SUSTAINABILITY EDUCATION

Teaching sustainability in *every* classroom

Why you should

How you can

An Introduction and Guide for Educators
(FIRST DRAFT)
December 1999

The Tahoe Center for a Sustainable Future

Harriet Goldman
Sustainability Curriculum Program Manager

WE WELCOME YOUR FEEDBACK!

This Guide is a draft document, part of an ongoing project to refine how sustainability education is brought to the classroom. Please complete the feedback form so that we may continue to expand and refine this document.

An Educator's Guide to Sustainability
Reviewer Feedback Questionnaire

1. What is your current position?

- Title
- Teacher   Grade Level
- School Administrator
- Non-profit Agency Staff
- Government Agency Staff
- Other, please describe

2. How would you describe your knowledge of sustainability concepts?

- Low
- Average
- High

3. How important do you feel sustainability education is to the educational process?

- Not Important
- Somewhat Important
- Very Important

4. What elements of the *Guide* stood out for your?

5. What material was most helpful?

6. What material could be improved?
Please describe how this material can be improved.

7. What materials will you use with your students or community?

8. Do you have information that you would like to share with us? (If you provide us with information that we use in the final text of the *Guide*, you will be listed as a contributor and receive a free copy of the *Guide*.

- Class project descriptions
- Examples of student work
- Lesson plans
- Resources
- Other

9. Are you interested in teacher in-service or attending workshops out of your region?

10. Which areas are you interested in?

- Overview of sustainability education
- Curriculum integration
- Project based learning through sustainability
- Group facilitation methods (team building, action planning, conflict resolution, etc.)

11. Other comments?

12. May we have your contact information? (Optional)

Name
Title
Mailing Address
Phone Number

TABLE OF CONTENTS

PREFACE

"Only within the moment of time represented by the present century has one species--man--acquired significant power to alter the nature of this world."
Rachel Carson, *Silent Spring*

The ultimate goal of the sustainability endeavor is to graduate students at all levels who understand the concepts of sustainability, take them to heart, and incorporate them into their daily lives. To reach that goal, all teachers, including those outside the science disciplines, must understand the concepts of sustainability and be able to relate them to students in the classroom in meaningful and useful ways.

The work of the President's Council on Sustainable Development (PCSD) has served as an important resource for this workbook. The PCSD, in its report*, "Education for Sustainability, an agenda for action",* states that the connection between the education of teachers and the environmental literacy of students as an outcome of education is a key step toward the advancement of sustainability.

The PCSD notes that teachers will be expected to play an increasingly major role in preparing society for an age of accelerating change. However, day-to-day realities for teachers include increased pressure to teach; to prepare exams, stress academic basics, and bring large numbers of unprepared, unmotivated students up to basic levels. These constraints pose a challenge to this vital role and a majority of teachers surveyed by PCSD felt ill prepared to convey issues and content related to the environment. The intent of this workbook is to help teachers begin to bridge the gap and discover a means to tie together the vast amount of information and various curricula available to them.

In her ground-breaking book, *Silent Spring*, Rachel Carson tells us that the ultimate future of the earth demands that humans develop an appreciation of their many connections to nature and a desire to interact with caution and respect. This knowledge must begin with all students across the entire curriculum of learning. It can be developed through the processes of sustainability education, which plays a vital role by imbuing meaning to the way we educate our children so that they will know enough and care enough to be stewards of the Earth.

Harriet Goldman
South Lake Tahoe, California
December 1999

ACKNOWLEDGMENTS

Contributors:

Sue Rae Irelan, environmental planner. Former program manager for *The Tahoe Center for a Sustainable Future*, Ms. Irelan developed the preliminary outline for this workbook. She has also developed programs and training methods in many facets of sustainability education.

Catherine Fornaris, trainer, Outward Bound. Ms. Fornaris has a degree in experiential education and developed the lesson plans and provided editorial review of this workbook.

Harriet Goldman, program manager, consultant, and trainer. Ms. Goldman is a consultant affiliated with The Management Center of San Francisco and provides services in organizational development, group facilitation, and strategic planning. She also teaches workshops in group facilitation and strategic planning.

Susan Ritter, writer and editorial consultant. Ms. Ritter is a former high school teacher and served as primary editor of the workbook.

Toni Rockwell, faculty, Ridout Elementary School, Tahoe City, CA. Ms. Rockwell teaches fourth grade and provided editorial review, assistance with lesson plan development, and ongoing encouragement.

Heather Segale, editorial consultant and web site design. Ms. Segale provided editorial review and designed the Sustainability Education Guide web site (http://ceres.ca.gov/tcsf/seg/).

ABOUT THE TAHOE CENTER FOR A SUSTAINABLE FUTURE

The Tahoe Center for a Sustainable Future (The Center) began in 1992 with a focus on maintaining the health of Lake Tahoe while developing vital communities and a strong economy in the region. In short the mission of *The Center* is "*to facilitate information, resources, education, and training to achieve a sustainable future in the entire Lake Tahoe Region*." To achieve these goals, *The Center* promotes education, effective use of technology, and positive public dialogue to develop a responsible and informed electorate. *The Center* works with schools and both public and private agencies to enhance educational methods and environmental literacy.

Organizational projects have included: creation of a Wide Area Network with the California Resources Agency CERES program; Internet training and web page design for teachers, government and non-profit agency staff (Info Tech program); and operation of the Tahoe Environmental Hotline. *The Center* has collaborated with the University of California at Davis, Sierra Nevada College, the California Tahoe Conservancy, Incline Village General Improvement District, and the Tahoe Regional Planning Agency.

Through its Sustainability Curriculum Program, *The Center* supports teachers and students through outreach activities and sustainability projects focused on Tahoe Basin ecosystems using experiential and *Project Based Learning* processes. Services include project site selection, design, coordination, teacher training, and operation of the *Community Leaders in Classrooms* program. This program facilitates the participation of community experts in classroom projects, field studies, and training and produced the *Community Leaders in Classrooms (CLC) Resource Guide.*

The Center serves California and Nevada communities and schools in the entire Lake Tahoe Basin and adjacent communities. In addition, its work in sustainability education and building community and classroom connections is recognized as an exemplary model by such organizations as the AutoDesk and Stanley Foundations. The Sustainability Curriculum Program serves as a laboratory for the material used in this *Sustainability Education Guide*.

President Clinton's visit to Lake Tahoe in July 1997 brought national attention to the Lake Tahoe region because of its importance as a national treasure whose fragile environment is seriously threatened. Increased federal funds have been committed to Tahoe government agencies for new projects that protect the environment. Community consensus emerging from forums leading up to the President's visit was that even with federal dollars and increased agency projects and regulations, **protection of the environment will require changes in individual behaviors**. The President's Council on Sustainable Development states that public awareness and understanding of natural resources and economic challenges facing the world is critical. *The Tahoe Center for a Sustainable Future* strives to create, through sustainability education, an environment where the regional capacity to address these vital concerns is increased and active.

For further information, visit our web site at **http://ceres.ca.gov/tcsf**

TCSF Board of Directors:

Joseph Kruth, Chair
President, Arete, Inc.

James Baetge, Secretary
Former Executive Director, Tahoe Regional Planning Agency

Lori Gaskin
Dean of Instruction, Lake Tahoe Community College

Rochelle Nason
Executive Director, League to Save Lake Tahoe

Vance T. Peterson, Ph.D.
President, Sierra Nevada College

Eric A. Severance
Partner, E and E Consulting

TCSF Staff:

Scott Ross, Executive Director
P.O. Box 452, Truckee, CA 96160
Phone & Fax: 530/582-5420
E-mail: scottross@telis.org

Harriet Goldman, Sustainability Curriculum Program Manager
P.O. Box 14600, South Lake Tahoe, CA 96151
Phone & Fax: 530/541-5589
E-mail: hgassoc@thegrid.net

SUSTAINABILITY EDUCATION -- Just What *Is* It?

