

Environmental education in Tobago's primary schools: a case study of coral reef education

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Abstract: Environmental education is a relatively new area on the primary school curriculum of Trinidad and Tobago. Because of the close relationship between human activities and the degradation of the natural environment in Tobago, environmental education will become increasingly important to the preservation and conservation of the island's fragile natural resources. Current teaching methods rely heavily on text books and utilise a lecture style that does not promote student interaction. Unfortunately, these methods are not very conducive to environmental education. As such, this paper examines a pilot program in which staff from the Buccoo Reef Trust taught students from 15 primary schools about coral reefs using interactive tools and hands-on methods as described in *People & Corals: an Education Package for Primary Schools (People & Corals)*. The pilot program ran over an eight week period with prepared lessons being taught every two weeks and student evaluations taking place once before the first lesson and once after the last lesson. The lessons were supplemented with a field trip to a coral reef ecosystem. Despite several challenges that were faced in the implementation process, the overall outcome of the pilot program was successful. Teachers and students reacted positively to the information that was being shared, thereby reinforcing the effectiveness of using a dynamic, active method of teaching to advance environmental education.

Key words: environmental, education, Tobago, coral, primary school.

Education in Trinidad and Tobago is focused on traditional subject areas such as Science, Social Studies, Mathematics, Language Arts and Arts and Crafts, which do little to introduce students to environmental issues and their related social issues in Trinidad & Tobago. In an effort to address these shortcomings, the Division of Curriculum Development in the Ministry of Education has sought to incorporate environmental concepts into the Science and Social Studies syllabi. While the new Science and Social Studies curricula reflect environmental issues, the method by which teachers deliver these concepts has remained the same.

Current teaching methods reflect a heavy reliance on textbooks, note taking and regurgitation of information with very little critical thinking and linking of related concepts and

ideas. In addition, students are confined to the classroom and inactive for the majority of the day – which is unnatural for any child. None of these situations is conducive to teaching environmental material, which is of itself, very dynamic and encourages or even requires personal interaction with the material.

The Buccoo Reef Trust has recognised this shortcoming and has set about to change the way environmental material is taught. The organization has initiated a project focused on educating primary school students in Tobago about the environment, with emphasis on their own marine environment. This paper examines this project in the context of changing or improving the delivery of environmental material so that it is effective and has a beneficial impact on both Tobago's society and the physical environment.

TOBAGO'S NATURAL ENVIRONMENT AND RELATED HUMAN INTERACTION

Trinidad and Tobago are the two most southerly islands of the Caribbean chain. Tobago is the smaller of the two islands and lies approximately 41.6 km to the northeast of Trinidad (John 1996). Tobago is 42 km in length and 12 km at its widest part. There is a Main Ridge of hills in the centre, which runs northeast to southwest for approximately two-thirds the length of the island. The south-western side of the island is flat and comprises a coastal plain of coral terraces (Anonymous 1998).

Tobago has various natural resources at its disposal. The Main Ridge holds the oldest legally protected forest reserve established in the western hemisphere. The reserve was established in 1765 at the insistence of Soame Jenyns, Member of Parliament for Cambridge (Environment TOBAGO, unpublished). Also located in Tobago are mangrove wetlands, sea grass beds and coral reef systems. These coastal and marine ecosystems are located all around the island with the most popular one – the Buccoo Reef Complex – being located in the southwest.

These natural environments, especially the aquatic ones, are faced with many threats. These include solid waste pollution from littering and illegal dumping of rubbish; sewage pollution from households, resorts and yachts; destruction of wetlands for development; soil erosion from indiscriminate vegetation removal; and loss of wildlife due to over hunting, over fishing and habitat destruction. One common denominator that unites these threats is that they are anthropogenic in nature. Human behaviour and interaction with the natural environment is proving to be very detrimental. However, unlike other forms of threats, these can be reversed over time. The most effective way of achieving this reversal is through education.

The people of Tobago are generally unaware of the direct and indirect effects their actions are having on their natural environment. For example, the Buccoo Reef Complex, which

consists of the oldest and largest fringing reef on the island, a lagoon and a mangrove swamp, is rapidly being destroyed by a combination of human actions. The mangrove areas are being cleared to accommodate rapid housing developments that characterise the southwest end of the island. As a result of this clearing, valuable habitat is lost and sediment loading into the lagoon and subsequent reef system is causing serious harm to marine life.

