Creating Curriculum for Sustainability:
The Earthscore Notation

by Paul Ryan

NB: This is an unpublished book manuscript that presents the five components of the Earthscore Notation as a way to generate curriculum for sustainability.   Some of the exercises and questions are not developed. Please see other sections of the web site such as 'Ten Lessons for Threeing' to support this text.   The book is presented in six PDF files. This file is the introduction. Each of the next five files present one of the five components of the Earthscore notation in the context of education.

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Table of Contents

Preface

Introduction

Component Three: Cooperative Learning

- Shared Observation of the Environment
- The Tricolor Talking Stick
- Threeing
- Computer Groupware (undeveloped)

Questions (to be developed)

Exercises (to be developed)

Component Four: Creative Envisioning of Sustainability

- Creativity
- The Gaia Hypothesis
- Chreods

Questions (to be developed)

Exercises (to be developed)

Component Five: Coordinating the Interpretation of Ecosystems

- Semiotics
- The Ten-fold Sign Classification
- The Twenty-Eight Fold Sign Classification
- The Sixty-Six Fold Sign Classification

Questions (to be developed)

Exercises (to be developed)

Introduction

A sustainable society takes care of itself without putting future generations at risk.   At the Rio de Janero Earth Summit in 1992, convened by the United Nations, participants agreed: modern society, as we know it, is not sustainable. We deplete soil, exhaust fisheries, pollute air, foul waters and warm the planet. To take care of ourselves, we put future generations at risk.

Most of us never learned this in school. Generally speaking, our teachers did not recognize the ecological situation. They organized our educational experience with curriculum that continued the traditions they had learned from their teachers. In doing so, they gave order to the relationships between generations. But for us as educators, the recognition that we are putting future generations in jeopardy brings with it the responsibility to reorder our relationship to the next generation. We who do not know how to live sustainability must teach the next generation how to live sustainably. We who have put our children at risk must teach our children how *not* to put their children at risk. Since the curriculum our teachers followed unwittingly concealed issues of sustainability, there was an innocence in their gifts of knowledge to us. We enjoy no such innocence. Those we teach are those that

our very way of living is putting in danger. At some level, students know this,- even if they have not thought about it explicitly. As teachers, we can help them think about it.   If we fail to help them think about it, if we lock ourselves into the current curriculum of denial, we corrupt the teacher student relationship.

What we teach and how we teach must be reorganized in terms of the issues of sustainability. In this book, I offer a way for educators to reorder our relationship to the next generation.   I present a notational system for generating curriculum for sustainability. This system is called Earthscore. Just as a composer composes music using a notational system , so educators can compose curriculum for sustainability using Earthscore. Just as musical notational enables a composer to compose anything from "Three Blind Mice" to Beethoven Fifth Symphony, so the Earthscore Notation enables an educator to create simple compositions about sustainability for first graders as well as complex compositions about sustainability for graduate students.

 My task, as author of this book, is to provide an general explanation of Earthscore for educators. Your task, as an educator reading this book, is to comprehend this explanation in terms of the grade level and subject matter that you teach.   In other words, while I can explain Earthscore to you, I cannot

comprehend it for you. Earthscore involves ways of thinking that may not be familiar to you. As with all learning, you will have to struggle to grasp new patterns. Once you have comprehended this notational system, however, you should be able to use it to generate curriculum for sustainability in every phase of your teaching.   I will do all I can, within this book format , to bridge the gap between my general explanation and particular educational contexts. Besides filling this text with samples and examples to counterbalance the necessarily abstract nature of the notation system, questions and exercises are supplied for each chapter.   In short, this book presents everything an educator must know in order to create curriculum for sustainability based on the Earthscore Method. The Earthscore Method consists of five components:

     1) three comprehensive categories of knowledge,

     2) organized by a relational circuit ,

     3) for cooperative learning, and,

     4) envisioning a sustainable future, and,

     5) coordinating the interpretation of ecological systems.

