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Teaching strategies for integrating man and land

MICHAEL J. NAYLON*

It has been said that learners and workers in our nation's capital spin 100 miles and travel 1,000 linear miles in space per minute. This may not measurably affect school grades or job performance, but it is a fact of their existence in a non-simultaneous universe of change and energy events. It is this reality, perhaps, that is the ultimate basis for current social concern about the mechanics, quality, and economics of problems presently encountered in the social and physical environments.

It is increasingly evident that Man must shortly attach more realistic values to differing educational alternatives as well as to those relating to environmental management. An informed populace will have to make decisions, explore, and validate the above on matters of public and individual concern. A balance must be struck between the dynamic forces and demands of urban techniques, economic needs, and the equally compelling imperatives of managing the natural environment on a self-sustaining, self-renewing basis. In like fashion, educational endeavors must admit to the fact that individuals make these decisions through the combined biases of personal need, persuasion, and the general state of economic well-being.

Too few of us have sufficient background to deal with questions of ecologic nature. This is a function of compartmentalized, departmentalized education and unrealistically specialized skill training. These forms of educational specialization preclude comprehensive thinking. There is need for the formulation of a core of knowledge and learning directed toward the mobilization and coordination of relevant technical means to satisfy social need.

Learning environments can no longer be considered to be entities called "schools" or "jobs." Learning encompasses an individual's entire environment. Learners are limited only by their lack of physical ability to study one point or another within it. The need, therefore, is for an expansion of the concept of "school" or "learning" to include one's real, immediate surroundings and to provide for a continuum of relevant experiences that admits of social man, his needs, economic relationships, and interaction in the social and physical environments. The Minnesota Environmental Science Foundation suggests that this would be best realized through an inquiry-oriented problems approach to knowledge that cuts across the artificial boundaries of disciplines established to satisfy an administrative bent.

Adjunct Learning Environments

Simplistically stated, plants and animals live together in basic units known as "communities." These biologic systems, however, are not closed, self-contained entities. They are subsystems of a grander scheme. Even Spaceship Earth does not constitute a closed system; it draws its life-supporting energy from the sun. It also can be said that our solar system is not truly closed. It is relative to and influenced by other celestial units.

The community concept has great potential as an organizer for realistic and practical programs of environmental education. Communities can be arbitrarily defined as aggregations of living things, living together and interacting with matter and energy that make up the physical environment of that unit known as an eco-system. Natural populations exist in these communities for the appropriate reason that their basic biologic needs are satisfied in one form or another and are complementary to the physical environment of the area. Ecologists call this "fitness."

In like fashion, human populations can exist in their habitat, the city, for similar reasons. People's real (biologic) and invented (cultural) needs are satisfied by a number of interactions that occur between an area's co-inhabitants. (Fig. 1). Communities can serve as "everywhere/everything" laboratories that provide educational experiences directly related to the experiential reality of the learner. Programs of this type have three inherent components: the physical environment, the community "habitat," and social man living in and interacting with his physical world.

Inquiry-oriented comparative studies of cultural and naturalistic phenomena can be used to provide learners with an operational insight that cannot be provided by textbook course work. Several examples follow:

A. RESOURCE EXPLOITATION. Resources such as air or minerals exist not necessarily because of some intrinsic value in them but rather because of their relative value to life forms that can utilize the resources in one fashion or another. Operationally speaking then, a resource becomes a resource when its utilitarian aspects can be exploited by living things. On a fundamental level, the discovery and exploitation of a resource may involve the random occurrence of a chromosomal operon that permits a microbe to utilize a new carbon source. On the more complex social level, the exploitation of a resource may be as far-reaching in its impact as the discovery of iron in northern Minnesota and subsequent open-pit mining operations that change the landscape drastically.

B. INTERACTION AND NEEDS. Although space and nutrient resources are exploited by all life forms, the "exploitation" is usually related directly to the gratification of biologic needs. People and their invented cultural systems cause some complications. Needs are no longer holistically biologic

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in their nature. Social specialization and trade systems as alternative means of satisfying basic biologic needs further complicate any consideration of resource utilization. Particularly in America, it appears that the driving force in the social environment is that of the dollar, whereas in the physical environment, the system is primarily driven by energy initially provided by the sun.