Another more serious problem is the presence of high nutrient loading in the waters of the Buccoo Reef Complex. Water quality tests have shown that nutrient loading is very high in this area but the point source of these nutrients has not been successfully identified. It is suspected though that improper treatment of sewage from housing complexes and hotels bordering the Buccoo Reef Complex is responsible for the heavy nutrient loading. The impact of this pollution is evidenced by the excessive growth of algae on corals (Lapointe 2003).

The Buccoo Reef is a major tourist attraction for Tobago and many individuals ply their trade by taking tourists out on glass bottom boats to view the corals. However, poor practices such as reef walking and the dropping of anchors are partially responsible for the loss of coral life on the reef. Also, when the tide is low, the bottoms of boats frequently scrape the surface of the coral causing them to break.

All these actions are rapidly killing an important natural resource of the island of Tobago. People are aware that the reef is endangered, but they are not aware that their individual activities are the major reason behind the loss of this magnificent treasure. It is in instances such as this where environmental education and awareness become extremely important in stemming and eventually reversing the tide of destruction.

BUCCOO REEF TRUST'S SOLUTION

In light of the aforementioned environmental degradation, especially of the marine environment, the Buccoo Reef Trust has begun

educating the general public about the problems that exist. A film entitled "Buccoo Reef: To Rescue and to Restore" was made in collaboration with the Tobago House of Assembly to sensitise individuals to the challenges and opportunities for restoring Buccoo Reef. This film has been aired frequently on local and national television.

The Trust has also developed a programme titled B.E.A.C.H., which is the acronym for Building Environmental Awareness and Appreciation of Coastal Habitats. This programme is the umbrella under which all environmental awareness and education projects of the Trust will take place. The scope of the B.E.A.C.H. programme will span primary and secondary schools, youth groups and the community at large. Under this programme, the Trust has begun educating primary and secondary school students about the marine environment. Currently, upper level secondary students are participating in a vacation programme titled "Sea, Sun and Science – a Marine Science Experience," which exposes them to the marine environment in a hands-on manner and introduces them to potential career opportunities of local relevance. Some primary school students in Tobago have also been exposed to marine environmental education.

PRIMARY SCHOOL ENVIRONMENTAL EDUCATION IN TOBAGO

The Buccoo Reef Trust began educating primary school students in the final term of the school year (May 2003 to July 2003). Fifteen primary schools were selected by a committee of principals, teachers and facilitators, to participate in the pilot phase of this project. One of the 15 schools chosen had learning disabled students. The objectives of this project were to sensitise students to the coastal environment and the interdependence of land and sea; to help them make informed decisions regarding their impact on the environment; to generate a keen understanding of and appreciation for the marine sector; and to provide training and

resources to teachers to facilitate the successful delivery of environmental material.

In order to minimise disruption to the current school programme, the Trust's education programme targeted students in the standard third level (ages 8-9) of the schools. This level was chosen because students were at the point in their science syllabus where they would be exposed to "aquatic life – marine, sea, beach, [and] rocks – [the] natural environment" (Anonymous 1999). *People & Corals* was used as the basis for teaching the students. This education pack was developed by the Caribbean Conservation Association to assist in teaching concepts in the primary school curriculum. Primary schools in Barbados, St. Lucia, Dominica, Antigua and Jamaica have used this aid to deliver key environmental concepts within their school curriculum.

In Tobago, this type of teaching aid is a novelty because it does not utilise the traditional method of teaching where students are passive learners. Instead, the material is delivered using visual aids (posters, pictures, and actual specimens), games and other activities that allow the students to embrace the material through active learning and self enquiry. Students are motivated, have fun and are readily encouraged to relate personal stories about their interaction with the environment. It is because of this dynamic, interactive learning style, along with the content of the book (see Appendix 1), that the Buccoo Reef Trust selected this guide to help implement the programme.

