DOCUMENT RESUME

ED 061 031 SE 012 640

AUTHOR Howlett, George
TITLE Twelve Major Concept Categories and Their Rationale.
INSTITUTION Project I-C-E, Green Bay, Wis.
SPONS AGENCY Bureau of Elementary and Secondary Education (DHEW/OE), Washington, D.C.
NOTE 16p.

EDRS PRICE MF-$0.65 HC-$3.29
DESCRIPTORS Definitions; *Ecology; *Environment; Environmental Education; *Fundamental Concepts; Interdisciplinary Approach
IDENTIFIERS ESEA Title III; Project I C E

ABSTRACT

Twelve concepts utilized by Project I-C-E (Instruction-Curriculum-Environment) for integrating science, social studies, and language arts with environmental studies are elaborated in this booklet. The rationale for each concept is put forth together with a more detailed explanation of the concept. Topics considered include: energy, ecosystems, limiting environmental factors, water supply, clean air, distribution of natural resources, factors influencing land use, values and attitudes, the power of man, economics, decision making, and land stewardship. This work was prepared under an ESEA Title III contract. (BL)

PROJECT I-C-E

TWELVE MAJOR CONCEPT CATEGORIES AND THEIR RATIONALE

by George Howlett

Project I-C-E
(Instruction-Curric
Robert J. Warpinski
1927 Main Street
Green Bay, Wisconsi

Produced under Title III, ESEA Project #59-70-013

P R O J E C T I - C - E

TWELVE MAJOR CONCEPT CATEGORIES AND THEIR RATIONALE

by George Howlett

Project I-C-E
(Instruction-Curriculum-Environment)
Robert J. Warpinski, Director
1927 Main Street
Green Bay, Wisconsin 54301

Produced under Title III, ESEA Project #59-70-0135-1

The Concepts and Their Rationale

Concept One: Energy from the sun, the basic source of all energy, is converted through plant photosynthesis into a form that all living things can use for life processes.

When we turn on an electric light switch, we may be able to mentally trace th source of this useful energy back to a generating station. We may even know that in most cases the energy comes by releasing the energy stored in fossil fuels. Very few of us conceive of the hydrogen bomb reaction of the sun as being the ultimate source of our electrical energy. Yet this sun, radiating light energy, is the source not only of the electrical energy of our modern world, but also of the very energy we need for body operation. Only the green plant can trap and store this energy. When light energy strikes the green plant the simple common compounds of water and carbon dioxide are transformed into an energy rich storage product, sugar Some of the sugar undergoes transformation over geological time to energy storage products we call fossil fuels. Whether we use this energy stored by the green plan when eating plant products, when eating animals fed on plant products or when burni fossil fuels, we release this energy by using oxygen produced by the plant during sugar manufacture. We thus free carbon dioxide and water to recycle through the energy storage cycle to keep life systems operating.

Concept Two: All living systems interact among themselves and their environment, forming an intricate unit called an ecosystem.

We have seen in concept one that there is a dependency on the green plant for the operation of the energy cycle of life. But the green plant does not operate independently. It is dependent on the physical and biotic world in which it lives. Plants as food energy producers, animals as energy consumers and decay organisms recycling organic matter for plant use--all form part of a complex interacting biotic community. These organisms are specially adapted to living with each other within a physical realm which is itself a complex of interacting factors such as soil, climate, available light, season, water and oxygen supply, etc. Each biotic community type is different because its surrounding and physical factors vary. In addition, each community has its own influence on the physical surroundings. This creates a feedback situation known as the dynamic balance of nature. Constant change is part of the whole system. We call this complex of life and physical factors and their interactions an ecosystem.

The Concepts and Their Rationale

rgy from the sun, the basic source of all energy, is converted
ough plant photosynthesis into a form that all living things can
for life processes.

n on an electric light switch, we may be able to mentally trace the
ful energy back to a generating station. We may even know that in
ergy comes by releasing the energy stored in fossil fuels. Very
e of the hydrogen bomb reaction of the sun as being the ultimate
trical energy. Yet this sun, radiating light energy, is the
f the electrical energy of our modern world, but also of the very
r body operation. Only the green plant can trap and store this
ht energy strikes the green plant the simple common compounds of
dioxide are transformed into an energy rich storage product, sugar.
undergoes transformation over geological time to energy storage
fossil fuels. Whether we use this energy stored by the green plant
products, when eating animals fed on plant products or when burning
release this energy by using oxygen produced by the plant during
. We thus free carbon dioxide and water to recycle through the
cle to keep life systems operating.