Each component will be presented in a separate chapter. In the remainder of this introduction, I will present my reasons for thinking that the Earthscore Notation merits consideration by educators concerned with sustainability.

1) Education for sustainability means educating people at risk.

Earthscore can encode education for people at risk.

Therefore, Earthscore is an appropriate way to educate for sustainability.

Educating for sustainability means educating people at risk. This is true by definition.   Simply to acknowledge that the generation we teach is inheriting an unsustainable society is to establish that they are people at risk. The factual data about our unsustainable society is provided by the WorldWatch Institute on a yearly basis. For a full characterization of our state of risk, I recommend the extraordinary book by Ulrich Beck titled *The Risk Society*. This book, and the debate it spawned, help clarify the current state of danger. Beck describes how we in the West have moved from a society in which the paramount concern was the distribution of goods; i.e.,- material wealth, happiness and progress,- to one in which the paramount concern is the distribution of "bads"; i.e.,- product liability, AIDS, and toxic waste.

Unless people have simply given up, those who recognize they are at risk activate survival intelligence and survival behavior. Evolutionary processes formulated the basic circuit for survival in the reticular core,- the reptilian brain,- of the mammalian nervous system. Humans are mammals. The reticular core is the stem of the nervous system. It regulates the relationship

between diverse ends necessary for mammalian survival— ends such as fleeing,

fighting, and sleeping. Each of these ends requires the commitment of the

entire organism. You cannot commit yourself to any two of these ends at once.

You cannot both fight and flee at the same time. Hence there evolved a

method of evaluation in which attraction to incompatible ends could be

resolved. Choices could be made. Using this method, you can choose fight

instead of flight, sleep instead of sex. The method of evaluation is a circuit that

organizes preference in a way best exemplified in male rats (a species of

mammal) under experimental conditions. With apologies to the rats, the

experimental conditions simulate an actual survival situation that could occur

for either rats or humans.

Deprived of food and sex for a specified period, a hundred male rats, given a

choice, will all choose to eat food instead of have sex. When faced with a

choice between sex and avoidance of shock, all hundred rats will choose to

have sex,- even if it means getting a shock. However, when it comes to a

choice between avoiding shock and eating, the rats will choose to avoid shock

rather than eat food. In other words, unlike with sex, if they have to endure a

shock to eat, they will choose not to eat.   A (food) is preferred to B (sex), B

(sex) is preferred to C (avoid shock) , but C (avoid shock) is preferred to A

(food). The pattern of preference is circular.   (McCulloch, 1965)

Note that in circularity of preference, choices are made between *diverse* ends. There is no way to measure the amount of food and the amount of sex using the same ruler. Hence the survival choices of the rats cannot follow the simple rule of bigger is better. What the rats value, as exhibited by their choices, cannot be thought of in terms of any single scale of values. For circularity of preference to work, there can be no confusion between magnitude and value. Bigger is not better. Value cannot be subsumed under magnitude. What is valued is survival, as an end, in and of itself. Survival requires judgments in context, not dogmatic adherence to an arbitrary scale of values. Choices are made according to a circularity of preference designed to generate an appropriate survival respond amid threatening conditions.

This method of evaluating diverse ends by recognizing their differences is called heterarchic. A heterarchy contrasts sharply with a hierarchy. In a hierarchy of values, magnitude and value *are* fused together. Diverse ends are ranked in order by the establishment of one *summum bonum,* i.e., one highest good,- preferred to all others. Once this highest end is established, a ranking of preference occurs. Each rank has the right to inhibit all inferiors. In effect, this system of ranking inhibits the exercise of any circularity of preference. If A is preferred to B, and B is preferred to C, then A must be preferred to C. Many

military and religious organizations operate according to such a hierarchy of values. The verbal command of superiors precludes circularity of preference. Personal judgments in context are not valued. Survival on the battlefield and survival in the afterlife are linked to blind obedience.