PROJECT IMPLEMENTATION

Seven lesson plans were developed using the first three topic areas covered in *People & Corals*. A separate set of lessons was developed for the learning disabled students. The concepts were the same but the actual content was much simpler. Prior to the delivery of these lessons, a pre-evaluation of the students was done to determine their level of environmental knowledge and awareness. The questions in the evaluation were designed to be interactive

and fun (see Appendix 2). There were short answer questions, word puzzles, diagrams and pictures. After the pre-evaluation process was completed, Buccoo Reef Trust personnel began going into the schools to facilitate the delivery of the lessons.

The initial aim was to deliver one lesson per week, with the assistance of the class teachers, and reinforce the material with relevant field trips. However, only the first three lessons covering the first topic were delivered. These lessons were delivered once every two weeks because several factors placed limitations on when the material could be taught. Firstly, the school term was only 10 weeks long and there were several other conflicting activities taking place that schools were required to participate in. These issues might have been overcome with better planning and coordination.

Another constraint was the lack of Buccoo Reef Trust personnel to introduce and deliver the designed lessons at the predetermined rate of one lesson per week. There were only two people employed – one full time, one part-time – to implement this project in the 15 schools. The final constraint in delivering the material was the lack of resources. Non-traditional teaching aids, such as power point presentations, using multimedia projectors and video footage, were employed to deliver some of the lessons. Lack of equipment meant that Buccoo Reef Trust personnel could not split up to deliver the material effectively. The lack of equipment also limited how the material was presented to the students.

Despite limitations, the project proceeded. The first lesson was carried out using a power point presentation coupled with interactive handouts for the students. The second lesson was illustrated with actual specimens, posters and interactive handouts (Fig. 1). The final lesson was taught using posters, mock demonstrations and video footage. All concepts were illustrated and reinforced with local examples.

Students were encouraged to create folders in which handouts and other related materials could be kept. In some instances, the material

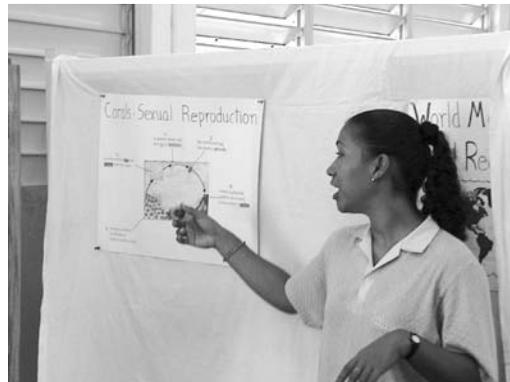


Fig. 1. Buccoo Reef Trust Staff using a poster to illustrate Coral Sexual Reproduction.

received was put into the science or social studies work book.

Lessons for the learning disabled students were all activity based and very visual. Concepts were introduced and reinforced using photographs, pictures and drawings that could be coloured, videos, word puzzles and local examples.

On the weeks that Buccoo Reef Trust personnel did not go to a school, teachers were encouraged to review and reinforce the material with the students and where possible move ahead in teaching some aspects of the lessons that did not require Buccoo Reef Trust personnel to be present. For example, one teacher used dramatisation to help students understand the concept of how coral polyps feed and by extension, how the coral reef grows. Some students portrayed different types of coral while others portrayed plankton. They came to life as a coral reef using different movements to characterise their various roles.

The pilot project culminated with a field day where students were exposed to the environment they were learning about. They had a tour of the Buccoo Reef (Fig. 2); walked through the mangrove wetlands at Buccoo; played a coral reef survival game and did a “reef rap” (Fig. 3). The coral reef survival game helped reinforce good and bad conditions for coral reef growth and the “reef rap” introduced students to animals and plants on

the reef through poetry, rap, song, dance, choral speaking and drama.

The students were also able to see a physical model of a watershed (Fig. 4) which introduced the interdependence of land and sea and showed how ecosystems work together to maintain a balance. They saw, through this model, how human activities on land affect what happens in the sea.

The project closed with a post-project evaluation of the students. Some questions that were asked in the pre-evaluation were repeated in the post-evaluation process. The teachers were also asked to evaluate the merits of the programme from the point of view of the teaching method used, the type of material taught and the potential for cross-curricula linkages.

