

Appropriate Technology Educational Models

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Table of Contents	Page
Problem and Background Statement.	1
Goals and Objectives.	3
Weighing Alternatives.	4
Implementation of Strategies.	6
Monitoring and Evaluations.	8
Appendix 1.	9
Appendix 2.	10
Appendix 3.	11
Appendix 4.	12
Group Time Sheet.	13
Individual Timesheets.	14
References.	15

Problem Background and Statement

Appropriate technology as defined by the HSU Campus Center for Appropriate Technology is:

- a way of providing for human needs with the least impact on the Earth's finite resources
- a site specific technology that performs exceptionally for its particular environment
- should involve and develop community

With more than 6.5 billion people in the world today, the actions of others greatly affect the quality of life available in the future for ourselves and generations to come. The need for appropriate technology education is becoming more and more evident every day as we continue to consume fossil fuels, pollute our waters and air and waste our natural resources.

The fact that our society has internalized various unsustainable practices and made them conventional is a testament to the lack of education about appropriate technology. Appropriate technology is a current way of thwarting environmental degradation in our world, but with limited educational resources it has obstacles to overcome. In general, examples of appropriate technology are not being taught in public schools and children are limited to other means to be introduced to such technologies. Instructors feel as if these ways of doing and thinking about problems are inefficient or too far from the ordinary that they may feel threatened by the prospect of teaching them or using them in a lesson. This is a significant hurdle to overcome, when considering the constant barrage of unsustainable practices that threaten the planet and its resources. There is a need for a way to present appropriate technology in an understandable and easy to implement manner. By doing this in one way or another, we may be able to overcome this obstacle and further the use of appropriate sustainable technology.

The problem has been outlined as a need to teach appropriate technology to people in order to develop a more sustainable society. This can best be accomplished through teaching because this has long been proven as the best method to incite change in society. By teaching appropriate technology in school, we can shape the wants of the future and insure that we pass down the desire for a sustainable society.

Hands-on learning activities have been overshadowed in recent years by the increased usage of electronic devices for information gathering. While tools such as the internet are undeniably effective for obtaining incredible amounts of information very quickly, the impacts of hands-on activities and communication in the education process are second to none.

The Campus Center for Appropriate Technology (CCAT) has long found this to be true through their residential living demonstration and their on-site education seminars and workshops, which have been essential to the programs popularity and success over the years. Other programs focusing on the same goal also exist within the local community. The Redwood Coast Energy Authority (RCEA) has found hands on learning

opportunities to be beneficial. They have recently installed four demonstration centers that allow for hands on learning and exploring. Yet another center that has benefited from hands on learning is the Blue Ox School. The high school program provides hands on learning opportunities for such tasks as blacksmithing, ceramics, woodworking and printing projects.

The predominant limiting factor in the implementation of appropriate technology demonstrated by CCAT, RCEA or the Blue Ox School is their site specific demonstration tools. Considering that a person was seeking to incorporate appropriate technology in the classroom environment, they would have to visit a center such as CCAT, RCEA or the Blue Ox School in order to do this. This is a problem for many obvious reasons. The very geographic isolation of Humboldt County is one problem. Another problem is the difficulty of travel during winter conditions. These problems necessitate the creation of some way to approach people with a readily available method of teaching appropriate technology in a hands-on manner that can be accessible to all.

The points of the Problem that need to be addressed specifically are as follows:

- CCAT and other appropriate technology centers do not provide information that is available to all people
- People must visit appropriate technology centers in order to view demonstrations and appropriate technology at work
- Appropriate technology is not being taught effectively
- Appropriate technology is not being implemented enough
- There are too few hands on opportunities for learning appropriate technology

These problems necessitate the creation of some way to approach people with a readily available method of teaching appropriate technology in a hands-on manner that can be accessible to all.