The sharp contrast between hierarchy and heterarchy can be seen in children's interaction. In hierarchic interaction, the biggest kid shoves the next biggest kid (A over B) . The next biggest kid shoves the smallest kid (B over C) . But the smallest kid does not dare shove the biggest kid, he goes off and kicks a rock (Not C over A). Heterarchic interaction takes place in the child's game: paper-rock-scissors. Ignoring any ranking of each other according to size, three children stand in a circle. Each child throws out one hand. A flat hand signals paper. A fist signals rock. Two spread fingers signal scissors. The children then slap each other playfully on the wrists according to the heterarchic formula: paper covers rock - rock breaks scissors - scissors cuts paper.

One of the dangers of introducing sustainability into education is that the concept of sustainability itself could be used as a *summmum bonum* to fix a quasi-religious hierarchy of values. Ironically, this would distort our heterarchic capacity for survival and contribute to an unsustainable social order.

Earthscore avoids this pitfall by formalizing heterarchic intelligence into a

figure of regulation for the entire Earthscore Notation.   This figure, called the

relational circuit, will be presented in detail in chapter two. Here I will only

consider the nature of this figure as an ideal geometric object. This is the

basis of my second argument for why Earthscore can create curriculum for

sustainability.

2) Education for sustainability must maintain consistency over generations.

Earthscore is designed to maintain consistency over generations.

Therefore Earthscore is an appropriate way to educate for sustainability.

If education is to fulfill its role in the context of creating and maintaining

sustainable societies, it must order relations between generations. Ordering

relations requires a consistency. Without consistency, relationships get tangled

in knots of misunderstanding.   If the relationships between generations are

tangled, the information we pass on about ecosystems will not be trusted.

Human efforts to create consistency have their optimal realization in the ideal

objects of geometry, not language.   Language alone is too equivocal to

support the consistent understanding of sustainability required. Let us look at this question of language by examining the meaning of "sustainability".

In "Two Meanings of Sustainability", educator David Orr distinguishes between technological sustainability and ecological sustainability. (Orr 1992) Technological sustainability indicates the belief that modern society can become sustainable thorough better technologies and more sophisticated economics. This belief is generally held by businessmen, engineers and government officials. Ecological sustainability indicates the belief that modern society cannot become sustainable without a major break from the values of industrial society such as individualism, mechanization, anthropocentrism, patriarchy, and consumerism. This belief is generally held by concerned members of non-government organizations. David Orr skillfully straddles the fault line between these two meanings. He regards these beliefs as successive stages in the path toward sustainability, "I consider both to be necessary parts of a sustainable world. To use a medical analogy, the vital signs of the heart attack victim must be stabilized first or all else is moot. *[technological sustainability]*   Afterwards, comes the long term process of dealing with the causes of the trauma...*[ecological sustainability]*"... (Orr, p   *my italic inserts*).

While educator David Orr is able to straddle this fault line successfully in his essay, the American political forum addressing education for sustainability has not had similar success. The struggle over the two meanings of sustainability in the President's Council on Sustainable Development resulted in a situation in which "the educational principle is not clearly stated or supported, the policy recommendations have become confused, and the responsibility for carrying out activities has been scattered." (Keehn, Tom   Access #129 &130 August and Sept 1995 page 16)   Clearly, the failure of the President's Council on Sustainability to resolve their differences into a coherent policy jeopardizes the new generation's very prospects for sustainability.

Politics is the art of formulating and promoting policy.   Among other things, education ought to be a forum that supports student capacity to generate and advocate policy.   But the educational process itself ought not to be politicized. That is to say, students should not be approached as potential converts to a particular policy agenda. In the current climate, where the civic pursuit of ideals for humanity has yielded to a politics of identifying with subgroups of humanity, there is a deep cynicism that education can ever be a forum without a hidden agenda. One reason sustainability is attractive is because it holds the promise of a new universal context in which hidden agendas can be revealed and addressed. The political arena is where the struggle to shake out hidden

agendas should take place. But in education, the ideal of sustainability itself should guide the process.

