

Trading Books for Boats

Designing an Interactive Marine Science
Education Program



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Introduction

Trading Books for Boats is an interactive marine science program based on the principle of "learning through doing".

The *Trading Books for Boats* program was developed by ACAP Humber Arm for the Bay of Islands and Humber Valley regions of western Newfoundland. This program provides students with a highly interactive means of studying oceanography focused on their home region. Participants learn about their coastal area and relevant marine issues, rather than learning about issues facing coastal areas in other provinces or countries. They also develop a sense of ownership for the local area and an appreciation for their important role in coastal management. This program also provides an opportunity for participants to actively participate in some of the marine quality testing methods covered in their text books.

This electronic guide contains all the information you will need to introduce an effective and successful experiential learning program, such as *Trading Books for Boats*, for your area.

In the end people will only conserve that which they love, love that which they understand and understand that which they are taught.

Teach a Child, Shape the Future.

Getting Started

The rewards of establishing an experiential learning oceanography program such as Trading Books for Boats in your region are vast and long lasting. The successful launch of such a program, however, requires dedicated planning on the part of you and your team. With the following easy steps you should be well on the way to providing the youth in your area with a meaningful and memorable learning experience:

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Finding Your Target Audience

One of the first things you must determine is who is the target audience for this program you are about to establish. In determining your target audience, you may want to consider the following questions:

- ◆ Are you going to target students through the school system or would you prefer to work with local youth groups like the girl guides or boy scouts?
- ◆ Are you considering focusing the program on youth but offering it during the summer months?
- ◆ Are you interested in targeting adults?

Once you have determined your target audience, you need to ensure that they will participate. If you are targeting established groups, such as schools or youth groups, you will want to make contact with those groups early in the process to ensure the program is developed to meet the needs of the group(s). For example, a program designed to target a secondary institute would focus on the curriculum objectives for a specific grade or course, whereas a program for Boy Scouts would focus more on badge requirements. Where your target audience may not be as formalized, such

as a summer program or a course targeting adults, you may want to identify organizations in your area that are used to working with these individuals and can provide guidance on how to make your program appealing to the target group. The YMCA, municipal summer programs or outdoor clubs are a great place to start. It is crucial that when you begin to solicit participants, you are able to show them a direct connection between what it is you are offering and the objectives of the group.

The media is another great ally when trying to launch a new program. Involve them from the very beginning, they will help spread the word and generate support for your program. Take advantage of every possible promotion opportunity whether it is a booth at a community fair or a speech to the local chamber of commerce. Oh, and don't forget to invite media and community leaders to participate in your program once it has started, so they can experience the program first-hand.

Establishing Partnerships

Another crucial step in developing an interactive marine science program is to establish partnerships with the key organizations you will need to deliver the program. In determining whom to approach as potential partners you must first determine what they have to contribute and how they will benefit. The table below provides some general suggestions:

Organization	Possible Contribution	Potential Benefits
Teachers	When involved at the earliest stage they can ensure that the program you design is connected to curriculum	Enhanced learning activity for both the students and teachers
School Boards	Same as teachers Assist with ground transportation (bussing) Provide access to teachers Lend credibility to the worthiness of the learning experience Provide some funding	Enhanced learning activity for both the students and teachers

Organization	Possible Contribution	Potential Benefits
Youth Leaders	When involved at the earliest stage they can ensure that the program you design is connected to the interests of their group	Are provided with an enhanced learning activity for their youth
Marinas/Yacht Club	Provide a venue	Good Public Relations May generate some revenues through rental of space
Government Departments	Funding Provision of materials Expertise	Good Public Relations
Non-Governmental Organizations	Provision of materials Expertise Human Resources	Good Public Relations Integration of their own 'message'

Set Program Objectives

Once you have determined your target audience you can work with your partners to determine objectives for your program. If, as in the case of ACAP Humber Arm, you are working with schools you will want to match your program objectives to the prescribed curriculum outcomes. Your local school board or a teacher will prove very helpful in making this connection. For youth groups you may want to match your program objectives to the criteria established by the specific organization (i.e. program objectives or badge requirements). Again, solicit input from a leader with that organization to ensure the program fits the organization. Perhaps your target audience does not have a formal structure or specific requirements (i.e. tourist or general public); if this is the case you can develop the program objectives to convey the message of your organization or for a general content.