living systems interact among themselves and their environment,
ming an intricate unit called an ecosystem.

n in concept one that there is a dependency on the green plant for
the energy cycle of life. But the green plant does not operate
is dependent on the physical and biotic world in which it lives.
ergy producers, animals as energy consumers and decay organisms
matter for plant use--all form part of a complex interacting
These organisms are specially adapted to living with each other
realm which is itself a complex of interacting factors such as
ilable light, season, water and oxygen supply, etc. Each biotic
different because its surrounding and physical factors vary. In
mmunity has its own influence on the physical surroundings. This
situation known as the dynamic balance of nature. Constant
the whole system. We call this complex of life and physical
interactions an ecosystem.

Concept Three: Environmental factors are limiting on the number of organisms living within their influence, thus each environment has a carrying capacity.

Recent space adventures have made us aware that our astronauts are depende a life support system which must be finely planned and engineered to achieve a s and successful space voyage. We on earth live in a similar life support system. Because we have not yet treated this spaceship, Earth, with the foresight in pla that is done for space travelers, we may be pushing this system to the limits of resistance. Each environmental factor is a strand in the web of life and when a strand breaks because pressure on it exceeds its capacity, the whole web is weak and may break down. The best measure of the strength of an environmental strand its ability to support a population of organisms. The weakest strand, of course the one that will limit the density of the population. We can destroy life's we increasing population beyond the capacity of the limiting factors; for example, overgrazing a pasture. Also, we can change the resistance within life's web by altering the environmental structure as we do in polluting water.

Concept Four: An adequate supply of pure water is essential to life.

No life of which we know functions without water. Even a virus, basically super molecule, is active only in the watery environment of living tissue. Each organism has adaptations for life in an environment that includes a certain wate quantity and quality. The varied concentrations of wastes pouring from our indu and sewers change water quality so that native organisms are eliminated. Some o the new industrial compounds poured out are so strange that no organism can adju Man has changed the supply and quality of water in many areas without considerat for the quality of the biotic communities dependent on these waters. He even go on changing water quality when it is of detriment to his own use of this water.

Concept Five: An adequate supply of clean air is essential for life.

Some of our commercially most useful organisms, the yeasts, can exist with air. In fact, as obligate anaerobes, they must carry on their active life proce in the absence of oxygen. But even these anomolous organisms depend on the ener laden organic molecules such as the sugars produced by oxygen respiring green pl

Environmental factors are limiting on the number of organisms
living within their influence, thus each environment has a
carrying capacity.

ace adventures have made us aware that our astronauts are dependent on
system which must be finely planned and engineered to achieve a safe
space voyage. We on earth live in a similar life support system.
not yet treated this spaceship, Earth, with the foresight in planning
r space travelers, we may be pushing this system to the limits of its
ch environmental factor is a strand in the web of life and when a
ecause pressure on it exceeds its capacity, the whole web is weakened
own. The best measure of the strength of an environmental strand is
support a population of organisms. The weakest strand, of course, is
ll limit the density of the population. We can destroy life's web by
lation beyond the capacity of the limiting factors; for example, by
asture. Also, we can change the resistance within life's web by
vironmental structure as we do in polluting water.

An adequate supply of pure water is essential to life.

f which we know functions without water. Even a virus, basically a
is active only in the watery environment of living tissue. Each
aptations for life in an environment that includes a certain water
ality. The varied concentrations of wastes pouring from our industries
ge water quality so that native organisms are eliminated. Some of
al compounds poured out are so strange that no organism can adjust.
the supply and quality of water in many areas without consideration
of the biotic communities dependent on these waters. He even goes
r quality when it is of detriment to his own use of this water.

n adequate supply of clean air is essential for life.

r commercially most useful organisms, the yeasts, can exist without
s obligate anaerobes, they must carry on their active life processes
f oxygen. But even these anomolous organisms depend on the energy
lecules such as the sugars produced by oxygen respiring green plants.

The green plant carries on respiration even as it photosynthesizes an excess of oxygen for animal respiration. Both plant and animal respiratory systems have evolved in an atmospheric condition predating man's inventions. We now see the damage to plant and animal communities resulting from industrial and automotive fumes and smogs. Some organisms are more sensitive to changes in air quality as seen in the death of the Ponderosa Pine in the mountains near Los Angeles. Our concern is not only with the lethal effects to sensitive organisms or to more tolerant organisms under disaster conditions, but also with the long term, low level toxicity which is cumulative to organisms such as man because of the changes our industrial culture has on air quality.