Sustainability education is a new way of looking at the environment in which students

- examine the network of dependant relationships that exist between the environment, the economy and the culture, and

- come to understand that these interrelationships exist on the local, regional, national and global levels.

Major components of sustainability education include:

A focus…on the complex relationships between ecological systems, economic structures, and community dynamics.   To provide a depth of knowledge and the tools with which students, teachers, and parents can work toward lasting societal change.

A process…community and project-based, that supports student investigation and participation. To provide teachers and students opportunities to learn by *doing*, including exposure to diverse viewpoints, and development of critical thinking and problem-solving skills.

An approach…Integration of new and existing curriculum.   To provide a framework for cross-curricula collaboration among all disciplines. An evolution of environmental education which includes traditional disciplines such as science, mathematics, social science, and the arts, and integrates environmental, global, and multi-cultural education.

A method…of discussion and dialogue to address diverse interests. To provide a process that allows examination of controversial subjects and complex decision-making. Students, teachers, parents, and community leaders will learn communication and dialogue skills that will engage all participants, allowing them to address diverse views, and devise viable solutions to complex problems.

The use…of appropriate technology to develop relevant projects.   To provide students access to new technology and the tools that help decision-makers become more efficient and effective.

SUSTAINABILITY EDUCATION – And the Classroom Teacher

Although teachers today are very well prepared, one area of thinking that is not yet emphasized in teacher training courses of study is sustainability education. The concept of sustainability has not even been adequately introduced to classroom or pre-service teachers.

Today's teachers are, however, trained in the use of integrated, thematic units that incorporate many areas into one unit or course of study. They are also trained to reach a wide diversity of cultures and to serve students with a variety of learning styles and learning challenges. They learn to use the Internet as a research and information tool. Many know how to operate the newest multi-media computer software programs.

Sustainability education involves studies of a variety of systems--social, political, and economic--in relation to real-life issues. Contemporary attitudes about what students must study in order to receive a quality education result in curricular constraints. Often teachers have little time to relate the learning to environmental concerns, other disciplines, community issues, etc. Too often students learn subject areas in an isolated fashion, failing to relate English with math, history with art, etc. Too often the environment is left out of the learning equation altogether.

The emphasis is placed on specific subject areas such as history, social sciences, mathematics, and English. This leaves precious little time for teachers to encourage students to relate their learning to current community issues. Assessment tests like the SAT and ACT stress learning that is factual and concrete, and test specific skills with right and wrong answers. Teachers feel pressured to cover those testable concepts, and to ignore or play down problem-solving and analysis activities.

Sustainability education should be a critical component of today's education because it allows students to explore resources, related issues, and solutions from a variety of social, scientific, historical, political and economic perspectives. Sustainability education includes analytical thinking and problem-solving skills. Students need such skills to make inform-ed decisions about how to use the world's resources in a prudent and informed way for the benefit of the present and future generations.

Toni Rockwell
Ridout Elementary School
Tahoe City, CA

AN ORGANIZING THEME -- To Develop Integrated Thinking

"We need people who think broadly and who understand systems, connections, patterns, and root causes."

David Orr, *Earth in Mind*

Sustainability education helps tie curricula--subject areas and processes-- together rather than developing new curricula. Sustainability education helps students learn how to think in whole systems and how to find connections. It teaches students how and when to ask the "big questions," and how to separate the trivial from the important. (Gagnon, *The Atlantic Monthly*). Sustainability education brings a variety of processes to develop thinking skills by:

- demonstrating interconnections among disciplines;

- focusing on real-world issues addressed from various perspectives;

- examining the complexity of issues that are viewed in terms of ecological systems, economic structure, and community dynamics;

- addressing crucial missing components in state education frameworks by demonstrating how all components fit with *what* students should know and *why*.

SUSTAINABILITY EDUCATION -- Underlying Principles

STRONG CORE ACADEMICS
Always stress the basics

UNDERSTANDING RELATIONSHIPS BETWEEN DISCIPLINES
All learning is connected

SYSTEMS THINKING
Nothing exists in isolation

LIFETIME LEARNING
Never stop discovering

HANDS-ON, EXPERIENTIAL LEARNING

COMMUNITY-BASED LEARNING
As close as your own backyard

EFFECTIVE USE OF TECHNOLOGY
In the age of technology

PARTNERSHIPS
United we stand

FAMILY INVOLVEMENT
All change begins at home

PERSONAL RESPONSIBILITY
You are your brothers' keeper

HUMAN DEVELOPMENT AND THE EARTH'S NATURAL SYSTEMS
Be kind to your mother!

Source: *Sustainable America*, The President's Council on Sustainable Development (PCSD)

SUSTAINABILITY -- Historical Context

Among the major factors contributing to the degradation of the environment are population pressures, particularly widespread poverty. (*Educating for a Sustainable Future*, UNESCO) From 2.5 billion in 1950, world population is projected to reach more than eight billion by 2025.

The human population places the greatest stress on Earth's resources and natural processes. The U.S. Geological Survey (USGS) estimates that the use of air, water, and other natural resources has increased by a factor of 10 in the past 200 years. A cycle of consumption and overuse is perpetuated as areas are developed, resources exhausted, and populations relocate. Excessive fishing, harvesting and grazing result from increased demand for food, goods, and services, which increases the demand for natural resources and land use.

The USGS report notes the serious effect this activity has had on the atmosphere, water cycle, and the climate, and how it has altered ecological systems. It seems apparent that the delicate balance of natural nutrient cycles required to produce and balance elements essential to life are being disturbed and disrupted. According to the report, "the challenge of sustainability involves…moving towards development which is environmentally sound."

Renewable and Finite Resources: While the fight to stop the exhaustion of non-renewable resources seems to be making headway, the rapid depletion of renewable resources is a continuing problem. Improvements in monitoring techniques include water quality chemical analysis, satellite collection of data, and development of computerized systems such as the Geographic Information Systems (GIS). These improved tools aid in data collection, organization, simulation, and modeling to enable scientists to observe and measure more effectively the effects of human activity on natural systems.

Increase in Detrimental Practices: Patterns of consumption and production in industrialized countries constitute the major causes of global environmental degradation. Use patterns must be modified to adhere to methods of sustainability if the environment is to endure. From the mid-nineteenth century until well into the second half of the twentieth, nearly 15 per cent of the Earth's forests were denuded. Another six percent was denuded during the ten-year period from 1980 to 1990.

A 1998 study in the environmental publication, *World Watch*, cites seven of ten biologists who expressed the fear that Earth is now in the midst of the fastest mass extinction of living things in the 4.5 billion-year history of the planet. Seventy percent said they "…believe that during the next 30 years as many as one-fifth of all species alive today will become extinct, and a third of the respondents think as many as half the species on Earth will die out in this time." The need for environmental awareness and action that leads to sustaining the Earth makes sustainability education crucial.

SUSTAINABILITY CONCERNS BECOME GLOBAL -- Act Locally, Think Globally

As the consequences on human impacts have increased dramatically, scientists, economists, and government leaders worldwide realized that they must address the reality of ecological damage and finite resources. The idea and practice of "act locally, think globally" resulted in part from important international meetings focusing on the environment and the need for cooperation among nations regarding quality of life issues, economic development, the use of resources, and land use practices.