DISCUSSION

On initial review, the project was a success. Students were very enthusiastic about the subject matter. In fact, when students completed the pre-evaluation form, they wanted to know when next Buccoo Reef Trust personnel would be coming to teach them. During the delivery of the lessons students were very vocal – asking questions and volunteering responses and experiences. Many showed initiative and further interest by venturing out to the beach to search for shells and corals and indicating willingness to share what they were being taught with their parents and friends.

The teachers were very receptive, accommodating and cooperative in the delivery of the lessons. Although the material being taught was also new to all of them, they interjected throughout the lessons to explain the material in a way that was more familiar to the students. This type of collaboration was crucial to the success of the project because the teachers were the ones who knew the students most intimately. They knew their strengths and their weaknesses and how best to ensure that all the students grasped the concepts.

Many teachers expressed the need for this type of project and all lauded the use of



Fig. 2. Students on tour of the Buccoo Reef.



Fig. 3. Students perform a "reef rap".



Fig. 4. Buccoo Reef Trust staff illustrating how a coastal model works.

multimedia technology, games, and other interactive activities as effective teaching tools. They recognised the inadequacy of the school curriculum in covering environmental issues and were grateful for a reliable source of

information to help them deliver not only the Science and Social Studies syllabi, but also Geography, Arts and Crafts, and Language as well. Some were able to use the material to enhance vocabulary, as well as spelling and reading comprehension.

The teachers also acknowledged the difference in the students' reaction to the material being taught. The students were more excited, animated and willing to learn. This last observation was very evident in the arts and crafts projects that the Buccoo Reef Trust personnel provided to the students. These projects included making a coral colony out of egg cartons; making a pop-up coral reef; and making a coral reef in a bottle complete with plankton (Fig. 5). Many students also drew and coloured pictures of coral reefs to display in their classrooms and their bedrooms.

A careful perusal of the evaluation forms indicated that the students did retain and understand the concepts they were taught. This is a wonderful sign that the method of fostering active learning was effective in transferring information. It shows, on a preliminary basis, that this is a viable method of teaching about the environment. Further study using this teaching method will have to be done over an extended period of time before significant results can be confirmed.

In order for this to become a more widespread method of advancing environmental education, teachers need to have access to information in its various forms, including text, photographs, posters, videos. They also need equipment to share the material in a more dynamic form. Buccoo Reef Trust and Environment Tobago, the pioneer environmental NGO in Tobago, are poised to assist teachers in obtaining environmental information but because of monetary constraints these organisations are unable to provide complete technological and hardware assistance.

Environmental education is a very important field because it is the process by which individuals receive the information they need to make informed and enriched decisions about



Fig. 5. Students looking at a piece of coral reef in a bottle.

how to treat the environment. If environmental education is not carried out effectively then nature will continue to be exploited and future generations will be robbed of the benefits we receive now. As such, it is imperative that the methods used to teach people about the environment be effective and generate positive reactions to the plight of the natural environment. Fostering active learning and encouraging personal interaction with nature seems to lead to further inquiry, the need for knowledge and understanding, and eventually to positive changes in behaviour. A recent report by the North American Association for Environmental Education and the National Environmental Education & Training Foundation has also shown that students exposed to environmental education, and by extension environment-based education, have a better chance of becoming "high-performance, lifelong learners, effective future workers and problem solvers, thoughtful community leaders and participants, and people who care about the people, creatures, and places around them" (Anonymous 2001). These interactive methods of environmental education are demonstrably worth pursuing.

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making it such a wonderful, successful experience. I also acknowledge the continued support of the Buccoo Reef Trust staff, especially Kelly Mannette, who gave unstinting assistance in the delivery of the educational material.

RESUMEN

La educación ambiental es un área relativamente nueva en los currículos de las escuelas primarias de Trinidad y Tobago. Debido a la relación entre las actividades humanas y la degradación del ambiente natural, la educación ambiental va a ser cada vez más importante para la preservación y conservación de los frágiles recursos naturales de la Isla de Tobago. Los métodos de enseñanza actuales se basan principalmente en libros de texto y utilizan un estilo de lectura que no promueve la interacción de los estudiantes. Desafortunadamente, éstos métodos no son ideales para la educación ambiental. Así, este artículo examina un programa piloto en el que trabajadores del "Buccoo Reef Trust" enseñaron a estudiantes de 15 escuelas primarias acerca de los arrecifes coralinos usando herramientas interactivas y métodos manuales. Este programa piloto tuvo una duración de ocho semanas, con lecciones cada dos semanas y dos evaluaciones para los estudiantes: antes de la primera lección y después de la última. Las lecciones se complementaron con una gira de campo a un ecosistema de coral. A pesar de algunas dificultades en el proceso de implementación, en general el programa fue un éxito. Los profesores y estudiantes reaccionaron positivamente a la información compartida, reforzando

así la necesidad de usar métodos dinámicos y activos para mejorar la enseñanza en educación ambiental.