Concept Six: Natural resources are not equally distributed over the earth or over time, and greatly affect the geographic conditions and quality of lif

Before man's culture entered into the progression of life's history, climate, land form and mineral locations presented environmental conditions that only certai plant communities and their animal associates could tolerate and to which they coul adapt. The geologic activities of erosion and mountain uplift have changed the lan forms over time. Thus, plant communities were not always associated with the locations where man found them. Man is a most adaptable organism. His cultures ha reached all regions of the earth, but until recent times even this has been by genetic adaptation to environmental conditions. Now as industrial man seeks to extract resources for his economic machine he must trade with people of other regio Historically, the extraction of resources has often left the populations of those regions poorer as the extracting nations have been enriched. Even industrial man, with his capacity to modify the environment, is confounded when he moves to a pleas place of living like California. He finds that he has overloaded the capacity of t region to absorb his wastes because of the special local distribution of land form in the Los Angeles Basin.

Concept Seven: Factors such as facilitating transportation, economic conditions, population growth, and increased leisure time have a great influenc on changes in land use and centers of population density.

Consider two small settlements connected with the fur trade, one on Rock Isla in Door County and the other at present day Chicago as they were several centuries ago. What makes these two sites so vastly different today? We see one located whe

carries on respiration even as it photosynthesizes an excess of
l respiration. Both plant and animal respiratory systems have
nospheric condition predating man's inventions. We now see the
nd animal communities resulting from industrial and automotive
Some organisms are more sensitive to changes in air quality as
of the Ponderosa Pine in the mountains near Los Angeles. Our
nly with the lethal effects to sensitive organisms or to more
rs under disaster conditions, but also with the long term, low
hich is cumulative to organisms such as man because of the changes
lture has on air quality.

tural resources are not equally distributed over the earth or over
re, and greatly affect the geographic conditions and quality of life.

's culture entered into the progression of life's history, climate,
neral locations presented environmental conditions that only certain
s and their animal associates could tolerate and to which they could
gic activities of erosion and mountain uplift have changed the land
Thus, plant communities were not always associated with the
an found them. Man is a most adaptable organism. His cultures have
ns of the earth, but until recent times even this has been by
n to environmental conditions. Now as industrial man seeks to
s for his economic machine he must trade with people of other regions.
e extraction of resources has often left the populations of those
s the extracting nations have been enriched. Even industrial man,
y to modify the environment, is confounded when he moves to a pleasant
like California. He finds that he has overloaded the capacity of the
his wastes because of the special local distribution of land form as
es Basin.

Factors such as facilitating transportation, economic conditions,
population growth, and increased leisure time have a great influence
on changes in land use and centers of population density.

wo small settlements connected with the fur trade, one on Rock Island
nd the other at present day Chicago as they were several centuries
these two sites so vastly different today? We see one located where

the lake carrier, the railroad, the truck, the river barge and the airplane can bring and exchange goods from near and far. Having easily available the raw materials of agricultural produce, fuel, and ore and being close to the heartland of the agricultural market meant that a profitable manufactury could develop. Financial houses grew to provide the capital funds industry needed. The city fue its own growth as early expansion increased the demand for services. As urban growth changes the natural site appearance, the urban man seeks to use his increa free time affluence and to return where he can linger in the rustic atmosphere hi industry erased. Now this man invades the remote island, presently a park, to sample a way of life he cannot permit to remain where he carries on the activity economic man.

Concept Eight: Cultural, economic, social and political factors determine the st cf man's values and attitudes toward his environment.

Erich Fromm says of western and particularly of north American man: "Man h lost his central place, ...he has been made an instrument for the purpose of econ aims...he has been estranged from and has lost the concrete relatedness to his fe men and to nature, ...he has ceased to have a meaningful life." We have come to in a material, merket oriented society which is conditioned to value things above life and person. Man has created the machine and is now owned by his own creatio Our advertising causes us to search out in satisfaction of artificially created fantasies. The economic system that benefits from satisfying our consumer demands has its own demands on the resource base. The political system is cemented to economics because it measures national health in terms of Gross National Product.. also set our attitude to the land in the sense that our public lands were conside wild things waiting to be reduced to dominion. The Myth of Superabundance satura our whole outlook. In one sense we do see ourselves as central to all creation. believe it is our duty to go and conquer nature which has its existence only to s our demands. How different this is from the Indian culture that demanded an indi apologize to the spirit of any being or place which he needed to use for satisfac of necessary human activity.