The role of education and public awareness in addressing these issues is seen as vitally important. According to the International Conference on Environment and Society, this new vision is one in which education is no longer seen as an objective in and of itself, but as a means to bring about changes in behavior and lifestyles, to disseminate knowledge and develop skills, and to prepare the public to support changes towards sustainability. This vision is reflected in a new international consensus and framework for action that has emerged from a series of international conferences which began in 1972 with the United Nations Conference on the Human Environment, which put environment on the international agenda for the first time.

By 1983 the relationship between economic development and its impact on the environment had become the focus of the U.N. World Commission on Environment and Development, known as the Brundtland Commission. This organization was the first to introduce and popularize the definition of sustainability and called for strategies integrating environment and development.

> *"Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs."*

A series of international conferences and organizations have since followed that promote sustainability concepts and practices which strive to create a future with a healthy environment, a viable economy, and adequate human well being in functioning communities. These include the ***Rio de Janeiro Earth Summit (1992)*** *and the* ***President's Council on Sustainable Development (1993),*** *also referred to as the* ***PCSD.***

This group examined the consequences of choices this generation makes on the lives of future generations. According to the PCSD, the impacts on human health, livelihoods, and international peace underscore the seriousness of these challenges. Through their research and meetings across the country, they developed a strategy for sustainable development that includes the following components:

- *an* unprecedented *degree of international cooperation*

- *an understanding of the global forces that affect human lives*

- *empowerment of students to become responsible citizens*

One of the most recent and exciting examples is the National Town Meeting for a Sustainable America (NTM) that was held in Detroit, Michigan in April 1999. Over 3,500 people from across the United States attended, and 60,000 others participated via satellite and the Internet. Participants represented diverse sectors of society, including students, bankers, economists, non-profit and government agencies. They came together to share ideas, resources, and best practices for building a more sustainable America. According to Hank Habicht, CEO of the Global Environment and Technology Foundation, a co-sponsor of the event, this proved to be a unique cross-sector approach that underscores the interconnected nature of the sustainability issues among organizations that have not worked together before.

SUSTAINABILITY – Education Has A Critical Role

Envision a world in which education is no longer seen as an objective in and of itself, but as a means to bring about change in behavior and lifestyle that can ultimately change the world. ACT LOCALLY, THINK GLOBALLY is a concept that grew in part from international meetings focused on quality of life issues, economic development, land practices, and use of resources.

It is the job of educators to disseminate knowledge and help students develop skills that will prepare them, as part of the adult public, to support changes toward sustainability before depletion and misuse go much further. This vision for education has grown from the *United Nations Conference on the Human Environment* that has been holding international conferences since 1972.

By 1983 the impact of economic development on the environment became the focus of the *U.N. World Commission on Environment and Development* (the Brundtland Commission). This organization first introduced and popularized the term *sustainability* and called for strategies integrating both environment and economic development. Subsequent international conferences have been held, including the Rio de Janeiro Earth Summit in 1992 and the President's Council on Sustainable Development in 1993, which have promoted sustainability concepts and stressed the important role of education. One of the most recent and exciting examples is the *National Town Meeting for a Sustainable America* (NTM) that was held in Detroit, Michigan in April 1999. Over 3,500 people across the United States attended, and 60,000 participated via satellite and the Internet. A realistic program strategy for the development of sustainability will include:

- a**n** unprecedented **degree of international cooperation**
- **an understanding of the global forces that affect human lives**
- **empowerment of students to become responsible citizens**

A MAJOR GOAL OF EDUCATION --
Environmentally Literate Citizens

An informed and engaged populace is critical to any broad change and citizens who possess broader awareness and understanding of the challenges facing the world regarding natural resources and economic development are essential to the promotion of sustainability. The world must be populated by thoughtful consumers, producers, and policymakers who will begin their awareness in the classroom.

> *"It is not sufficient just to have a few trained persons who understand what it's all about; there must also be an alert citizenry to insist that knowledge, research, and action are properly integrated…It is mandatory that every young scientist, and indeed every educated person, acquaint himself with at least the overall environmental processes and conditions that make possible their very survival."*
>
> Eugene Odum – *Ecology*

As we strive to develop communities that are viable, we must stimulate an active interest in community involvement at a young age. Developing an accurate base of knowledge about the environment and sustainability is of utmost importance. Only an informed electorate can ensure sensible legislation and sound planning. A 1992 national survey (Peter D. Hart Research Associates) indicated that a mere one percent of those surveyed listed endangered species as a serious problem and only one in seven had even heard of biological diversity loss.

Kids connect with nature: Children have a natural interest in nature that adults often fail to stimulate or encourage. Sustainability education captures and nurtures students' natural curiosity and wonder about the environment. This lays a broad foundation for pleasant life experiences, appreciation of natural systems, and respect for the environment. According to Odum, sustainability education shows students how they are personally connected to the environment and fosters attitudes that are essential to environmental stewardship.

Integrating all disciplines and curriculum: Sustainability education serves as an umbrella for integrating all components of the curriculum, which results in learning experiences that realistically examine all aspects of a problem in the proper perspective of the whole. Environmental concerns are not relevant to only the science classroom. Sustainability education allows educators in each discipline to examine human action as it impacts the environment. Emphasis on small group work, peer collaboration, and a focus on learning (through active discussion by students of different interpretations of information) is essential to overall problem solving. Sustainability offers an ideal means of achieving these educational goals.

WHERE STUDENTS LEARN BEST – The Real World

The sustainability education process involves a **hands-on** and **regionally specific** approach directly related to where students live. This helps them apply what they learn to their daily lives. Through community based projects students:

- develop increased awareness of local environmental, cultural, and economic issues

- become stewards of the environment and make a personal connection to the social and environmental aspects of their community, as they are encouraged to become involved in community service

- increase learning comprehension through work with positive adult role models that demonstrate the application of knowledge to real life

- develop critical thinking skills as they take responsibility for their own learning and examining problems in relation to the whole.

- develop citizenship skills as they learn to appreciate diverse viewpoints and learn how to work with others in pursuit of solutions.

SYSTEMS THINKING -- Critical to Sustainability Education

"By becoming ecologically literate, we can apply the lessons of ecosystems, the language of nature, to our human communities."
From the Parts to the Whole, Systems Thinking in Ecology and Education. Frijtof Capra

According to Frijtof Capra, renowned physicist and systems theorist, understanding the basic principles of ecology and their applications can enhance and inform the learning process. As a result, educators will be able to make considerable strides in preparing students for the 21st century. Education has, to a great extent, focused on analysis, that is, taking things apart in order to understand them. The new way of thinking focuses on studying things in terms of their **connection**, **context**, and **relationships to the whole**. This process also addresses differences in student learning styles, which results in more engaging learning experiences.

Capra tells us that nature does not show us isolated building blocks, but rather a **complex web of relationships** between the parts of a unified whole. The importance of each component of a system **is tied to its relationship to the whole**. And the essential properties of a living system (whether an organism or community) are properties of the **whole**. By looking at just one component in isolation (for example, an atom), we would not have realistic picture of its importance. The essential properties of a living system are properties of the whole, which none of the parts have. **A major application of systems thinking is that human communities and ecological communities are all living systems.**

Billings, in his text, *Plants, Man and the Ecosystem*, states that ecological knowledge can be applied at each of the three principal levels of integration--the individual, the population, and the ecosystem. This approach to studying nature can be applied to human social and political systems as well. This integrated approach is a fundamental underpinning of sustainability education and practice. Now that man has the ability to manipulate whole ecosystems for his benefit, there is the danger of letting them get completely out of hand, to the detriment of present and future generations.