Goals and Objectives

Goals 1.1

The goals of the sustainability project are to:

1. Provide a way for CCAT to share appropriate technology with the greater public without being inhibited by their location.
2. Effectively teach appropriate technology in a hands-on manner.
3. Use hands-on learning in order to increase the implementation of appropriate technology.

Objectives 1.1

The objectives to completing the above goals are as follows:

1. By May 19, 2006 CCAT will have an alternative method for sharing appropriate technology with all Humboldt County Residents.
2. By May 19, 2006 CCAT will have hands-on education materials that are portable, durable, and self-sufficient. These educational materials will be geared for the general public, being easy to use by people of all learning styles, varying ages, and most levels of prior knowledge.
3. By May 19, 2006 CCAT will be using the aforementioned educational materials in an effort to increase the implementation of appropriate technology.
4. By May 2, 2006 a report detailing the creation of these educational materials will be created.

Weighing Alternatives

The alternatives for the sustainability project were developed through a rigorous process of collaboration and creation. There was a period of reflection following the creation of a list of alternatives. After this period, the suggested alternatives were narrowed to six possibilities for fulfilling the goals of the project and one alternative labeled "no action." These suggested alternatives including the no action alternative were then weighed against the goals of the project and evaluated based upon their fulfillment of the project goals. From these alternatives, a preferred alternative was selected.

Discussion of each alternative:

Website

The alternative to create a website was considered based upon its availability to many people. A website containing the necessary elements to disperse knowledge of appropriate technology to various places is an intriguing idea. However, one of the goals of the project is to 'effectively teach appropriate technology in a hands-on manner.' The creation of a website would do little to interest people in the adoption of appropriate technology using hands-on methods. Therefore, this option was rejected.

Print Literature

The discussion to create print literature in order to disseminate appropriate technology was also an attractive possibility. This would entail the creation of some report or material that could be printed on a mass scale in order to encourage the use of appropriate technology. The advantage of this alternative is the ability to reach an audience that does not or will not access a computer regularly. This is an alternative congruent with the first goal of the project but not necessarily the second and third project goals that emphasize hands-on learning. Therefore this alternative was rejected.

Write Letters to Educators

There was discussion to possibly write letters to educators to encourage them to focus more of their curriculum to teaching children about appropriate technology. This would be a very inexpensive and easy way to possibly get a great deal of information about appropriate technology to a younger audience. After further review, however, we found that this action does not fulfill the requirements outlined in our goals. This action provides no direct way of assuring that education of appropriate technology will be utilized in the class room as it is solely a letter and does not provide any hands-on educational material for instructors to use.

Appropriate Technology Coloring Book

This alternative was focused on developing a coloring book that was intended for kids in elementary school. It would have had examples of different types of common appropriate technologies that could be used around the house. Coloring books are a fun

and easy way to get kids a younger audience a basis for understanding the existence and the functionality of appropriate technology. However, this alternative was rejected due to the fact that it did not directly encourage the implementation of such technologies it only provided a mental framework for kids to understand what appropriate technologies are.

Board Game

A board game with an appropriate technology theme could be used to educate people about appropriate technology. The board game can include graphics and information about the chosen appropriate technology as the basis of the game. By nature a board game is hands-on and interactive as well as portable. This alternative meets all of the required goals. It has been rejected however due to the fact that a board game takes too long to deal with in the settings that it would likely need to be used.

Models of Appropriate Technology (Preferred Alternative)

A model of a specific appropriate technology is an excellent way to share information about the subject. The model would be a realistic representation of the appropriate technology with added facts and information about the appropriate technology. The model could be built to a size that would enable it to be portable, allowing CCAT to share the information to the greater public. The model provides opportunities for hands on learning by allowing the learner to touch and manipulate the model. This alternative meets all of the required goals.

No Action

This alternative is the alternative that would be viable if the project were too unsustainable to happen. This alternative dictates that nothing occur and the continued problems with appropriate technology continue occurring. No action means that we would do nothing with regard to the lack of appropriate technology in the county and the aforementioned problems detailed in the 'problem statement' of this document.