Concept Nine: Man has the ability to manage, manipulate, and change his environme

As man has advanced in cultural sophistication from the food gathering and hunting-fishing cultures still retained by some few people we refer to as aborigin

ier, the railroad, the truck, the river barge and the airplane can
hange goods from near and far. Having easily available the raw
agricultural produce, fuel, and ore and being close to the heartland
ltural market meant that a profitable manufactury could develop.
ses grew to provide the capital funds industry needed. The city fueled
h as early expansion increased the demand for services. As urban
s the natural site appearance, the urban man seeks to use his increased
luence and to return where he can linger in the rustic atmosphere his
ed. Now this man invades the remote island, presently a park, to
of life he cannot permit to remain where he carries on the activity of

: Cultural, economic, social and political factors determine the status
of man's values and attitudes toward his environment.

romm says of western and particularly of north American man: "Man has
ral place, ...he has been made an instrument for the purpose of economic
been estranged from and has lost the concrete relatedness to his fellow
ture, ...he has ceased to have a meaningful life." We have come to live
, market oriented society which is conditioned to value things above
on. Man has created the machine and is now owned by his own creation.
ng causes us to search out in satisfaction of artificially created
he economic system that benefits from satisfying our consumer demands
emands on the resource base. The political system is cemented to
ause it measures national health in terms of Gross National Product. It
attitude to the land in the sense that our public lands were considered
aiting to be reduced to dominion. The Myth of Superabundance saturated
ook. In one sense we do see ourselves as central to all creation. We
our duty to go and conquer nature which has its existence only to satisfy
How different this is from the Indian culture that demanded an individual
he spirit of any being or place which he needed to use for satisfaction
umen activity.

Man has the ability to manage, manipulate, and change his environment.

as advanced in cultural sophistication from the food gathering and
g cultures still retained by some few people we refer to as aboriginal,

his ability to change the environment has increased. Today we possess the unwan capacity to destroy most life directly with the terrible power of atomic force. are in awe of this terrible power. We are also becoming aware that a less drama destruction goes on under our command as we mindlessly pursue the "conquest of n We extract the plant resources, the life giving capacities of the soil, the mine and fuel deposits. We fill the waters with foul wastes, the marshes with our us goods, the air with contaminants and the land itself with the artifacts of progr We should not forget, however, that man also has the power, when possessed of wi to wisely manage the land, to use his knowledge of the ways of natural systems f maintaining his artificial systems in balance with those systems.

Concept Ten: Short-term economic gains may produce long-term environmental loss

In Governing Nature, E. F. Murphy states: "If it means the return of a pr North Americans have changed even the most hostile landscapes in order to make t serve current economic demands." Market oriented entrepeneurs seeking to maximi profit have traditionally operated with relatively short-term outlooks. We all the fruit of the land dangling before our eyes and wish to grab it unconcerned a the future productivity of the land. We operate with a faith in the myth of scientific supremacy which suggests that technology will atone for our abuse of land. There are long-term environmental and social costs to be paid when we con environmental factors as unimportant and air, water and land as "free goods." T costs must be paid. Even now we pay them as we find environmental quality decre and our social problems on the increase.

Concept Eleven: Individual acts, duplicated or compounded, produce significant environmental alterations over time.

Adam Smith in The Wealth of Nations conceived the idea of "the invisible h He said that it was largely the individual merchant, intent on his own gain, who the aggregate directs the availability of goods to meet the demands of a market economy. This same invisible hand in the form of individual consumer decisions, guided by competitive prices and product availability, directs manufacturers to on the resources of nature to supply the market. Each supplier's decision to ig the costs of maintaining environmental quality, so better to compete on the pric schedule, has added to the present environmental damage. The individual consume

hange the environment has increased. Today we possess the unwanted roy most life directly with the terrible power of atomic force. We is terrible power. We are also becoming aware that a less dramatic on under our command as we mindlessly pursue the "conquest of nature." lant resources, the life giving capacities of the soil, the mineral s. We fill the waters with foul wastes, the marshes with our used ith contaminants and the land itself with the artifacts of progress. rget, however, that man also has the power, when possessed of wisdom, the land, to use his knowledge of the ways of natural systems for rtificial systems in balance with those systems.

crt-term economic gains may produce long-term environmental losses.

ng Nature, E. F. Murphy states: "If it means the return of a profit, ave changed even the most hostile landscapes in order to make them cnomic demands." Market oriented entrepeneurs seeking to maximize litionally operated with relatively short-term outlooks. We all see land dangling before our eyes and wish to grab it unconcerned about ctivity of the land. We operate with a faith in the myth of nacy which suggests that technology will atone for our abuse of the long-term environmental and social costs to be paid when we consider ctors as unimportant and air, water and land as "free goods." These id. Even now we pay them as we find environmental quality decreasing roblems on the increase.