Scheduling your Program

When determining the schedule for your program there is really two considerations:

- ◆ What time of the year will your program be offered?
- ◆ What is the availability of your audience and staff?

What time of the year?

Once you have determined your target audience, you will need to consider what time of the year is the audience available (i.e. school groups only available from September to June, where as youth groups may be available year round. Consult the group(s) to determine what time of the year would offer the highest guarantee of their participation. In the case of ACAP Humber Arm as the target audience was school students; this meant the program had to be offered during the school year.

The second major consideration in scheduling your program is the weather in your local region. To ensure the safety and comfort of your participants, you should schedule the program during times with relatively calm and predictable weather. In the case of ACAP Humber Arm it was decided to offer the program early in the fall, when weather is still relatively mild. (To accommodate the weather considerations, school board officials asked that teachers covered the oceanography section early in the semester so that it coincided with the Trading Books for Boats program. This would give the students a better idea of the purpose and scope of the materials covered in the program).

Daily Schedule

The daily schedule for your program will again very much depend on your target audience. In developing your daily schedule you may want to consider the following questions:

- ◆ How much time are they willing to give to participating in the program?
- ◆ Based on their ages, how long can you reasonably expect to keep their attention?
- ◆ How much time will you need to deliver the full message and meet the expectations of your audience?

The classroom component could be delivered at a separate time from the boat component or you may choose to deliver both components back to back. This decision depends upon the time you have available and the attention span of your target audience. For example, if working with a children's group that only meets for an hour or two a week you may chose to deliver the classroom component one week and the boat component the next. In the case of ACAP Humber Arm, where the participants are junior high school

students and they are available for the day (approximately 6 hours), both components of the program are delivered on the same day.

Selecting a Venue

Selecting a venue is an important step, as it will act as your base of operations for the entire program. In selecting a venue you may want to consider the following:

- ◆ Is the venue able to accommodate the number of participants we expect?
- ◆ Will the venue allow us to leave our learning stations set up for the duration or must these be taken down and stored every night?
- ◆ Is the venue conveniently located for transporting participants to and from?
- ◆ Is the venue reasonably priced (or free!)?
- ◆ Does the venue provide easy access to the boat?

Depending on how you wish to offer the program the above questions may be of varying importance to you.

ACAP Humber Arm utilizes the Bay of Islands Marina as the venue for its Trading Books for Boats Program. It has a large meeting room that is easily converted into a classroom with adequate space for the learning stations. It is also the home dock for the chartered vessel used in the program and is very reasonably priced. In agreeing to provide a home for the Trading Books for Boats program the Bay of Islands Marina has received some great publicity and promotion (especially helpful when they go to government looking for funding for facilities enhancement or expansion).

Securing a Boat

One of the most important tasks is securing a safe boat with a flexible and reliable crew. While budgetary factors are always a concern, safety has to be paramount. Any vessel you charter must be:

- Certified to carry passengers (and the number you expect);
- Licensed and safety inspected;
- Man by a trained and experience crew;

- Fully insured and willing to assume liability for passengers while on board.

Any credible boat operator should be willing to provide you with copies of their vessel certification, inspection papers, insurance policy, training certificates, resumes and criminal certificates of all personal they will employ for the program and letters of reference from previous clients.

Boat operators should also be willing to take you for a 'test ride' prior to entering into any contract. During your 'test ride' you will want the captain to show you:

- Passenger loading and debarking procedures (can they accommodate those who have mobility impairments);
- Navigation and communications systems;
- Safety equipment (pfd's, life vessels, fire extinguishers, etc.);
- Washroom facilities.