Implementation Strategy

The preferred alternative to combat the current problems faced is to create a system of models of appropriate technology. The models will solve the specified goals for the project as indicated in the discussion and analysis of alternatives.

Specifically the project will be three interlocking models representing a bamboo housing structure, rainwater catchment system, and a greywater marsh system. We chose to work with Humboldt State University's Campus Center for Appropriate Technology (CCAT) because the organizations present location does not contain these examples of Appropriate Technology. These are important examples of appropriate technology that need to be exemplified in physical models in order to accurately show the processes and technologies that are being employed.

We presented the problem of un-sustainability to CCAT and they helped us to develop a list of possible projects that could combat the problem. Then, we narrowed the list in an effort to find the best possible alternative that would meet our goals. Finally, a decision was made about which project to employ and how the project would be implemented. For a calendar detailing the people involved and who did what see Building Timesheets.

Bamboo House

The bamboo house structure will be entirely biodegradable and use as much re-used equipment as possible. This and all models will be made to scale and represent the real technologies that they mimic. The bamboo home will represent a home with 424 square feet of interior space. Bamboo building is considered an appropriate technology. The housing needs of the expanding world population dictate the need for an affordable and fast growing source of homes. That source is realized in bamboo. It can be grown very quickly in depleted soils and serve the housing needs of many people within a small amount of land. In contrast, the forests that are being cut in order to supply housing are a slow growing resource that requires better soil and more land than a similar stand of bamboo. By using bamboo, trees and forests can be saved from deforestation.

Rainwater Catchment

Rainwater catchment systems have long been used throughout the world as an easy and dependable way of collecting rainwater for general human use. The systems are designed to capture rain from roof tops where it is then transported to storage containers. The model design of such system is going to be incorporated with the bamboo structure and also be built to scale. It will feature bamboo gutters and a transport pipe that leads to a rainwater tank next to the bamboo house. The functional system will demonstrate rainwater being used for general housing needs.

Grey Water Marsh

Water from the kitchen sink, bathroom sink and shower will be diverted from the house to a grey water marsh in the yard. The water will be filtered by the marsh to be used for watering other plants; the marsh will also serve as aesthetic focal point for the yard. The

model of the marsh will depict how a marsh is constructed along with the biological/mechanical processes of the water filtration. We chose to model how a grey water marsh works because CCAT can not physically demonstrate a marsh on their property at this time. The knowledge of grey water and how it can be reused is an important example of appropriate technology that the general public is lacking information about.

Monitoring and Evaluation Plan

With the construction of three models, CCAT will now be able to use portable examples of appropriate technology. These models have been constructed to CCAT specifications and this should insure that they are used. Likewise, the project is congruent with the CCAT mission statement. This fact alone should insure that the models be used in some capacity.

The first step of monitoring and evaluation is to have the models assessed by the current CCAT co-directors. This step will insure quality assurance and give us an opportunity to make any necessary changes to models.

Monitoring and evaluation of the models by the public will be achieved inherently through their use. This will happen because these education materials will be judged in the classroom by those that are being taught. It is difficult to quantify the effectiveness of the materials besides getting comments offered by those using the models. To explore this effectiveness, there will be a questionnaire consisting of 5 questions that is to be filled out by the presenter after each educational event. These questions will focus on the audience's general receptivity of the models and the level to which the models assisted in the audience's general understanding of the concepts. These questions can be found in Appendix 4. In Appendix 5 there is a sign out sheet in order to keep track of the number of uses that the models have gone through. Also, this sign out sheet will make sure that the models can be tracked down if they are misplaced.