However idealistically stated, real social values are graphically expressed by actual resource utilization. Man's present environmental dilemma relates directly to socio-ecologic compromise made in the interest of quick returns and short-sighted planning. All evidence suggests that Man and land have not been successfully integrated.

C. INVENTED VALUES AND EVIDENCE. It appears that the only constants in any community, social or naturalistic, are "interaction" and "change." Value systems are particularly difficult to deal with in educational situations. They are not constant entities and tend to have a "quicksilver" quality. A continuum of behavioral and attitudinal permutations exists that is a relative function of individual, cultural, and societal subsystem values.

A functioning, inhabited community, supporting people and their economy, has an impact on interrelationships in the physical environment. An example of this might be the transition from open pasture to paved parking lot. It is readily apparent in this instance that certain environmental relations having to do with water run-off and the types of plant and animal species that could be supported by the plot have been altered. The cumulative impact of community-induced changes in environmental relations also has an impact upon people, their needs, economy, and their stated value systems. Smog-laden thermal inversions do much to exemplify this point.

A Suggested Method

In order to provide the learner with real, but *quantifiable* educational experiences within the community, one might initially focus upon "land use" rather than stated values. The way man uses land for residential, commercial, or industrial purposes says much about the way he relates to the stated value system. Sometimes they are in close agreement. In other instances there is a great deal of difference between what is said and what is actually done. Land use is real. It is concrete and it exists. It is quantifiable in the sense that the learner can see and measure it. It endures for periods of time much longer than apparent values and systems of values within a culture.

The various ways in which man uses land to form his habitat can be identified as rather straight-forward components in almost all communities. Their size and positional relationship are plastic entities and shift with the needs of Man and according to the mandates of the physical environment. This mosaic of land-use units can be used as a guide in the learner's search for evidence of interaction between Man and land.

Recently, work done by Ian McHarg and his associates pointed the way toward a promising technique for establishing compatibility values for land use. It is a simplified method of using intersects to compare arbitrary categories of land use. We in Minnesota have modified the method slightly by assigning an arbitrary four-point index for compatibility. This allows us to use small numbers to compare the relative appropriateness of adjoining land uses and to derive an "environmental compatibility score" for the way a community is laid out.

In no way do we suggest that this method is infallible. One might even challenge the suitability of assigned com-