Palabras clave: Ambiente, educación, Tobago, corales, escuelas primarias.

REFERENCES

- Anonymous. 1998. Food and Agriculture Organization of the United Nations, Forestry Policies in the Caribbean Volume 2: Reports of 28 Selected Countries and Territories. FAO Forestry Paper No.137, Rome, Italy. 559 p.
- Anonymous. 1999. Revised Primary Science Curriculum. Trinidad and Tobago. 9 p.
- John, G.M. 1996. Quantitative Characterisation of Land-Based Sources of Marine Pollution in the Vicinity of the Buccoo Reef Marine Park, Tobago. MS Thesis, Univ. West Indies, Cave Hill, Barbados, pp. 5.
- Lapointe, B.E. 2003. Impacts of Land-Based Nutrient Pollution on Coral Reefs in Tobago. Buccoo, Tobago. 2 p.

INTERNET REFERENCES:

- Anonymous. 2001. Using Environment-based Education to Advance Learning Skills and Character Development. North American Association for Environmental Education, Washington, D.C. (Downloaded: June 15, 2003, <http://www.neetf.org/pubs/EnviroEdReport.pdf>).

APPENDIX 1

Contents

| | |
|--|---------|
| Introduction | i - xiv |
| Topic 1 Coral Reef Environment | |
| 1.1 Why are corals important? | 7 |
| Topic area: The value of coral reefs | |
| 1.2 How much area do corals cover? | 8 |
| Topic area: The area of ocean covered by coral reefs | |
| 1.3 Who shares our home? | 9 |
| Topic area: The importance of coral for reef fish and other animals. | |
| 1.4 What is coral? | 10 |
| Topic area: Corals as living organisms (polyps) | |
| 1.5 What is a polyp? | 12 |
| Topic area: The structure of coral polyps | |
| 1.6 What do polyps do? | 13 |
| Topic area: The behaviour of polyps. | |
| 1.7 What do polyps need to live? | 14 |
| Topic area: Ideal growing conditions for corals. | |
| 1.8 How do coral colonies grow? | 16 |
| Topic area: Polyps growth: coral forms (asexual reproduction). | |
| 1.9 How does a coral get about? | 18 |
| Topic area: The colonisation of new areas (sexual reproduction). | |
| Topic 2 Biodiversity | |
| 2.1 What is biodiversity? | 23 |
| Topic area: The concept of biological diversity. | |
| 2.2 Shall we look more closely at coral reefs? | 25 |
| Topic area: The major groups in coral reefs. | |
| 2.3 Why is biodiversity important? | 26 |
| Topic area: Introducing the links within coral reef communities. | |
| 2.4 What is a food web? | 27 |
| Topic area: Food webs in coral reefs. | |
| 2.5 Visiting the fish market? | 29 |
| Topic area: Coral reef fish as a local resource. | |
| 2.6 Where are the richest places? | 31 |
| Topic area: The links between important shore habitats. | |
| Topic 3 Fishing | |
| 3.1 What food comes from a coral reef? | 35 |
| Topic area: Coral reef fish as food. | |
| 3.2 How have the fisheries changed over the years? | 36 |
| Topic area: Historical changes in fishing | |
| 3.3 Fishing in St Lucia | 37 |
| Topic area: Interpreting a local fisherman's story. | |