As evidenced by the President's Council on Sustainable Development, however, the ideal of sustainability is difficult to formulate in a politically neutral way. Part of the problem is that the word itself, *sustainability,* contains equivocation. Like the word *con<u>tain</u>*, the Latin root of *sus<u>tain</u>* is *tenere*, meaning *to hold*. *Sus* is a mutation of *sub* meaning *under*. *Sustain* literally means to hold up from underneath. But does sustainability refer to holding up or being held up?   The meaning is equivocal and thus can be rhetorically appropriated on either side of the fault line:

> *The Ecologically Sustainable Spokesperson:*   A woman *contains* a child in her womb. Western man *holds things up* from underneath. Atlas stands and *holds the world up* above his head. Atlas *sustains* the world. The introspective Thinker sculpted by Rodin sits and *holds his sagging head up with a fist.*   Will Western Man continue the vain effort to *hold up our sagging industrial complex?*   Is that what the *sustainability* movement is about? When will we learn to let nature sustain us?

The Technologically Sustainable Spokesperson: Yes, sustainability means holding up our part. What do you want to do? Sit like the Buddha doing nothing? Didn't Buddha die from eating poisoned pork? Yes, the planet is polluted, but do you want us to eat the poisoned pork? We have to solve the problems of pollution. *If we pretend we can let nature take care of us as if we were a child in the womb, we are doing nothing more than infanticizing ourselves and abdicating our responsibility to future generations.* We have to hold up our end.

The equivocal nature of the word sustainability makes the political struggle over the concept of sustainability more difficult to resolve. How this struggle will turn out is anybody's guess. My point here is that In the rough and tumble of the politics surrounding sustainability, the concept will shift meanings. From an educational point of view, a curriculum for sustainability cannot easily be constructed using a concept with shifting meanings. As we know, the word *curriculum* comes from a root meaning *a course to run*. Asking students to run a course with one foot on either side of a shifting fault line hardly prepares them to create and maintain a sustainable society.

Let me contrast the equivocacy of language with the univocacy of ideal geometric objects using another term: *environment.*   Recall that *environment* once referred to *the* all inclusive context. Now it refers to just one issue among many. Environmentalists are seen by many people as just one more special interest group.   The word *environment* is bound to the politics of its use pattern over the last thirty years. The word *environment*   metaphorically reached for an inclusive understanding, but only grasped a piece of the whole. It is now an equivocal term.

At the root of the word *environment* is the French word *viron,*   meaning *circle*. The circle is an ideal object. The reach and the grasp of the ideal circle are identical. It's true sense is in this unity. A circle is what it is once and for all. It is not subject to the shifting contingencies of equivocal meanings. It is not bound by specifics. The meaning of a circle is univocal. Anybody can reactivate the self evident meaning of a circle. For a group of children today to reactivate the original meaning of *environment*   would involve helping them shift through sediments of meaning. By contrast, a circle requires no such archaeological dig. A group of children can all join hands and reactivate the self evident meaning of a circle for themselves. Guided by the ideal of a circle in their minds, they can make an ordered return to a prelinguistic world in which their subjectivity is not bound by language but freed by reference to a completely

idealized and objective form. The objectivity of the ideal figure marks and communicates interdependence among the children without oppression or confusion.

Only in geometry is it possible for humans over generations to reactivate understanding back to its most original self-evident status. Language endures loses of meaning and accrues sediments that confuse and break continuity. Every time we use the word *sustainable* without thinking we use up some of the flexibility for the future encoded in the word. Thirty years from now , after the politics and revenue streams that flow under the flag of sustainability have played themselves out, how will people reactivate our current understandings of the word *sustainable*?