Appendix 1:
Matrix of Alternatives

<u>Alternative</u>	<u>Goal #1</u>	<u>Goal #2</u>	<u>Goal #3</u>
Website	√	X	X
Print Literature	√	X	X
Write Letters to Educators	X	X	X
Prepare A.T. Coloring Book	√	√	X
Models of Appropriate Technology	√	√	√
Board Game	√	√	√
No Action	X	X	X

√ = fulfills the desired goal
X = does not fulfill the desired goal

Appendix 2:

Appropriate Building with Bamboo

Bamboo can be used as a sustainable building material due to its ability to grow in unfavorable conditions very quickly. Bamboo is a fast growing grass plant that can regenerate itself much faster than what we think of as traditional building materials such as lumber harvested from tree species. Bamboo can help to house the growing world population while reducing pressure on forests that take centuries to regenerate. Many products are made with bamboo from flooring to entire houses.

For More Information See:

General Bamboo Information and Resources
www.americanbamboo.org

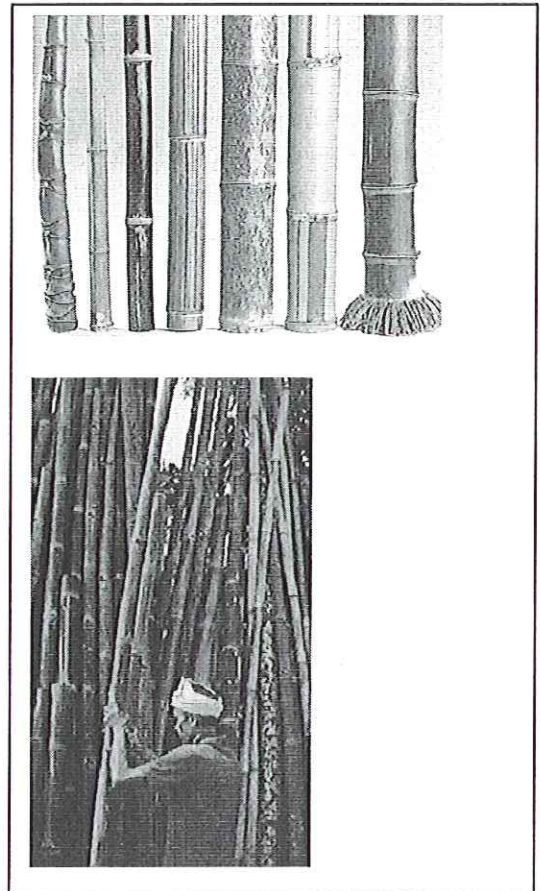
General Bamboo Information and Resources
www.bamboocentral.org

Report Detailing the Growth of an Experimental
Bamboo Forest in Washington State
<http://agsyst.wsu.edu/BambooReport2000.pdf>

Bamboo Housing and Products
www.bambootechnologies.com

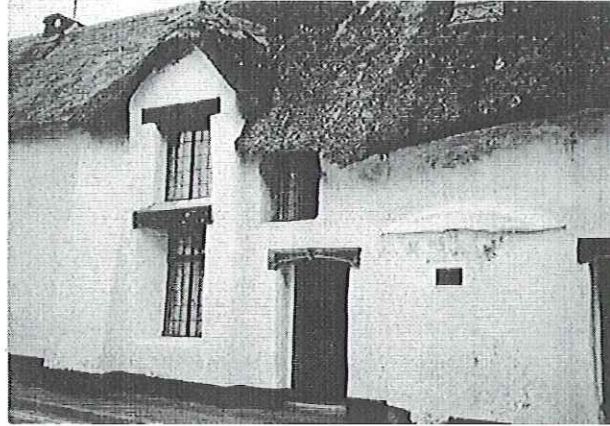
Bamboo Products
www.bamboocomposites.com

International Society for Bamboo and Rattan
www.inbar.int



Appendix 3:

Cob Construction



"No one knows exactly when cob originated, but presumably it came about when mankind started building permanent structures and settling into cities. Cob is one of the simplest ways of building one's house out of natural materials...There is evidence from around 10,000 years ago that people living the region of Jericho had buildings made of adobe, which suggests that cob could have also been present around or before that time"

(CCAT-

<http://www.humboldt.edu/~ccat/alternativebuilding/cob/jeffreySP2005/index.html>)

Making Cob

"Cob is made by mixing together the following ingredients: sand, earth containing clay, straw, and water. The amounts of each can vary without changing the effectiveness of the product. Therefore, numerous recipes exist [look for one on-line].