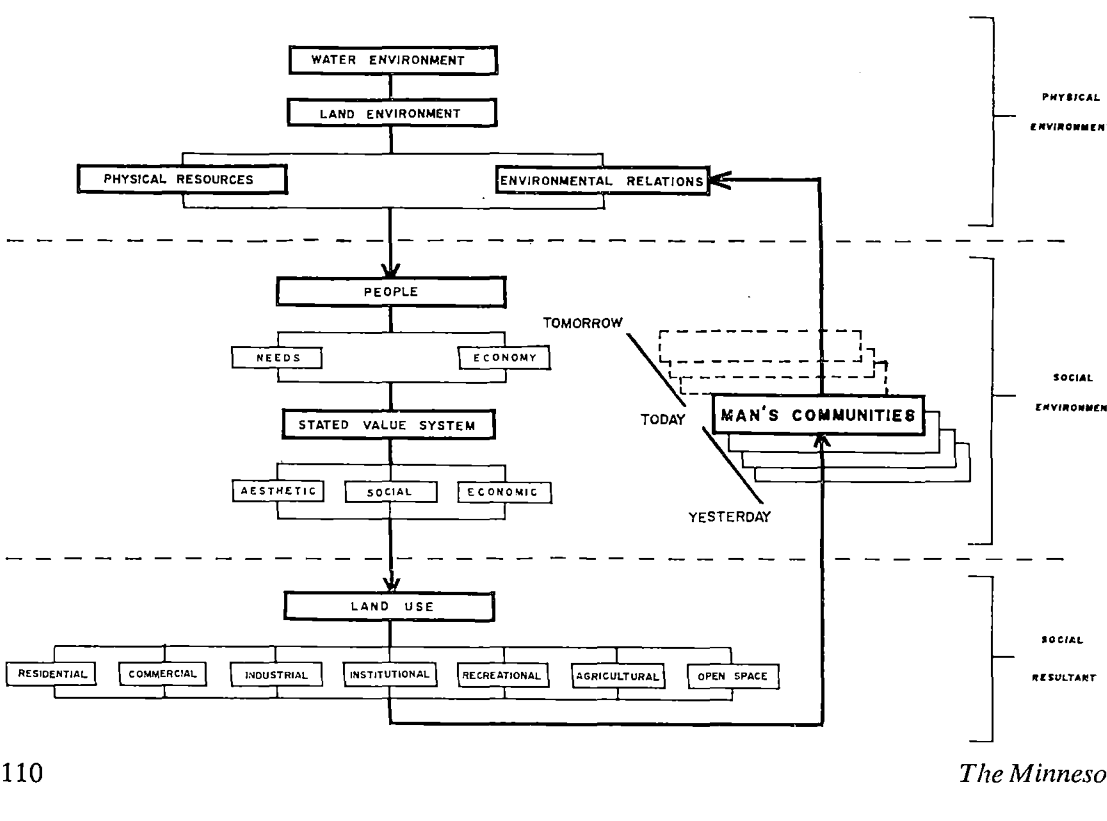

FIG. 1 — How interaction between man and land can be shown graphically

		URBAN	SUBURBAN RESIDENTIAL	INDUSTRIAL	INSTITUTIONAL	MINING shaft-mined	MINING open	MINING abandoned	QUARRYING stone & limestone	QUARRYING sand & gravel	VACATION SETTLEMENT	AGRICULTURE row crops	AGRICULTURE arable	AGRICULTURE livestock	FORESTRY even-stand softwood	FORESTRY uneven-stand softwood	FORESTRY hardwood	RECREATION saltwater oriented	RECREATION freshwater oriented	RECREATION wilderness	RECREATION general recreation	RECREATION cultural recreation	RECREATION driving for pleasure	WATER MANAGEMENT reservoir	WATER MANAGEMENT watershed
URBAN		4																							
SUBURBAN RESIDENTIAL		3	4																						
INDUSTRIAL		4	1	4																					
INSTITUTIONAL		2	4	1	4																				
MINING	shaft-mined	1	1	4	1	4																			
	open	1	1	4	1	-	4																		
	abandoned	1	2	4	3	-	-	4																	
QUARRYING	stone & limestone	1	1	4	1	-	-	-	4																
	sand & gravel	1	1	4	2	-	-	-	-	4															
VACATION SETTLEMENT		1	1	1	3	1	1	4	1	1	4														
AGRICULTURE	row crops	1	3	3	3	3	1	1	1	1	1	4													
	arable	1	3	2	3	3	1	2	1	1	2	4	4												
	livestock	1	3	2	4	3	1	3	1	1	3	4	4	4											
FORESTRY	even-stand softwood	1	1	1	2	3	1	4	1	1	2	1	2	2	4										
	uneven-stand softwood	1	2	1	3	3	1	4	1	1	4	1	1	1	-	4									
	hardwood	1	2	1	3	3	1	2	1	1	4	1	1	3	-	4	4								
RECREATION	saltwater oriented	2	-	1	4	-	1	-	-	1	4	-	-	-	-	-	-	4							
	freshwater oriented	2	4	1	4	1	1	4	1	4	4	2	3	3	3	4	4	-	4						
	wilderness	1	1	1	2	2	1	4	1	1	2	1	1	2	2	4	4	4	4	4					
	general recreation	4	4	2	4	2	1	4	1	3	4	2	2	3	2	4	4	4	4	4	4				
	cultural recreation	4	3	1	4	1	1	-	1	1	2	2	3	3	2	4	4	4	4	4	4	4			
	driving for pleasure	1	1	1	3	1	1	3	1	2	3	2	4	4	2	4	4	4	4	4	4	4	4		
WATER MANAGEMENT	reservoir	2	2	3	4	1	1	3	1	1	4	1	2	2	2	4	4	-	4	4	4	3	4	4	
	watershed	1	1	1	3	1	1	4	1	1	3	1	2	2	1	4	4	-	4	4	4	3	4	4	4

INTERCOMPATIBILITY VALUES

COMPATIBLE............. 4
TOLERABLE.............. 3
QUESTIONABLE........... 2
UNDESIRABLE............ 1
INAPPROPRIATE COMPARISON.......... -

*Modified from McHarg, "Design with Nature."