Individual acts, duplicated or compounded, produce significant environmental alterations over time.

in The Wealth of Nations conceived the idea of "the invisible hand." was largely the individual merchant, intent on his own gain, who in rects the availability of goods to meet the demands of a market ame invisible hand in the form of individual consumer decisions, itive prices and product availability, directs manufacturers to draw of nature to supply the market. Each supplier's decision to ignore ntaining environmental quality, so better to compete on the price ded to the present environmental damage. The individual consumer,

making decisions to buy, to dispose of consumed goods, to participate in politica action for environmental causes has a great degree of control over further destru to the land. If the aggregate of individuals love and respect the land as mother earth, these decisions will combine to solve present environmental problems and p more damage to earth's environment.

Concept Twelve: Private ownership must be regarded as a stewardship and should n encroach upon or violate the right of others.

Our Indian ancestors held that the land belonged to "the people." An indiv could hold land during his lifetime, but he was to treat it as the mother spirit nourished the people from ages past and would do so in the far distant future. W are charged with being custodians of creation, and are held responsible for the w use of creation's bounties. If we consider ourselves masters of the earth, yet d the environment, then we are out of control, being not masters but slaves. In hi Sand County Almanac, Aldo Leopold found the custodianship concept an ecological n Individual man is part of the community of nature, interdependent with this commu The community of the land is the life support system for all including man. Leop asks how a man might be considered a respected member of the human community when commits crimes of abuse against the land. We should have our social consciousnes extended to a concern not only for the relationships within the human community b also for the relationships between man and the total community of life. This Leo calls the Land Ethic.

isions to buy, to dispose of consumed goods, to participate in political
environmental causes has a great degree of control over further destruction
d. If the aggregate of individuals love and respect the land as mother
se decisions will combine to solve present environmental problems and prevent
e to earth's environment.

elve: Private ownership must be regarded as a stewardship and should not encroach upon or violate the right of others.

Indian ancestors held that the land belonged to "the people." An individual land during his lifetime, but he was to treat it as the mother spirit which the people from ages past and would do so in the far distant future. We too d with being custodians of creation, and are held responsible for the wise ation's bounties. If we consider ourselves masters of the earth, yet destroy nment, then we are out of control, being not masters but slaves. In his y Almanac, Aldo Leopold found the custodianship concept an ecological necessity. man is part of the community of nature, interdependent with this community. ity of the land is the life support system for all including man. Leopold man might be considered a respected member of the human community when he imes of abuse against the land. We should have our social consciousness o a concern not only for the relationships within the human community but he relationships between man and the total community of life. This Leopold Land Ethic.

PROJECT I-C-E Episode Evaluation Form (Reproduce or duplicate as

Please fill in:
Subject: _____

Grade: _____

Concept No. Used: _____

In commenting on each episode used in your clas
form. Feel free to adapt it and add more pages.
your critiques and comments - negative and positi
hand column, please rate (poor, good, excellent)
make specific comments or suggestions if possibl
vided to help us make this a more usable guide.

Poor	Good	Exc.	
			I. Behavioral Objectives A. Cognitive:
			B. Affective:
			II. Skills Developed
			III. Suggested Learning Experiences A. In Class:
			B. Outside & Community Activities:
			IV. Suggested Resource & Reference Materials (specific suggestions & comments)

Serving S

JECT I-C-E Episode Evaluation Form (Reproduce or duplicate as needed)

In commenting on each episode used in your class, please use this form. Feel free to adapt it and add more pages. Let us know all your critiques and comments - negative and positive. In the left-hand column, please rate (poor, good, excellent) each item. Also, make specific comments or suggestions if possible in the space provided to help us make this a more usable guide. Thank you.

I. Behavioral Objectives
   A. Cognitive:

   B. Affective:

II. Skills Developed

III. Suggested Learning Experiences
   A. In Class:

   B. Outside & Community Activities:

IV. Suggested Resource & Reference Materials
(specific suggestions & comments)

Project I-C-E
Serving Schools in CESA 3-8-9
1927 Main Street
Green Bay, WI 54301