In securing a vessel, you will also want to discuss the associated costs. Will they charge you an hourly rate, a per participant rate, a flat daily rate or a flat rate for the entire contract? Depending on what you intend to offer you will have to determine which option is best for you.

Don't forget to ask about rate policies in the event trips are cut short or cancelled due to inclement weather.

In the case of ACAP Humber Arm boat services are secured through a call for proposal. Over the last number of years only one proponent has successfully met the stringent criteria that have been put in place. Rates have been a flat rate for the program based on the number of expected participants as provided by the local school board. The boat operator outlines the safety measures to all participants prior to boarding the vessel and gives an onboard tour prior to departing the dock. The boat operator assumes all liability for participants and has the authority to cancel or cut short any trip due to safety concerns.

Any cancelled trips are rescheduled without additional costs.

Budgeting

This program can be an expensive one but it also offers great potential for securing in kind contributions and leveraging funds from other sources. In preparing your budget you will want to consider the costs of:

- Human Resources
- Boat Charter
- Venue Rental
- Ground Transportation
- Supplies
- Funding Sources

Human Resources

How you decide to offer your program will determine the number of people you need for the delivery. ACAP Humber Arm's Trading Books for Boats program is targeted at students. Once the class arrives at the venue, the group is split in half to make the numbers more manageable. Half of the students start the program with the classroom session while the remaining students start with the boat sessions (students switch sessions mid day). Splitting the class and offering the sessions simultaneous requires two 'instructors'. ACAP Humber Arm employs staff in these positions but depending on the nature of your program you may chose to use reliable volunteers.

It is also great to have an extra set of eyes on the boat as the instructor and captain will be occupied with their own responsibilities. As ACAP Humber Arm offers its program to schools it requires the teachers to fill this role of 'chaperone'. You may decide to arrange a similar agreement with the organizations you are targeting.

Boat Charter

The chartering of a fully certified and licensed boat could be your biggest expense. While you may be tempted to take less expensive options you should never compromise the safety of your participants. Try negotiating a special rate with a responsible boat operator or finding a corporate sponsor. Participant fees have been introduced by ACAP Humber Arm but were only implemented after the program had been established and proven for several years.

Venue Rental

The costs of securing a venue will depend on the size of the space you will require and the length of time it will be needed. Local venues may agree to waive any associated fees in return for the positive media that are sure to receive. ACAP Humber Arm has negotiated a discounted fee to cover basic cleaning and utilities for its venue.

Ground Transportation

Based on your target audience you will have to decide if you want to provide transportation to and from your venue or make that the responsibility of the participants. ACAP Humber Arm has entered into an agreement where the local school board provides all bussing required to have their students participate in the program.

Supplies

The most costly supply you will need is the equipment for the field tests (plankton tows, microscopes, DO meters, etc.) You may already own these, if not try borrowing them from a local university or government department. If you intend to offer this program more than once you may wish to invest in your own equipment. The amount of equipment you will need will depend on the number of participants per sessions. With approximately 15 participants per session ACAP Humber Arm utilizes three full sets of equipment.

In addition to your field equipment you will also want to budget for display material for the learning centers and printing costs for the student workbooks.

Funding Sources

If you are not in a position to finance this initiative yourself you may want to solicit funds from corporate and private sectors in your community. Many organizations and businesses have a vested interest in maintaining a healthy coastline and supporting public environmental education. These organizations may have funds set aside for community enhancement projects.

If corporate support is hard to secure, it may be necessary to charge your participants a small fee to cover some of the costs of the program. This may, however, be a deterrent to attracting first time participants.

In the case of the ACAP Humber Arm project, 'start-up' funding was provided by government and community partners. Once the participant base was built up, a small participant's fee was introduced, in an effort to reduce the reliance on government funding.