Systems thinking is reflected in the corporate, governmental, and non-profit sectors. The applications of systems thinking have led to many innovations in the workplace in terms of how employees work together and how organizations plan for the future. The business and leadership sections of bookstores are lined with exciting, practical methods based upon these concepts. These include practices such as continuous learning, team dynamics, ethical leadership, and group facilitation, which may include consensus building, visioning, and strategic planning. When incorporated into the educational process, all of these applications enhance the learning experience and help to develop students who will become citizens, employees, and leaders who can think clearly, evaluate processes, and create results.

PROJECT BASED LEARNING -- Students as Investigators

"Real life learning is meaningful learning: initiated, driven and executed by students, guided and supported by teachers, that breaks down the walls of the classroom and allows schools to be part of real life now."
Laurette Rogers, formally with the Autodesk Foundation

The Autodesk Foundation, a major supporter and developer of Project Based Learning (PBL) practices, recognizes that the student outcomes from these learning practices reflect important life skills. As students plan, implement, and evaluate community-based, experiential projects, they will develop essential skills required in the workplace of the 21st century. According to Autodesk, students will become:

- Implementers and Performers
- Contributors and Supporters
- Problem Finders and Solvers
- Initiators and Organizers
- Planners and Producers
- Team Members and Partners
- Communicators and Listeners

Materials developed by Autodesk provide a clear description of PBL concepts and practices:

- Learning experiences that engage students in complex, real-world projects through which they develop and apply skills and knowledge

- A strategy which recognizes that significant learning taps students' inherent drive to learn, capacity to execute complex work, and the need to be taken seriously

- Learning in which the results are not predetermined or fully predictable

- Learning which requires students to draw from a variety of information sources and disciplines in order to solve problems

- Learning which requires students to coordinate time, work schedules, and project outcomes in order to accomplish goals on a predicted time schedule

DEVELOPING COMMUNITY SUSTAINABILITY PROJECTS -- Overview

One of the most important functions of our educational system is to prepare students to assume responsibility as adults. Sustainability education encompasses not only the role of citizens, but also that of consumers, investors, managers, workers, and professionals. In short, it prepares people who can make complex, difficult choices on the basis of a broad view. This requires vision and the ability to gather and use information effectively. Helping students build productive community partnerships can help meet these goals in an effective way and one that is personally rewarding for each student. Community projects are the centerpiece of sustainability education. Incorporating the following considerations enhances the effectiveness of projects:

- *Projects should help students understand that "organisms do not live in isolation, but in functioning communities which are inseparable from the environment." "Mankind is still part of the earth ecosystem and dependent upon its abundance, limitations, and the way in which this large and complex system operates." (**Odum**)*

- *Involve students in **real-world issues** and allow them to produce tangible results that are useful to their community partners. Some examples include gathering data, such as water quality testing, and educating the public through presentations and newsletters.*

- *Realize that the pool of potential partners will be defined by the overall project goals. Some projects will emphasize the sciences, others, public outreach and media.*

- *Include projects in which the community partners can benefit from student involvement. For example, businesses can foster career awareness, develop greater connections with the community for their agencies, or gain assistance with monitoring and gathering of scientific data.*

- *Be aware that staff from participating agencies may require training or mentoring themselves in order to learn how to work effectively and appropriately with students at various grade levels. Additional expertise or training may be required to qualify a community partner to work with students.*

DEVELOPING PROJECT GOALS

Project based learning is...meaningful learning that breaks down the walls of the classroom and allows schools to be part of real life now."
Laurette Rogers, formerly with the *Autodesk Foundation*

1. **Define the critical sustainability issues** faced by students in their community or neighborhood by first surveying various sites or local natural features, such as:

    ◄ **water environments and water quality (streams, creeks, ponds, lakes)**

    ◄ **vegetation (forests, meadows, open space, parks,)**

    ◄ **animal life (mammals, birds, aquatic life)**

    ◄ **human impacts (housing supply, transportation, population density)**

2. Use **facilitation processes** to define issues.

3. After issues are defined, **select one** or more related **issues to address**, which will become the project goals.

4. After your students determine the issues to address and the projects by which they will address them**, review your curriculum requirements**. Framework elements in all subject areas to determine which ones can be met through the project.

5. Help students **research** and **contact community partners** who can participate in a joint project that is related to the issues your class has identified. Factor in availability of materials, time, field site access, and community project support.

6. Set up a meeting with community partner(s) and students to discuss various approaches to the project. Refine project goals to incorporate needs of each community partner. This type of evaluation/assessment is a critical aspect of the process.

7. Work with students to continue to **adapt project goals** based upon their research and preliminary findings. Such ongoing adaptation reflects real world continuous learning processes. This process is enhanced by use of group facilitation processes such as *The Discussion Method* and *The Workshop*. *(See below.)*

8. When the project is complete, provide time for reflection and application of lessons learned to broaden context and increase retention of knowledge and insights gained.

BUILDING COMMUNITY CONNECTIONS -- Considerations

PROJECT SITE: Project sites include the school, other public lands, and even private lands. Property ownership can be determined through the county assessor's office or from real estate agents. Investigate public land management agencies in your area, such as the United States Forest Service, regional park district, or regional conservancies, agencies usually open to student investigation on their sites

PROFESSIONAL EXPERTISE: (See RESOURCES LIST and COMMUNITY LEADERS LIST in Appendix). A variety of government agency professionals and members of the community are willing to share their expertise in the classroom, in the field, or at their workplaces.

- TCSF has developed a ***Community Leaders in Classrooms Guide for the Tahoe Basin*** that is available to all teachers and schools in the region.

- Schools outside of the Tahoe region can research local organizations for similar publications regarding environmental education.

- Track the resources used by teachers at your school, compare notes, and develop your own school resource list that can be shared by all.

- Survey parents to assess their jobs, hobbies, and contacts. Posting them on your school web page is a good way to keep track of contacts.

The approaches used are different for each community. Tailoring your approach to the issues identified by your students and the projects in which your community partners are engaged will enhance your success.

MENTORING: Classroom project leaders may be interested in providing ongoing individual student support to help build student self-esteem, guide career development, and enhance subject area expertise. Contact your school district office to clarify local and state requirements.

IN-KIND COMMUNITY SUPPORT: Local businesses and agencies may be willing to supply materials, transportation (or vehicles), and products for school projects. Brainstorming such resources with students and expecting them to make the contacts, either in writing, by phone, or through public presentations, is an important aspect of the PBL experience.

(See SAMPLE COMMUNITY PROJECTS, below)

WORKING EFFECTIVELY WITH COMMUNITY PARTNERS

◄ Students of all ages should be involved as much a possible in making the community connections and gaining financial support. They will develop practical skills and learn social graces such as telephoning, interviewing, writing letters, soliciting support and thanking people. Students are often more likely to get a positive response than adults.

◄ Be clear about what you expect from the community member and communicate this clearly. Keep in mind that agency staff and other community resource people are busy, so demonstrate your respect for their time by being organized. After you have identified curriculum needs in the preliminary project design, tailor your requests accordingly. Example: Rather than approaching a landowner with a vaguely worded request such as "What can my students do?" try "My students are studying plant communities and how they change in response to different influences. Do you have any plant study opportunities on your property?"

◄ Communicate what to expect from your class, including what students already know about the subject being studied and student management requirements. Keep in mind that not all specialists in a subject area know how to relate to students.