FIG. 2 – A chart method of establishing compatibility values for land use.

patibility values, but this seems irrelevant. The real worth of the technique is that it gives the user a focal point for group discussion. It is a convenient way to initiate a study of one's own community (Fig. 2). The McHarg technique for examining the effect of natural determinants on land use has been similarly modified (Fig. 3). It forms the useful beginnings of an "anticipation/confirmation" model. It promotes lively discussions in workshops and classroom presentations.

Socio-ecologic Needs and Costs

Mark Terry emphasizes the fact that our "spaceship" is a sphere, hence finite in the area upon which Man can live. Our exploitable resources also are finite. This suggests that environmental education programs also must expose participants to the problem-solving aspects of satisfying social and biologic needs. When society turns to the physical environment to exploit a resource, it must recognize the fact that there are alternative solutions to any given problem. The implementation of a particular solution must be preceded by an analysis of what it costs the public as opposed to what the benefits and savings might be to both people and the physical environment.

Essential components in this type of consideration might well be (i) those items to which we can affix a dollar sign and relate directly to our stated value system, and (ii) those non-price aesthetic and social value components of our stated value system. Having weighed alternative solutions to these kinds of problems, it should be possible to rank order a number of alternatives from least social cost to the greatest social cost.

Also to be recognized in the social environment is the fact that identification of a solution to a problem is not always the end of the situation. It must also be subjected to that process of social decision-making which is relegated to the arena of community, state, and national politics. In any event, the action taken is always some form of social compromise, not necessarily embracing the least or the most expensive in terms of social or ecologic cost,

INTERCOMPATIBILITY VALUES

COMPATIBLE............. 4
TOLERABLE.............. 3
QUESTIONABLE........... 2
UNDESIRABLE............ 1
INAPPROPRIATE COMPARISON.......... -

LAND USE		SLOPE: 0%	SLOPE: 0 - 5%	SLOPE: 15 - 25%	SLOPE: over 25%	VEHICULAR ACCESSIBILITY	SOIL: gravels	SOIL: sands	SOIL: loams	SOIL: silts	AQUIFER RECHARGE AREAS	WATER SUPPLY DEPENDABILITY	CLIMATE: fog susceptibility	CLIMATE: temperature extremes	AIR POLLUTION	WATER POLLUTION	STREAM SEDIMENTATION	FLOOD AND DROUGHT CONTROL	SOIL EROSION
URBAN		4	3	2	1	4	-	-	-	-	1	4	3	1	1	1	1	1	1
SUBURBAN RESIDENTIAL		4	4	3	2	3	-	-	-	-	2	4	2	2	3	2	1	1	1
INDUSTRIAL		4	2	1	1	4	-	-	-	-	1	4	2	2	1	1	2	1	2
INSTITUTIONAL		4	4	3	2	3	-	-	-	-	3	3	2	2	4	3	3	3	3
MINING	shaft-mined	2	3	4	3	4	-	-	-	-	1	4	4	4	4	2	2	4	2
	open	2	4	4	2	4	-	-	-	-	1	4	4	4	4	1	1	3	1
	abandoned	4	4	3	1	1	-	-	-	-	1	1	4	4	4	3	3	3	2
QUARRYING	stone & limestone	2	4	4	1	4	-	-	-	-	4	1	4	4	4	4	3	3	3
	sand & gravel	4	4	2	1	4	4	-	-	-	4	3	4	4	1	4	3	3	3
VACATION SETTLEMENT		4	4	4	3	2	-	-	-	-	3	2	4	3	3	3	2	2	2
AGRICULTURE	row crops	4	3	1	1	4	1	4	4	4	1	4	4	1	4	1	1	3	1
	arable	4	3	2	1	4	1	3	4	3	3	3	4	3	4	3	2	2	2
	livestock	4	4	4	3	3	2	3	4	4	4	2	4	3	4	3	3	3	3
FORESTRY	even-stand softwood	4	4	3	2	3	4	4	4	4	4	1	4	3	4	4	2	3	2
	uneven-stand softwood	4	4	4	4	2	3	4	4	4	4	1	4	4	4	4	4	4	4
	hardwood	4	4	4	4	2	3	3	4	4	4	4	1	4	4	4	4	4	4
RECREATION	saltwater oriented	-	-	-	-	3	-	-	-	-	-	4	4	4	4	4	-	-	-
	freshwater oriented	-	-	-	-	3	-	-	-	-	4	4	4	4	4	4	-	-	-
	wilderness	-	-	-	-	1	-	-	-	-	4	1	4	4	4	4	4	4	4
	general recreation	-	-	-	-	3	-	-	-	-	4	1	4	4	4	4	4	4	4
	cultural recreation	-	-	-	-	4	-	-	-	-	4	2	4	4	4	4	4	3	4
	driving for pleasure	-	-	-	-	-	-	-	-	-	4	1	4	4	4	4	-	-	-
WATER MANAGEMENT	reservoir	1	1	3	4	1	-	-	-	1	4	4	4	4	4	4	-	4	-
	watershed	-	-	-	-	1	-	4	4	4	4	-	4	4	4	4	4	4	4
LAND USE		NATURAL DETERMINANTS													CONSEQUENCES				