| | |
|--|----|
| Topic 4 Tourism and coastal development | |
| 4.1 Is my island any different? | 41 |
| Topic area: Comparing impacts in different Islands. | |
| 4.2 Tourism word search | 42 |
| Topic area: A tourism and development related word search. | |
| 4.3 Should the sale of coral reef curios be allowed? | 44 |
| Topic area: A role play looking at this local issue. | |
| 4.4 Sport and coral reefs...is there a link? | 46 |
| Topic area: The potential impact of beachfront tourism on coral reefs. | |
| 4.5 Is all development good or bad? | 48 |
| Topic area: Coastline developments. | |
| 4.6 Are we building on shifting sands? | 49 |
| Topic area: Coastal and beach dynamics. | |
| 4.7 What should we choose? | 51 |
| Topic area: Balancing environmental and development needs. | |
| 4.8 Can we play Coral Bingo? | 53 |
| Topic area: Reviewing features and impacts related to tourism and development. | |
| Topic 5 Pollution | |
| 5.1 Where does pollution come from? | 57 |
| Topic area: The types and causes of pollution. | |
| 5.2 Where are the creepy chemicals? | 60 |
| Topic area: The impact of agriculture and landuse. | |
| 5.3 How much litter is there in our schools? | 63 |
| Topic area: The impact, causes and solution to litter. | |
| 5.4. How does your pollution compare to other islands? | 65 |
| Topic area: Contrasting pollution impacts between islands. | |
| Topic 6 Positive Action | |
| 6.1 Positive vibes? | 69 |
| Topic area: Personal roles in litter problems | |
| 6.2 Cleaning the beach? | 70 |
| Topic area: Beach clean ups | |
| 6.3 How do you become a Super Ranger? | 72 |
| Topic area: Becoming a committed citizen | |
| 6.4. Marine protected areas | 73 |
| Topic area: Looking at conservation regulations | |
| Glossary | 75 |
| Contact Addresses | 77 |
| Further reading | 78 |
| Appendices | |
| Posters: Coral reef habitats of the Virgin Islands | |
| Negril Coral Reef Junior Rangers pack | |
| Identification chart: Major fish and sea food families on Caribbean markets | |



People and Corals

People and Corals



APPENDIX 2

Primary school environmental education programme pre-evaluation form

Name _____ School _____

Please try to answer the following questions:

1. Have you ever been to:

- A beach? yes no Name the beach _____
- A coral reef? yes no Name the reef _____
- A wetland? yes no Name the wetland _____
- A lagoon? yes no Name the lagoon _____
- A forest? yes no Name the forest _____

1. Can you think of 3 reasons why coral reefs are important?

- (i) _____
- (ii) _____
- (iii) _____

2. Can you list 5 activities (e.g. fishing) that you can do at the beach?

- (a) _____ (b) _____ (c) _____
- (d) _____ (e) _____

3. Circle those things that are living and underline those things that are non-living:

Sand mangrove mud jellyfish coral algae rain fishing boat

4. The following are names of animals that live on or near coral reefs. Can you unscramble them?

- (a) oblerst _____ (b) ueenq chonc _____
- (c) ntama ayr _____ (d) urelft _____
- (e) bradracua _____ (f) arrtposhif _____

5. Draw a smiley face J next to those things that are good for the environment.

Draw a frowny face L next to those things that are bad for the environment:

- | | | |
|-------------------------|---------------|--------------------|
| sewage | not littering | garbage |
| tree planting | oil spill | sand mining |
| re-using Chubby bottles | land clearing | not eating turtles |

6. The puzzle below has the names of animals, activities and things related to the marine environment hidden within it. Find the words: plankton, beach, brain coral, diving, grouper, sand, polyp, fishing, sailing, tourism, sponge, sea weed.

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| B | R | A | I | N | C | O | R | A | L |
| R | H | C | A | E | B | H | L | T | O |
| P | D | D | I | V | I | N | G | O | S |
| L | R | E | P | U | O | R | G | U | A |
| A | B | E | A | N | C | S | N | R | I |
| N | X | W | F | R | Q | P | I | I | L |
| K | S | A | N | D | M | O | H | S | I |
| T | I | E | S | G | V | N | S | M | N |
| O | E | S | O | F | T | G | I | Y | G |
| N | P | Y | L | O | P | E | F | S | B |

- (b) Write the words above under the correct heading below:

| Animal | Plant | Activity | Thing | Place |
|--------|-------|----------|-------|-------|
| | | | | |