◄ Let inexperienced community partners team-teach the first few times, working closely with the teacher. Ideally, teachers could provide a brief training session for a group of community partners to introduce them to basic educational concepts and techniques, especially regarding child development and age appropriate approaches to their presentations. The Center has provided this service, with teachers from the primary, middle, and secondary school levels as trainers in half-day educational overviews for community leaders who are given an overview of child development and receive coaching on how to create age-appropriate presentations and activities.

◄ Evaluate community participants and share findings with other teachers. Train those who do a poor job and note those who would not be able to do a good job even if they had training.

◄ Follow up on no-shows. Community members who do not follow through on commitment should understand the consequence to your students.

(See SOURCES OF COMMUNITY PARTNERS, below)

STUDENTS LEARN WORKPLACE SKILLS

Among the benefits gained by focusing on real-world issues is the opportunity for students to learn and practice skills needed in the workplace. By working with professionals in a wide variety of fields, students will gain exposure to and have opportunities to try out methods used to investigate and evaluate environmental, economic, and community issues. Each method can be tied directly to curriculum themes and learning objectives. By selecting carefully, these methods enhance study in many of the subject areas. We suggest three types of skills, or tools, that are important components of sustainability education because they offer effective means of gathering and organizing information and using it to make thoughtful decisions. These are:

- **field study methods**

- **group facilitation processes,**

- **and appropriate use of technology.**

FIELD STUDY METHODS

There are a growing variety of science curricula and supplemental materials that can be directly applied to local ecosystems. The learning of concepts prescribed by state frameworks is greatly enhanced by using the sustainability education process to integrate existing curriculum materials within a school district and the gathering of information in community settings. This process, which uses systems thinking, involves student participation in deciding **what** to study, **why** to study it, **what the information** gathered **means**, and **how it can be applied** to solving the problems identified.

By working with community partners, teachers do not need to have the scientific expertise. Teachers learn along with the students, thus setting a good example. After the arena to be studied has been agreed upon by students and an initial set of issues identified by students, a preliminary conversation with the community experts, or those identified as potential resources, will help pinpoint the types of field study methods the project will require.

Several of these areas can apply to one issue, offering a variety of study opportunities for students while remaining focused on a single issue or theme. With information being gathered from a variety of sources and methods, each student will be providing essential information about the effects on the problem identified, who the stakeholders are (those who have an interest in or are affected by the problems), and possible solutions to the problems identified.

Students will learn the importance of providing quality information and of sharing what has been learned clearly and effectively. Additionally, students will learn strategies to work cooperatively with other students and learn to appreciate the importance of each individual contribution to the communal knowledge base.

As students' knowledge base expands through research and investigation, they will continue to gather information from a variety of sources until they feel prepared to propose solutions.

Sample Field Study Topics:

WATER
- stream flow/survey
- observation and inventory
- mapping stream course
- human uses
- water chemistry/quality, dissolved oxygen, acidity, phosphorous/nitrogen, aquatic insects

VEGETATION COMMUNITIES:
- forest communities
- plant identification
- forest health
- erosion
- native and non-native species

WILDLIFE COMMUNITIES:
- use of local field guides for mammals, birds
- animal habitats
- animal migration
- predators
- native and non-native species

HUMAN IMPACTS ON NATURAL RESOURCES:
- population growth
- housing development
- transportation needs and impacts
- recreation (backpacking, hiking, biking, off-road vehicles, boating, personal water craft, skiing)
- habitat loss

DEVELOPING EMPOWERED CITIZENS

Young people comprise 20 percent of the population, but 100 percent of the future."
Richard Riley, former U.S. Secretary of Education

One of the primary objectives of incorporating critical thinking and communication skills into the educational process is to create informed citizens who are prepared to participate responsibly in society and the workplace.

Communities are developing sustainability indicators, or benchmarks, and various other strategies to forge economically healthy communities while managing resources effectively without compromising environmental integrity. There will be an increased need for more connections and better communication between the classroom and business, industry, government, and the general public.

The focus of this interaction is to share information and develop awareness of the common ground among various community sectors, or stakeholders. Awareness is essential to the ability of the public to make thoughtful decisions and guide leaders toward sound policy.

Community Dialogue and Leadership:

Learning experiences that represent the real world reflect the complexities, conflicts, and inconsistencies that exist in society. Many segments of the business, non-profit, and governmental sectors have addressed these needs by incorporating processes that enable groups to work together more effectively, manage information and change, and achieve results. They practice such group facilitation skills as conflict resolution, consensus building, information management, strategic and action planning, all in pursuit of solutions. Central to these processes are **clear interpersonal communication skills**, **critical thinking**, and **respect for diverse viewpoints**.

Cooperative Planning: Organizations that apply the systems approach to problem-solving, team dynamics, and information management have discovered that each person holds a piece of the overall puzzle and that together a group will create an energy (synergy) that is greater than the sum of its parts. Increasingly, community-planning processes involve more citizens and a broader range of interests than were previously included in shaping community vision and public policy. By gaining input from diverse stakeholders, better decisions can be made, and conflict mitigated at the outset. The PCSD report, *Sustainable America,* suggests that this may help reverse our society's drift towards cynicism and disengagement. In addition to providing historical grounding in our country's history and values, schools need to provide tangible tools for effective citizenship and leadership.

Application to Community Projects

The PCSD's *Agenda for Action* considers wise planning, constructive community dialogue processes, thoughtful, competent leadership, and group facilitation training to be important components in developing sustainable communities. Students can apply these processes to their projects in various ways:

- Identifying areas of concern within their communities, such as ecosystems (water, forests, vegetation, wildlife) and human needs (economic development, transportation, access to water, air quality, housing, etc.)

- Assessing and hypothesizing the issues related to an area of concern

- Researching and interviewing stakeholders to ascertain their values and perspectives about the issues

- Role playing the positions of the stakeholders

- Re-examining **what** to study, **why** it is important and **how** to solve problems based upon incorporation of diverse points of view

Group Facilitation Processes.

Group facilitation is a growing profession. Increased numbers of individuals experienced in organizational development and management are entering this field and a growing number of organizations are seeking facilitation and leadership training for their employees. There are a variety of methods currently used, with approximately 12 recognized, distinct facilitation processes. TCSF has worked with the Kettering process, effective in helping groups identify and discuss politically complex and sensitive issues in a respectful fashion, and the ICA Technology of Participation methods that lead groups to consensus and concrete action.

The Kettering Process:

Description. One tool for sustainability education incorporates a moderated dialogue process developed by the Kettering Foundation. TCSF has used the process to identify different community viewpoints relating to sustainability issues, to understand the common ground, where fundamental differences lie, and to provide a basis for implementing community solutions to the issues identified. In the school setting, this process can be used to demonstrate a town hall approach to discussing community concerns. The Kettering process is one format for student role playing of stakeholder perspectives. It can also be used as a powerful joint student and community exercise. The South Lake Tahoe chapter of American Association of University Women (AAUW) has also used this process successfully in the community and included high school students as important stakeholders.

Groups can use the process to develop their own issues and arguments, or use a series of prepared books and parallel audio and videotape materials devoted to research and education about public issues. The Kendall/Hunt Publishing Company prints and distributes these materials, as part of the National Issues Forum (NIF). The materials have been used by more than 5,000 civic and educational organizations interested in addressing public issues. Materials are available on a wide range of topics, including some that are specifically relevant to sustainability:

- *Prescription for Prosperity: Four Paths to Economic Renewal*
- *People and Politics: Who Should Govern*

b) The Process. Professional training sites for facilitators of the Kettering Process are located throughout the country. UC Davis is the Northern California site and usually offers its Public Policy Institute in August or September. However, local groups have successfully conducted NIF Forums in their communities without bringing in a professional facilitator, if they have staff or volunteers with other types of professional facilitation experience. An outline of the process follows:

Convene a community or classroom forum.