Modified from McHarg, "Design with Nature."

FIG. 3 — Integrating land use and natural determinants.

but representing the choice of the decision-making group as influenced by those people who were most effective in making their point. These special interest groups might well be business people as well as conservationists (Fig. 4).

Evaluating Community and Culture

Communities are loosely organized units. They have many characteristics other than their individual and population components. Some communities are of sufficient size and completeness of organization that they are relatively independent of adjoining communities. Others are more or less dependent upon neighboring aggregations of man and his industries.

A definite functional unity exists within and between communities. Characteristic patterns of transportation and commerce exist that are functional manifestations of culture. The community "metabolism" of food, goods, and services promotes "health" and "growth." Uncontrolled growth, inadequate waste disposal, or poor planning cause problems. Consider the acceptability of these statements.

(1) Living things are interdependent with one another and their environment.

(2) The above suggests that the environment be maintained on a self-renewing, self-sustaining basis.

(3) The relationship between Man and his environment is influenced by his culture. Harmonious relationship with the environment may require a modification of Man's cultural expression.

(4) Adequate environmental management is complex and involves the application of knowledge from many disciplines.

(5) Present technologies of science, industry and agriculture tend to promote some degree of environmental degradation.

It is within Man's urban habitat, the city, that most environmental problems begin to appear. It is here that programs of environmental education should begin. Cities are real and within the experience of the learner. Problems and interrelationships can be measured and evaluated in terms of one's own personal experience. These experiences can then be built upon so that when confronted by large, interacting systems in the physical environment, the learner is at least aware of some of the basic mechanics of the functioning system.

To cope effectively with the biologic and sociologic needs of people, more is needed than a citizenry with technological skills. There is an additional need for a basic understanding of the mechanics of Spaceship Earth. Such understanding hopefully will equip society to anticipate future environmental problems and to plan realistically to cope with them.

Most current problems do not as yet effectively address themselves to these problems nor do they put them in perspective in terms of the real experiences of the learner. Social comprise is taught in civics. The ecology and the sociological aspects of problems do not necessarily come together but find themselves relegated to social studies or to biology classes. Perhaps the study of real communities and real problems will help to promote a more realistic approach to giving learners an education which is functional as well as technological.

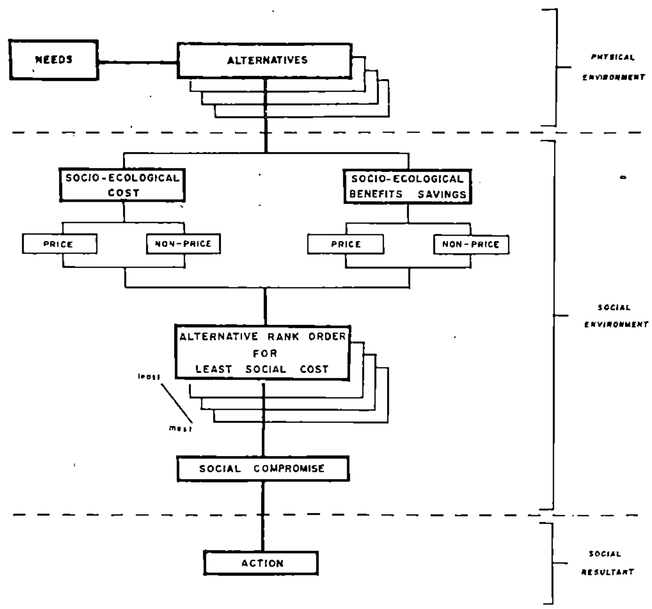

FIG. 4 — Establishing least social cost for socio-ecologic needs.

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