Classroom Component

The benefit of a program such as Trading Books for Boats is that it teaches through experiential learning. This should be kept in mind when creating the classroom component of your program. The focus should not be on replicating a typical classroom setting but rather creating an interactive learning environment where multimedia presentations are complemented with hands-on learning opportunities for your participants.

Multimedia Presentation

The multimedia presentation should be designed to address the objectives you developed for your program. You may want to consult with a key contact from your target audience group to ensure that the presentation fulfills their needs and expectations. For example, if you are working with a Boy Scouts group, have one of the Scout Leaders review the presentation in advance to ensure it fulfills the requirements of the particular program or badge.

Your multimedia presentation should also focus on your local region, unless otherwise specified by your target audience. The benefit after all in developing this type of program is the ability to incorporate local examples and provide participants with a greater understanding and appreciation of their local coastal environment.

The multimedia presentation should be designed in a manner to encourage discussion with the participants. Ask the participants questions about the local area in order to get them involved. You may also choose to stop the presentation at strategic points to have your participants visit one of the interactive learning stations.

For a closer look at how the classroom component could be organized please examine the ACAP Humber Arm example

The ACAP Humber Arm Example

The ACAP Humber Arm Trading Books for Boats Program was designed to target grade nine students in the Bay of Islands area (Western School

Board). The presentation was developed based on the grade nine sciences Environmental Quality Unit. ACAP Humber Arm worked with the school board to ensure that the program fulfilled the learning objectives outlined for that unit by the Province.

The presentation developed by the ACAP Humber Arm is divided into two sections, the first section focuses on aquatic habitats and water quality and the second section examines human impacts on aquatic environments.

The section on habitat and water quality presents a definition of habitat, characteristics of a healthy habitat and an examination of some water quality indicators (i.e. pH balance, temperature, dissolved oxygen (DO) level, nutrient levels, turbidity, total and fecal coliform levels). The water quality indicators discussed in the classroom session are the same as those tested in the boat component of this program. The purpose of this section is to provide students with the necessary background to perform the field test in the boat component, although this information is covered again during the boat component.

The human impact section examines the effects of human use on water quality. This section is tailored to the issues or concerns from the immediate and surrounding area (i.e. Bay of Islands). Students were asked to participate in this section of the presentation by suggesting any aquatic habitat or water quality issues they were aware of in the surrounding area. This section concluded with suggestions for mitigating human impacts, where possible examples of mitigation methods from the area were utilized. For example, the primary industrial use on the Humber Arm is the Corner Brook Pulp and Paper Limited (CBPPL) mill; prior to 1997 CBPPL discharged its wastewater, untreated, into the Humber Arm. However, in 1997 the mill implemented a wastewater treatment plant. Students are also presented with some of the measures they as individuals can take to mitigate their impact on the aquatic environment (i.e. recycling, water conservation, waste management etc.).

The presentation takes approximately 30-40min, depending on the amount of student participation.

Learning Stations

The learning stations present an opportunity to depart from a standard classroom environment and allow participants to conduct various hands-on activities related to the program objectives. The learning stations also provide a great opportunity to involve partners in your program. In creating the learning stations you may want to consult with local environment groups, government departments or post secondary institutions. Many of these partners may be able to provide you with the materials required for the learning stations or may even agree to be responsible for establishing a particular station themselves. For example, if you have decided to include oil spill prevention and remediation as one of your topics why not contact your local oil spill response organization to include them in your program?

In creating your learning stations you will also need to be cognizant of the amount of supervision that will be required. If you will only have one instructor available for the classroom component, you may want to set up the learning stations in such a way that participants can carry out the activities with little supervision; more complex learning stations can be developed if you have the personnel to provide the assistance to your participants.