Invite stakeholders who have information or interest in the topic selected. Include representatives of different viewpoints (e.g., business people, environmentalists, scientist, educators, and students).

Define the problem to be addressed and explore actions available to address it.

Group the actions into categories based on similar viewpoints and state those viewpoints in clear and concise language.

Develop statements supporting the viewpoints that reflect both pro and con.

Clarify the underlying values of each viewpoint and determine similarities.

Restate viewpoints, consolidating agreement among different viewpoints. Define available actions for the new views.

Other options for use include:

Simplifying the process for middle school and high school students. High achievers on the secondary level can use the process without modification.

Another simple adaptation of the process is to have the class review the prepared issues and material on a chosen subject and role-play the various stakeholder views. A component of the process that can stand-alone is to invite community stakeholders to the classroom to present their points of view on the particular topic in a moderated panel discussion. Students can then break into small groups to discuss issues and report back their conclusions to the class

Learning Outcomes:

- appreciation of different viewpoints
- understanding of values underlying diverse political positions and approaches to issues
- learning a communication process that allows for calm discussion of controversial subjects
- learning how to find the common ground amid difference.
- creating a basis for cooperative approaches to school or community problems

Technology of Participation, the ToP Methods

(See **RESOURCES** page for contact information)

Description and Application. This process uses group facilitation methods that are adaptable and appropriate for any setting and geared toward motivating participants to action. They were developed by a nonprofit organization, the **Institute of Cultural Affairs (ICA)** and have been used successfully worldwide in third world countries, government agencies, corporations, and non-profit organizations for over 30 years. They can be employed to analyze current situations and trends, help groups talk through touchy issues and clarify the diverse perspectives within groups. Their application in the classroom provides an energizing framework for project-based, experiential student learning. These processes are ideal for use throughout the sustainability education process:

- *initial class survey of arenas for potential community projects*

- *(water quality, vegetation, human impacts, etc.).*

- *identification of the various issues within a chosen area of study*

- *brainstorming suggestions for possible community leaders to assist with the project*

- *assessment of gathered information*

- *refinement of the original project plan*

- *decisions on the steps needed to address the issues or solve the problem*

Underlying Assumptions. The Technology of Participation methods are based upon research in group dynamics, organizational development, and how learning takes place, as well as over 30 years of in-field use and refinement. The methods are based upon the following assumptions that resulted from this underlying knowledge.

- We need to share the vision in order to have participation of the group and achieve commitment

- The knowledge and perspective of all members of a group are essential pieces needed for solution of the puzzle or issue facing the group

- Participants in the planning will become more motivated and more likely to follow through with action

Basic Methods

The Discussion Method. This is a structure for effective communication that allows everyone to participate and stimulates feedback by promoting dialogue in a non-threatening manner. This method:

- Is synergistic, in that the process stimulates participants to play upon each other's ideas in a creative fashion.

- Broadens perspective and deepens insight by gathering all available information which leads to well-thought-out decisions.

- Puts responsibility on groups as a whole by requiring participation of all present and leading to group decisions.

The Workshop Method. This process uses team collaboration for data and ideas, and organizing this information into meaningful categories, leading to group consensus, resolution, and product. The method:

- Generates creativity by incorporating rational and intuitive approach to problem solving

- Channels input by integrating diverse ideas

- Generates purposeful vision

- Develops solutions by weaving collective individual wisdom into a practical plan

Action Planning. This process recycles the previous two steps and takes good ideas and generates action by clarifying direction, evaluating current situations, and aligning resources with tasks. It is a practical process that moves groups from the beginning brainstorming process to high levels of commitment.

- Maximizes involvement by using task forces/teams and designated leadership roles

- Visualizes success by asking what it will look like

- Teaches process for successful launch of a project

- Develops time lines for big picture continuity

- Enhances accountability by determining implementation actions

Training in these methods is available nationally but the processes can be adapted and applied without training. Adoption of the underlying values and application of the basic processes will dramatically enhance student-centered approaches to learning

TECHNOLOGY IS CHANGING THE WAY WE LIVE AND WORK

"In an information-age society, we have factory era schools."

--PCSD

In the report, *Sustainable America*, the PCSD states that technological innovation is changing the ways in which Americans live, work, produce, and consume and refers to concerns of the U.S. Department of Education that technology is changing everywhere ~~except in our classrooms~~. According to the report, while society is being transformed through communication technologies and access to them, the application of this technology is lagging in the classroom.

According to the report, knowledge has become the economy's most important resource. Because knowledge is rapidly changing and increasing, students and citizens need to know how to access and manage this vast information base. Many traditional teaching methods have become outmoded and leave students unprepared for their role in society.

Public policy, reflected in government and private initiatives to increase access to the Internet, reflects the recognition that use of communication technologies has become a cost effective and efficient means of providing unlimited information to learners of all ages. These include programs to increase Internet access in rural and undeserved communities and to ensure that all public schools are wired for the Internet.

Since Sputnik in 1957, hundreds of men and women and countless electronic eyes have looked back at Earth, to capture images that reveal effects of human activity on the Earth's natural systems. Technology has become an important tool for monitoring and communicating about natural resources, environmental quality, and human impact on the environment. Students must learn to interpret this technological information. For example, GIS, or Geographic Information Systems, is a computer-based tool that integrates common database operations with visualization and geographic analysis through mapping. It can serve as a valuable aid in a wide range of public and private enterprises for explaining events, predicting outcomes, and planning strategies.

In the future, multi-media, interactive and computer-aided education products that allow students to use the Internet will increase. But students must first learn to use it. Teachers need to be well trained in order to use and teach the effective applications of technology. A major need affecting technology use in the classroom is the ability to analyze and select from the vast amount of information produced. Another challenge is that teachers cannot possibly keep up with the ever-changing and extensive material available on line. Consequently, teachers are often no longer the experts in the classroom. Student knowledge of technology often exceeds that of the teacher.

The Mendocino Unified School District on California's north coast is a model program in which technology is integrated with curriculum in a meaningful way. Access to the Internet complements Mendocino's primary goal of creating a learning community that provides opportunities for students and teachers to become lifelong learners. The school district has provided equipment and training and developed policy and a curriculum geared towards:

- increasing the excitement of and love for learning

- helping to make it possible to teach writing as a process

- providing students with an introduction to a wide variety of technology-related career opportunities

For students and teachers, technology creates opportunities for collaborative learning worldwide, breaking down artificial walls between schools and society. It affords the means to gather, analyze, and synthesize information from a variety of sources, to communicate effectively with diverse colleagues, and serves as a tool for problem solving. But in order to be effective, its use needs to be incorporated across an integrated core curriculum in a way that is meaningful to students and supportive to the learning process. It also creates opportunities for teachers to access new research and curricula and communicate with their peers.

IN CONCLUSION – Intentional Learning

Research conducted by Bereiter and Scardamilia on how humans learn suggests that schools attend to a higher order of learning objectives. These include a focus on achieving an organized knowledge of a particular subject rather than a focus on achieving the knowledge in order to pass a test in a subject area.

In their studies, they found that students tend to see learning as an outcome of their teachers' actions, rather than their own. The researchers suggest that learning be viewed as **problem solving** rather than as a learning activity. They suggest a new focus—helping students monitor information **for what it can contribute to their own understanding**, rather than to merely complete assignments. This can be done by framing lessons in ways that engage students in problems of understanding and identifying core concepts underlying events worldwide, by an emphasis on small group work, peer collaboration, and a focus on learning through active discussion by students of different interpretations of information.