You might say, what's the problem? That's the nature of a healthy language. Words live and grow and change. I agree.   But I say that whatever understanding we can secure about how to live on earth without jeopardizing future generations ought to be passed on as clearly as possible to subsequent generations, regardless of politics. That's what education is about. Language in conjunction with geometry can carry much more understanding than language alone. By referencing our understanding to a univocal geometric figure that future generations can reactivate as an ideal object in their minds,

we increase their chances of understanding the earth itself over generations. Earthscore education is designed around such an ideal geometric object. In chapter two, I present this ideal object and explain why its special characteristics make it a particularly suitable figure of regulation for organizing a curriculum for sustainability. Here I simply want to indicate, with the example of children in a circle, that an ideal geometric object has a potential beyond language. Earthscore is based on an ideal geometric object, and, as such, has the potential to organize curriculum over generations with a consistency impossible to a curriculum based on language alone.

3) Education for sustainability should relate to life like art.

Earthscore can raise education to the level of an art form.

Therefore Earthscore is an appropriate way to educate for sustainability.

Much of the practice of art can be understood as exercises in survival behavior removed from immediate life-or-death survival conditions. Survival intelligence and survival behavior are encoded and enacted in art. Early cave paintings sharpened the intelligence of hunters. Egyptian tomb paintings were meant to keep the souls of the departed alive. Drama thrives on combat and courtship patterns. Temples, churches, and cathedrals can all be taken as fortresses,

rarely ever used as such. *Art is created as if life depended on it.*   This relation

between survival and art becomes explicit when we compare the circuit for

making survival choices with the circuit for making artistic choices. As shown in

Figure # 1, the two circuits are congruent,- they can be mapped onto each

other.

Figure # 1

Options	A or B	B or C	A or C

In a Hierarchy:

    A - Highest Rank

    B - Next Highest

    C - Lowest Rank

Choices Made	A over B	B over C	**A over C**

In the Children's Game:

    A - Paper

    B - Rock

    C - Scissors

Choices Made	A over B	B over C	***C over A***

In a Heterarchic

Survival Situation:

    A - Food

    B - Sex

C - Avoid Shock

Choices Made	A over B	B over C	**C over A**

In Art: Cezanne

A - Blue

B - Brown

C - White

Choices Made	A over B	B over C	**C over A**

Consider the painter, Paul Cezanne, faced with what he fondly called *those little blues, those little browns, and those little whites* (Lacan 1978: 110). How does he choose?   He may have just chosen blue over brown,- and brown over white,- however,- when he is faced with a choice between blue and white, he may well choose white over blue. He does not blindly obey any hierarchy of values. Cezanne painting with blue-brown-white is like children playing with paper-rock-scissors. Cezanne balances the color values in his composition by making choices according to the same sort of circularity of preference we see in the child's game,- the same circularity of preference we see in survival behaviors. This process of evaluation and choice evident in Cezanne can be seen in other painters. Mondrian with his three primary colors. Pollack with his

action painting. Clemente's compositions. A similar pattern of choice can be found in the work of many musicians, choreographers and architects. Choice making in art is heterarchic, not hierarchic. *Circularity of preference, freed of any immediate threat to life, is the basic circuitry for making art.* The process of art-making proceeds from a circularity of preference. (Ryan 1993)

The Earthscore Notational System grew out of my efforts to interpret nature as an artist using video. I began working on the system in 1971 while living in the Hudson River Valley. It did not take long for me to realize that no matter how good I became at producing landscape video as an individual artist, it would have little effect on how people actually treated the ecology of the Hudson Valley. I felt that what was really needed was a cooperative group of video artists who could interpret the natural world and present it to the community at large on an ongoing basis. To insure that such an effort would be effectively organized, and be able to continue over generations, a formal notational system for interpreting nature was needed. No such notational system existed. In effect, I had to invent the Earthscore Notation. Once I invented the system, I used it to design a television channel dedicated to monitoring the ecology of a region and developing consensus among inhabitants about sustainable policies and practices. I have presented my television ecochannel design at the

Museum of Modern Art in New York City, the Cathedral of St. John the Divine,

and at the United Nations Conference on Sustainable Cities. (Ryan, 1993)

In this educational version of Earthscore, video perception is not emphasized.

However, the heterarchic circularity of preference, proper to art, is made

central to learning. Earthscore is redesigned to support teachers in their

orchestration of cooperative learning that can lead to sustainable societies.