The number of learning stations will vary depending upon the scope of material you wish to cover and the time available. The learning stations chosen by the ACAP Humber Arm focused on:

- Industrial Effluent Treatment
- Oil Spill Prevention and Remediation
- Marine Debris
- Your Coastal Environment
- Municipal Wastewater Treatment

Industrial Effluent Treatment

This learning station provided a detailed look at the wastewater treatment system implemented by Corner Brook Pulp and Paper Limited in 1997. This station included a flow chart and diagram of the treatment system. Samples from each stage of treatment were available for participants to view and compare. As an outcome of this learning station participants should have gained an understanding of wastewater composition prior to entering the

treatment system and differences in various treatment types (i.e. physical, biological and chemical).

Oil Spill Prevention and Remediation

At this station participants discussed possible sources of oil pollution in the Bay of Islands and then narrowed in on small spills from pleasure boaters and fishing boats in particular. The participants examined the contents of a spill kit designed for pleasure boaters and review the applications of the various items. The impact of oil on bird feathers was demonstrated as participants compared an oiled and non oiled bird feather through a microscope.

Marine Debris

This station provided examples of marine debris and natural debris collected from the local coastal area. A marine debris timeline outlining the amount of time it takes various types of marine debris to biodegrade in a marine environment was provided. Participants were challenged to think about the impacts on marine life of specific examples of marine debris.

Your Coastal Environment

This learning station allowed participants to learn a little more about their local coastal environment. Information was provided on local history, water quality, potential pollution sources and physical factors of the Bay of Islands.

Wastewater Treatment

The display defined terms associated with wastewater treatment (i.e. effluent and influent) and examined three degrees of wastewater treatment (primary, secondary, and tertiary). The display also demonstrated some of sewage treatment methods currently being utilized in the Humber Valley/Bay of Islands area.

Workbook

You may want to develop a short workbook to focus the participants' attention on specific aspects of the work stations and presentation. If your participants will be evaluated on their performance in the program, the

workbook can also provide an evaluation tool for the teachers or group leaders.

In developing the work book you will once again want to work very closely with representatives from you targeted participants group. This will ensure the relevancy of the workbook and entire learning experience to the objectives of the program.

Boat Component

The boat component is the highlight of the program for many participants but to ensure that this component is both safe and educational requires plenty of advanced planning.

Safety Instructions

Before boarding the boat it is crucial that all participants are properly informed of safe boating practices. This safety session should be conducted by an experienced boater (i.e. the captain of the boat). Some of the issues that you will want to cover include:

- Distribution of and instruction on how to put on a PFD;
- Difference between a lifejacket and a PFD;
- Hypothermia and the importance of conserving body energy in cold water;
- Importance of having a whistle on the lifejacket and why the whistle should only be used in case of an emergency;
- What role the Coast Guard plays in distress calls in your particular area;
- Emergency features of the boat;
- Importance of remaining seated at all times while boat is moving;
- Respect for the scientific equipment - the equipment being used is quite expensive and should be treated with care;
- Respect for others property. If the program takes place at a marina, participants are reminded that other boats are private property and are off limits.

Locating Test Site

Several factors must be taken into consideration when determining a test site, these include:

- Weather - Finding an area that is sheltered from the wind is very important, as it will make testing more enjoyable and safer for all participants. While you may want to have test sites pre-selected you must be flexible - the weather may force you to change your location.
- Diversity - If data is going to be collected, it's a good idea to survey as many test areas as possible. If your program is going to

run for extended periods of time, you may also want to revisit sites to compare results from earlier testing.

- **Time Restraints** - If you have limited time available for the boat session, it is best to pick locations close to your launch site. The purpose of this program after all is to allow participants the opportunity to conduct the tests, not to spend all your time steaming to and from a site.

Field Tests

The main purpose behind the boat component is to allow your participants the opportunity to conduct water quality tests themselves. This requires the full attention of your participants, which may be challenging in such a scenic environment. For this reason, it is important to allow ample opportunity for each participant to conduct the water quality test; the more involved they are in the water quality testing component, the easier it is to hold the attention of the participants.