Sand and earth with clay are the main ingredients. The sand content can be as low and 50 percent and as high as 85 percent. The texture should be considered when choosing sand. A rough or jagged structure is beneficial because the grains can interlock creating a high compressive strength. The sand found at beaches is rounded and will not create this benefit. Earth containing clay on the other hand can make up anywhere from 10 to 40 percent of the total composition of cob.

The other materials needed are straw, and water. These can make up from 10 to 40 percent of the total composition. They are added to form the desired consistency. Straw is added to increase tensile strength and to bind the layers of cob together to form a strong structure"

(CCAT- <http://www.humboldt.edu/%7Eccat/alternativebuilding/cob/anonymousFA2000/cob.html>)

While these percentages are suggested, rely on your intuition to make cob.

The knowledge is in your cells!

Other Resources:

ilovecob.com/archive/making-cob-video/

weblife.org/cob/cob_050.html

www.deatech.com/natural/dealy/freebldg/

Time Sheet

Week of	Tasks Accomplished by Group	Time Taken
1/31/06	Problem Brainstorming	7 hours
2/07/06	Meeting with CCAT Problem Research	1 hour 1.5 hours
2/09/06	Problem Research	2 hours
2/15/06	Problem Background Research Meeting with CCAT	1 hour 1.5 hours
2/21/06	Making Problem Background and Statement	1 hour
2/23/06	Brainstorming Goals Brainstorming Objectives Meeting with CCAT	2 hours 1.5 hours 1 hour
2/28/06	Writing Goals Writing Objectives	1.5 hours 1.5 hours
3/04/06	Brainstorming Alternatives Weighing Alternatives Writing Alternatives	2 hours 1.5 hours 1 hour
3/10/06	Make time line for April	1 hour
3/25/06	Brainstorming Implementation Writing Implementation	1.5 hours 1 hour
4/03/06	Brainstorming Monitoring and Evaluation Choose Model Topic	1.5 hours 4 hours
4/11/06	Writing Monitoring and Evaluation	1.5 hours
4/25/06	Present to CCAT Power Point Presentation	2 hours 3 hours
5/02/06	Power Point Presentation	5 hours
5/09/06	Writing Report	4 hours
	Total Time Spent in Group Work	51.5 hours

**Building Timesheet
Todd and Paul
Bamboo House/Rainwater Catchment System**

Date	Task(s) Accomplished	Time Required
3/19/06	Gather Supplies	4 hrs.
4/04/06	Cut Materials to Scale	3 hrs.
4/07/06	Construct House Frame	6 hrs.
4/10/06	Cob Walls	4 hrs.
4/15/06	Construct Roof	5 hrs.
4/16/06	Assemble Rainwater Catchment	4 hrs.
4/22/06	Gather Supplies	2 hrs.
4/22/06	Final Details	3 hrs.
	Total Time	31 hours

**Building Timesheet
Amber
Greywater Marsh Model**

Week Of	Task	Time Taken
3/28/06	Research Model Topic	2 hours
	Gather Supplies	3 hours
4/10/06	Make mold for marsh	3 hours
	Make paper mache	5 hours
4/17/06	Paint model	2 hours
	Rock chambers	3 hours
4/25/06	Marsh baffles	2 hours
	Finish work	1 hours
5/02/06	Make Box	2 hours
	Total Time	23 hours

References:

CCAT website. <http://www.humboldt.edu/~ccat/appropriatetechnology/index.html>. 22 February, 2006.

Redwood Coast Energy Authority. <http://www.redwoodenergy.org/>. 15 February, 2006.

Blue Ox Millworks. <http://www.blueoxmill.com/school.htm>. 13 February, 2006.