Life in this century will require citizens who are knowledgeable about the biophysical environment and its associated problems, aware of how to help solve them, and motivated to work toward their solution. (Stapp) Sustainability education offers an ideal means of achieving these vital educational goals.

SUSTAINABILITY EDUCATION GUIDE

APPENDICES

In Odum's introductory college text on ecology, two major viewpoints that underlie the work are the concepts of **levels of organization** and **the importance of homeostasis** (balance) and biological regulation. He also treats humans as part of nature and therefore, affected by and able to have an effect upon the laws of natural systems.

Odum defines *ecology* as a field of environmental biology derived from the Greek root *oikos* meaning *house*. Therefore, it is the study of houses or more broadly, *environments*. It is one of several fields of biology that are concerned with fundamental common to all life. "Because ecology is concerned especially with the biology of groups of organisms and with functional processes on the lands, in the oceans, and in fresh waters, it is more in keeping with the modern emphasis to define ecology as *the study of the structure and function of nature*." Odum includes mankind as a part of nature, since nature includes the living world. The basic concepts of ecology are the following:

Major Concepts of Ecology

Life is supported by energy = **ENERGY FLOW**

All life is interdependent = **INTERDEPENDENCE**

Life changes and adapts to changing conditions = **ADAPTATION**

All life has order or cycles = **CYCLES**

All life has diversity = **DIVERSITY**

In order to create a sustainable community, we need to make sure that there is free flow within a network, so that the network of relationships is nurtured = **SUSTAINABILITY**

Major Principles of Ecology

Ecosystems	Individuals and populations do no live along in nature but in association with at least a few, and usually a great many, ordered, machine-like organizations which use energy and raw materials in their operation. This community of plants and animals, together with the environment that controls it, is called an ecosystem
Communities	Plants and animals that live together and make up the biological part of an ecosystem
Habitat & Niche	The specific kind of environment occupied by the individuals of a species
Cycles	
Biotic Succession	Changes in composition of vegetation at a given location through time

Food Chain	The series of organisms through which food energy moves before it is completely expended
Food Web	A complex set of interlocking food chains
Biomass	Weight of living organisms in an ecosystem, expressed either as fresh weight or dry weight
Carrying Capacity	
Natural Phenomena	

SAMPLE COMMUNITY PROJECTS

Redevelopment issues
- analyze plans already developed for a specific community redevelopment or restoration project
- research and then role-play positions of stakeholders

Analyze the effectiveness of regulations for water, transportation, recycling, burning, tree cutting, toxic wastes

Analyze appropriate use of land

Research best location of public parks

Examine or create sustainability indicators
- Research indicators from cities such as Seattle, Washington
- Develop you own community/school indicators
- Choose one indicator, such as energy efficiency, and investigate

Wildlife Habitat
- Study migrating birds
- Study bat habitat and threats to it by development
- Study the life cycles of bears and the effect of development on them

The effect of development on marshes

Ecosystems
- The terrarium as a simple ecosystem
- The pond as an ecosystem
- The space shuttle or space station as a self-contained ecosystem
- The coral reef as a complex ecosystem

Study of an ecological indicator (a rare or sensitive feature) that will show strain before it becomes apparent in the larger community

The role of fire in ecological health

Plant Life
- Survey the role of plants and their relationship to man; choose a plant type in your region and investigate its significance to animal life, soil and water health, how it is affected by human development
- Study the problems presented by a non-native plant that was introduced to your region

Survey the major ecosystems of the world and identify those in your community; choosing one and examining the threats to it
- The seas
- Estuaries and seashores

- Streams and rivers
- Lakes and ponds
- Fresh water marshes
- Deserts
- Tundra
- Grasslands
- Forests

Study terrestrial ecosystem types: their characteristics and where they are located, then study the one found in your region
- Tropical rain forest
- Tropical savanna
- The atoll
- Temperate grasslands
- Temperate deciduous forest
- Temperate rain forest
- Boreal coniferous forest
- Arctic and alpine tundra
- Montane coniferous forests

TAHOE SPECIFIC

Research the value of a pine needle collection program and begin one in conjunction with a community business (such as local refuse company) or government or non-profit environmental agency

Begin a composting program for your school or students at home

Study how much garbage you generate and where it goes

Create a native seed collection program

Do a soil analysis before revegetation of a nearby site, such as a stream

Create a ski resort environmental planning team

Trace the source of your drinking water and what affects if purity

Identify "natural" sources of economic benefits to the region and how they are affected by overuse

Identify some aspects of our natural surroundings and how they benefit our way of life

Study and role-play various perspectives of a current community concern
- Extent of housing development that should be allowed
- Appropriate use of off-road vehicles
- How to handle pollution of water supplies by gas additives (MBTE)
- Use of off-road recreational vehicles in U.S. Forest land vs. non-motorized sports

QUESTIONS ABOUT TAHOE

Where does your drinking water come from?

Where does your trash go?

From what direction do winter storms come from?

Where is North from your front steps?

What spring wildflowers bloom first?

What is a conifer?

Can you name one type of conifer that lives in Tahoe?

How deep is Lake Tahoe in the deepest part?

How long is Lake Tahoe?

Can you name three significant mountain peaks in or near South Lake Tahoe?

Can you name a type of rock in the South Lake Tahoe area?

Name a "natural" source of economic benefit for this area.

Name some types of businesses that Lake Tahoe provides for this community.

Name some important benefits of the natural surroundings to our way of life.

SOURCES OF COMMUNITY PARTNERS

Businesses
- Architects
- Banks Chambers of Commerce
- Development Companies
- Hospitals
- Law Firms
- Nurseries
- Planning and Management Consultants
- Realtors

Community Groups and Service Clubs
- American Association of University Women
- Ducks Unlimited
- Fly Fishers
- League of Women Voters
- Kiwanis
- Lions
- Optimists
- Rotary
- Soroptimists
- Toastmasters

Cultural Institutions/Organizations
- Local Historical Society
- Arts Agencies
- Museums

Environmental Organizations
- Audubon Society
- California League of Conservation Voters
- League to Save Lake Tahoe
- National Wildlife Federation
- Roots and Shoots
- Sierra Club
- Sierra Nevada Alliance

Retired Professionals
- American Association of Retired Persons (AARP)
- SCORE
- Senior Centers
- Sons in Retirement (SIRS)

Federal Agencies
- Americorps Program

- Army Corp of Engineers
- Bureau of Land Management
- Bureau of Reclamation
- U.S. Department of Fish and Wildlife
- U.S. Forest Service
- U.S. Geological Service
- Resource Conservation Districts
- U.S. Park Service

State Agencies
- California Conservation Corps
- Conservancies (State, Regional and Private)
- Division of Environmental Protection
- Division of Forestry
- Division of Wildlife
- Resource Conservation Districts
- State Historic Preservation Officer
- State Lands
- State Park Service

County and Regional Agencies
- County Education Employees
- County Health Departments
- Local and Regional Planning Agencies
- Regional Water Quality Control Boards

Local Agencies
- Non-profit Organizations
- Parks and Recreation Programs
- Refuse Companies
- Utility Districts
- Volunteer Agencies

Colleges and Universities
- Research Institutes
- Specific Departments
- Student Interns

Student Programs
- Make-a-Difference
- Scouts
- Scholastic News

REFERENCES

Autodesk Foundation, 111 McInnis Parkway, San Rafael, CA 94903

Ecology, Eugene P. Odum, The University of Georgia 1963, Holt, Rinehart and Winston, Inc.