Over the years of developing the notational system as an artist, I sometimes

worked simultaneously as a teacher. I've taught at most levels from fourth

grade through to graduate school. I've taught science, algebra, geometry,

philosophy, literature, writing, media, computers, video, magazine production

skills, workplace skills and communications theory. Whenever it was

appropriate, I used one or more components of the Earthscore Notation in my

teaching. Most recently,- using Earthscore,- I've designed and taught a very

successful 48 hour curriculum that teaches displaced workers the cooperative

skills needed for the new workplace. These teaching experiences are the basis

for my adaptation of Earthscore for educators.

 In contrast to my notational approach, many artists working with video chose

to work in the manner of painting, without using a notational system. There

have been major showings of this kind of personal work, such as *American*

Landscape Video (Judson: 1988). This work is what the philosopher, Nelson Goodman, would call autographic (Goodman 1968: 113). Autographic art is produced by a single artist and the "signature" and style of that artist is a critical factor in determining the authenticity of the work. Cezanne's paintings must be made by the hand of Cezanne. A fake Cezanne is a painting that the hand of Cezanne never touched. It's a forgery— an object that falsely claims to have the history of production proper to an original.

In contrast to autographic arts, Goodman distinguishes "allographic" arts. Music, and to a lesser degree, dance and architecture, are allographic. Allographic arts involve a two step process. The first step is the conception, articulated in a notational system. The second step is the performance, based on what has been notated. This can be carried out by someone other than the conceiving artist. As Goodman says:

> When there is a theoretically decisive test for determining that an object has all the constitutive properties of the work in question without determining how or by whom the object was produced, there is no requisite history of production and hence no forgery of any given work. Such a test is provided by a suitable notational

system with an articulate set of characters and of relative positions for them (Goodman 1968: 122).

A good example of the sort of notational system Goodman is talking about is found in classical music. The "articulate set of characters" would be the unambiguous set of distinct notes and the "relative positions for them" would be provided by the staff and bars. Any performance of any particular score written in this notational system can be judged to be authentic or not by testing out whether the performance complies with the particular score. Such a test presumes a suitable notational system.

Classical music notation is designed to organize the creation of sounds using various instruments, including the human voice. The range of what classic notation covers is restricted to sound. While you can create a dance to accompany a particular piece of music, you cannot specify the dance itself with the music notation. It simply does not apply to the domain of choreography. The domain of the allographic Earthscore Notation is whatever can be recorded on video. This includes sound, still images, moving images, words, abstract figures and so on,- signs of any kind. In effect, with the hybrid between video and computers, anything that can be encoded in digital electronics is information that can be composed for learning using the Earthscore Notation.

While Earthscore works well for multimedia compositions, it is not just another multimedia program.   My history with video had less to do with multimedia production and more to do with learning by recording and replaying my experience with myself and my colleagues. (Ryan 1993)   This learning process, based on feedback, is formalized in Earthscore as a process of cooperative learning. Hence the Earthscore notation holds the possibility of composing creative leaning experiences for groups of students. This process of cooperative learning can be linked up to multimedia, or, be used in a free standing way without any electronic mediation.   The 48 hour skills curriculum for displaced workers, mentioned above, uses no electronics at all. As is proper to the allographic arts, others can and have "conducted" this curriculum.

The aspiration to raise curriculum design to the level of an art form is not without precedence. Plato's *Dialogues*, Aesop's fables and Gray's *Anatomy* were all produced as educational material.   Paul Klee's *Sketchbooks* had an instructional purpose. Bach's *Well-Tempered Clavier* was composed as a teaching exercise. Likewise Chopin's etudes. With the Earthscore Notation, I think it is possible for educators with a talent for composing curriculum to become composers of cooperative learning experiences that support sustainability. With the Earthscore Notation, I think it is possible for educators

with a talent for conducting learning experiences to be provided with curriculum

units that are masterpieces they can make their own, and delight in teaching.