You may also want to adapt the workbook you created for the classroom component to require participants to record their notes and observations. This can then be used for evaluation purposes or to establish a water quality database.

The water quality tests you choose to conduct will depend on the objectives of your program and the equipment available. In the case of ACAP Humber Arm the following tests were conducted:

GPS location

Dissolved Oxygen/Temperature

Salinity

Turbidity

Plankton Tow

Prior to conducting each test the instructor will want to provide clear direction on the proper testing method. Participants should also be engaged in a discussion as to why certain tests are conducted and the implications for water quality.

GPS location

GPS locations are taken using a handheld GPS system (i.e. Magellan GPS 2000 XL). If a handheld GPS is unavailable, it is possible to use a GPS onboard the charter boat. Several ideas on GPS/map and compass can be covered in this section such as:

- Why a GPS is often used in science testing (to land mark a site for future reference)?
- What are the benefits/negative aspects of using a GPS system?
- Which would rather use in the woods? GPS or compass?
- Explain that GPS uses batteries/fragile/not always possible to get reading etc;
- Benefits of using a compass (cheap, light, accurate etc).

Do an experiment. Get the group to pretend they are lost and tell them they have to walk north to get home. Get the group to point to which direction they think is north. Chances are they will point in multiple directions. Show them where north is and why a compass is a cheap and beneficial tool in finding direction.

Dissolved Oxygen/Temperature

Participants' measure dissolved oxygen and temperature using a dissolved oxygen/temperature digital meter. This is not the only device that may be used to measure oxygen levels, as there are many makes and models to choose from. Use the piece of equipment that best suits your needs.

Topics covered on dissolved oxygen and temperature are (but are not limited to):

- Is there oxygen in the ocean?
- What types of organisms require oxygen in an oceanic environment?
- How do they obtain this oxygen?
- How do you know for sure there is oxygen in water?
- What is the current water temperature?
- Can you name several factors that affect water temperature in your particular area?
- Can you name several factors that influence oxygen levels in water?
- How might pollution/waste affect dissolved oxygen levels?

Salinity

Participants collect water samples and examine salinity levels by using a portable salt refractometer. This is an excellent system as it is quite user friendly and easy to calibrate but other devices may be used based on your needs.

Discussion on salinity could include:

- What is salinity?
- Why is salinity important?
- How might changes in salinity affect aquatic organisms?
- What are some factors that affect salinity levels in the ocean?

Turbidity

Turbidity is studied using a secchi disk on a calibrated line. If the line is not calibrated when purchased, you will want to mark it indicating 10 cm increments. You may also want to mark it at each meter. This will make it easier for the participants to identify measurements once the secchi disk is placed in the water.

Questions on turbidity could include:

- What is turbidity?
- What is important about turbidity?
- What is the major organism that is affected by turbidity?
- What happens if turbidity levels are high?
- What affects turbidity?

Plankton Tow

Plankton samples are retrieved using a plankton tow and placed in test tubes or magnifying boxes for ease of viewing.

Your participants will want to discuss:

- What are plankton?
- What are the two types of plankton?
- Why is plankton important?
- What eats plankton for food?
- What can impact plankton levels in ocean environments?

All About ACAP Humber Arm

ACAP Humber Arm encompasses twelve communities surrounding the Humber Arm, Bay of Islands region. All of these communities are situated close to the water's edge; many of the people who settled these communities relied upon the sea for a livelihood. Human use of the marine and coastal area has begun to change in the Bay of Islands; however the ocean remains an important element of the economy and quality of life in the area. A combined population of 37, 906 makes the Humber Arm, Bay of Islands the most densely populated region on the West coast.

The Humber Arm Environmental Association was formed in 1991 address citizen concerns about the effects of municipal sewage on Atlantic salmon frequenting the Humber River. In 1992 the Government of Canada announced creation of the Atlantic Coastal Action Program and tasked the Humber Arm Environmental Association as the deliverer of the program for the Humber Arm region.