Plants, Man, and the Ecosystem, Fundamentals of Botany Series, Second Edition, W.D. Billings, Duke University, Wadsworth Publishing Company, Inc. Belmont, CA, 1970

"A Vision of the Future Implemented Today" CUE Newsletter, Volume 16, Number 6, Computer-Using Educators, Inc., November/December, 1994

U.S. Geological Survey Yearbook, Understanding the Earth, 1995, U.S. Geological Survey Information Services, 1996, Box 25286, Federal Center, Denver, CO 80225
http://yearbook.usgs.gov/

Closing the Achievement Gap, Using the Environment as an Integrating Context for Learning, Gerald A. Lieberman, Ph.D., Linda L. Hoody, M.A., State Education and Environment Roundtable

Education for Sustainability, an Agenda for Action, a report by the National Forum on Partnerships Supporting Education about the Environment, which is a demonstration project of the President's Council on Sustainable Development, 1994

Global Change, teaching packet, U.S. Department of the Interior, U.S. Geological Survey, National Mapping Division, U.S. Geological Survey, Reston, VA 22092

Making Education Real, Using the Environment as an Integrating Concept, Gerald A. Lieberman, Linda L. Hoody, interim report by the State Education and Environment Roundtable, April 24, 1997

PBL NETWORK, Autodesk Foundation, 111 McInnis Parkway, San Rafael, CA 94903

Public Linkage, Dialogue, and Education, From Classroom to Community and Beyond: Educating for a Sustainable Future, Task Force Report, The President's Council on sustainable Development, February 1997

Sustainable America, a New Consensus for the Future, A New Consensus, The President's Council on Sustainable Development, February 1996

"Intentional Learning As a Goal of Instruction," Carl Bereiter, Marlene Scardamalia, Knowing, Learning, and Instruction, L.B. Resnick, Ed., Hillsdale, New Jersey: L. Erlbaum Associates, 1989

"Schools as Knowledge-Building Communities," Marlene Scardamalia, and Carl Bereiter, Centre for Applied Cognitive Science, Ontario Institute for Studies in Education, to appear in S. Strauss (ed.), Vol. 5. *Human Development*, Norwood, NJ: Ablex, paper presented at the Workshop on Development and Learning Environments, University of Tel Aviv, Israel, October 1989

From the Parts to the Whole, Systems Thinking in Ecology and Education, Fritjof Capra, Center for Ecoliteracy, Berkeley, CA

Educating for a Sustainable Future: a Transdisciplinary Vision for Concerted Action, United National Educational, Scientific and Cultural Organization, November 1997

RESOURCES

Organizations:

The Tahoe Center for a Sustainable Future, Scott Ross, Executive Director, P.O. Box 452, Truckee, CA 96160, or Harriet Goldman, Sustainability Curriculum Program Manager, hgassoc@thegrid.net or, (530) 541-5589, http://www.ceres.ca.gov/tcsf

Institute of Cultural Affairs (ICA), regarding training in group facilitation methods and strategic planning. Contact Patricia Truckee, mentor trainer/registrar, at 775/333-6998, or Harriet Goldman, trainer, at P.O. Box 14600, South Lake Tahoe, CA 96150, Phone (530) 541-5589

National Issues Forums (NIF) 100 Commons Road, Dayton, Ohio 45459-2777, Phone (900) 433-7834

PBL NETWORK, Autodesk Foundation, 111 McInnis Parkway, San Rafael, CA 94903 (415) 507-6337

Creative Change Educational Solutions, Susan Santone, Director, 229 Miles Street, Ypsilanti, Michigan 48198-4017, (734) 482-0924, educhange@igc.org

Education for a Sustainable Future (ESF), a division of The Concord Consortium, efsinfo@concord.org

Curricula/Supplementary Material:

A Child's Place in the Environment, Achieving a Sustainable Community, Olga N. Clymire, California Department of Education, curriculum

Acorn Naturalists, Resources for the Trail and Classroom catalog, 17300 East 17th Street, #J-236, Tustin, CA 92780, (800) 422-8886, acornnaturalists.com

California Project WET, Water Education for Teachers, a project of the Water Education Foundation, (916) 444-6240 for catalog and additional information

Environmental Education, Compendium for Human Communities, California Energy Commission, The California Department of education, May 1994

Environmental Education, Compendium for Water Resources, California Department of Education, California Department of Water Resources, November 1996

Global Change, U.S. Department of the Interior, U.S. Geological Survey

Healing the Water, a Public Television Program, and Viewer's Guide, Water Education Foundation, 717 K Street, Suite 517, Sacramento, CA 95814, Phone (916)448-6240
Internet: http://www.water-ed.org/

Project Wild, Primary and Secondary Activity Guides, Western Regional Environmental Education Council, 1986Teaching Naturally, Using Environment to Improve Teaching & Learning, An

Interdisciplinary Guide to the Sunshine State Standards, Panhandle Regional Environmental Education Service Project, c/o PAEC, 753 West Boulevard, Chipley FL 32428, (850) 638-6075; also contact Office of Environmental Education, Florida Gulf Coast University, 1311 Paul Russell Rd., Suite 201A, Tallahassee, FL 32301

Telecommunications Curriculum Units for Grades 1-12, Mendocino Unified School District, in partnership with NASA's NREN K-12 Internet Schools Project, Autodesk Foundation, and The California Department of Education's Telemation Project, Summer 1994, P.O. Box 1154, Mendocino, CA 95460, (707) 937-5868

The Shape of Change, Introduction to Sustainability and Towards a Sustainable Economy, two sustainability curricula for use in high school science, social studies, or humanities classes, also suitable for adult education, Susan Santone, Creative Change Educational Solutions, 229 Miles Street, Ypsilanti, MI 48198-4017, (734) 482-0924, E-mail: educhange/igc.org

Books/Texts:

Games on Sustainable Development, Dennis L. Meadows, Barbara Van der Walls, University of New Hampshire, The Laboratory for Interactive Learning, Institute for Policy and social Science Research, Thompson Hall, 105 Main Street, Durham, New Hampshire 03824, (603) 862-2186

The Kid's Guide to Social Action, Barbara A. Lewis, Free Spirit Publishing, 1991, 400 First Avenue North, Suite 616, Minneapolis, MN 55401, (612) 338-2068

More than 50 Ways to Build Team Consensus, A. Bruce Williams, IRI Skylight Training and Publishing, Inc., Palatine, IL, 1993

Sea and Earth: The Life of Rachel Carson, Philip Sterling, Dell Publishing Co., Inc., New York, 1970

Streamkeeper's Field Guide, Watershed Inventory and Stream Monitoring Methods, Tom Murdoch, Martha Cheo, Kate O'Laughlin, The Adopt-A-Stream Foundation, 600-128th Street SE, Everett, WA 98208, (206) 316-8592

Understanding Our Changing Planet, Earth Science Enterprise 1998 Applications Fact Book, National Aeronautics and Space Administration, Code YM, NASA Headquarter, Washington, DC 20546, http://www.hq.nasa.gov/office/mtpe

Websites:

Creative change Educational Solutions: http://www.creative_change.net/ and The Sustainability Education Project: http://www.co.washtenaw.mi.us/depts/eis/susted/susted.html a related project

The Sustainable USA Network: http://www.sustainable-usa.org/

President's Council on Sustainable Development: http://whitehouse.gov/WH/EOP/pcsd/

Reading & Writing Naturally, a searchable database of children's literature related to environment: http://www.readnwritnaturally.org/

A Guide for Researching Sustainability on the Internet, a service of the Washtenaw County Sustainability Education Project, September 1999: http://www.co.washtenaw.mi.us/depts/eis/susted/susted.html