEY WORDS/ PARTIAL UNDERSTANDING</td> <td>0</td> <td>5</td> </tr> <tr> <td>CONFUSED RESPONSES/ VAGUE UNDERSTANDING</td> <td>0</td> <td>2</td> </tr> </tbody> </table>	Response Category	Series 1	Series 2	RESPONSE OBTAINED	0	20	USED MOST KEY WORDS/ GOOD UNDERSTANDING	0	13	USED SOME KEY WORDS/ PARTIAL UNDERSTANDING	0	5	CONFUSED RESPONSES/ VAGUE UNDERSTANDING	0	2	
Response Category	Series 1	Series 2															
RESPONSE OBTAINED	0	20															
USED MOST KEY WORDS/ GOOD UNDERSTANDING	0	13															
USED SOME KEY WORDS/ PARTIAL UNDERSTANDING	0	5															
CONFUSED RESPONSES/ VAGUE UNDERSTANDING	0	2															
2	WHAT I DO CHANGES THE WORLD?																
	RESPONSES OBTAINED	20															
	OPTIMISTIC	13															
	PESSIMISTIC	6															
	BLANK	1															
	<table border="1"> <caption>Data for Chart 2: What I Do Changes the World?</caption> <thead> <tr> <th>Response Category</th> <th>Series 1</th> <th>Series 2</th> </tr> </thead> <tbody> <tr> <td>BLANK</td> <td>0</td> <td>1</td> </tr> <tr> <td>PESSIMISTIC</td> <td>0</td> <td>6</td> </tr> <tr> <td>OPTIMISTIC</td> <td>0</td> <td>13</td> </tr> <tr> <td>RESPONSES OBTAINED</td> <td>0</td> <td>20</td> </tr> </tbody> </table>	Response Category	Series 1	Series 2	BLANK	0	1	PESSIMISTIC	0	6	OPTIMISTIC	0	13	RESPONSES OBTAINED	0	20	
Response Category	Series 1	Series 2															
BLANK	0	1															
PESSIMISTIC	0	6															
OPTIMISTIC	0	13															
RESPONSES OBTAINED	0	20															
3	ADOPTION OF LIFE STYLE PRACTICES																
	RESPONSES OBTAINED	40															
	A. CONSERVING RESOURCES	21															
	i. WATER	5															
	ii. ENERGY/ELECTRICITY	8															
	iii. PAPER	3															
	iv. WILD LIFE	2															
	v. ADOPTING STRAY ANIMALS	3															
	B. FINDING ALTERNATIVES :	19															
	i. RECYCLED BAGS	3															
	ii. RECYCLED PAPER	4															

	iii. BICYCLE	2
	iv. BUCKET	4
	v. CONSUMING LOCALLY PRODUCED FOOD	6



4	SLOGANS :	
	TOTAL RESPONSES	20
	ROUTINE	8
	CONFUSED	3
	INSPIRING	9



Appendix 11: Examples of Integration

GROUP 1

ENGLISH A1

Paper1 –

This is the easiest place to incorporate various ‘issues’ as teachers could select passages/poems that have scope for such discussions.

Paper 2 -

- A. Schools could consciously select a text from the Prescribed World Literature List and Prescribed Book List, which highlights/touches upon environmental concerns.
- B. The easiest way to insert a text which is not on the Prescribed World Literature List and Prescribed Book List, would be to add it into Part 4 of the syllabus ‘School’s Free Choice’ – the only part of the syllabus where schools are allowed to deviate from the prescribed list of texts. This does not require a change in the construction of the course, only a conscious effort from the school to address the issue.
- C. The IB English course could be modified to include at least 1 compulsory text that focuses on Eco-criticism. It could be another criterion for syllabus construction along with the compulsory 4 World Literature texts for HL & 3 World Literature texts for SL. 1 text that focuses on Eco-criticism could be a mandatory text for Part 4 to avoid too many changes in the syllabus.

Integrating environmental studies with economics – proposed linkages

TOPIC	LINK TO ENVIRONMENT SUSTAINABILITY
Defining economics	Scarcity of resources and there alternate uses. Problem of making the right choice.
Resources and factors of production	Interlink ages between the economy and the environment. Environment provides resources and acts as a waste sink.
Positive and normative statements	Growth Vs development issue
Defining natural resources	Encompass the concept of critical natural capital
Concept of opportunity cost	Inter-temporal trade off
Distinction between free and economic goods	Absence of market for free goods stressing on there importance and changing status
Alternative indicators of development	Green GNP
Externalities	Concept of social cost and market correction
Value added method of calculating national income	Intermediate consumption component ,use of non renewable resources should be stressed, we are not accounting for the actual damage done
Crowding out theories	Use demand side policies to increase consumption and hence resources and then increase government expenditure to adopt measures to conserve the environment.
Protectionism	Environmental standards and practices and the ad-hoc involved.
Sources of economic growth	Natural resources and environmental assessment
Consequences of growth	Irreversible damage to the environment
Sustainable development	efficiency Vs equity

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Linda Kogan (2006

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