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Culture, Crisis and Population Explosion: A Deweyan Approach in the Classroom

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From the perspective of the philosophy of John Dewey, the population explosion is first and foremost a crisis in culture. Dewey, perhaps the most influential figure in American education, especially in the earlier part of this century, has come back anonymously but unmistakably, as theorist behind most aspects of contemporary educational reforms. It was his belief that the task of education is first and foremost to critique culture in such a way so that culture might be in tune with the realities of natural environment. He held to a biological model in which culture constitutes our species adaptive advantage. Hence the population explosion is only in one sense an ecological problem, indeed the problem of any organism, it is in another sense the primary problem of culture, to find a way for the species to be suitably adapted to its environment. Dewey's philosophy is thus intrinsically suited to the single most important problem that the coming century is faced with.

The biological model of the task of culture is brought by Dewey into every aspect of teaching and learning in the classroom. Dewey is most remembered for his idea of experience based education. Experience teaches. Typically this is understood to mean learning by doing. In his final work on 'Aesthetics' he made clear that thought begins in feeling. The great model of the intellectual is the sculptor. Reason is finding its bearing in the realm of sensation and confirms its truth in the process of a concrete action or event. Humans, as with all organisms, know their environment through their senses and these are very limited to their ecological needs. Reason connects these sensations to solve a problem and only in the resolution to the problem is there any objectivity. The task of the teacher is therefore to model the conditions for which reason came into existence. The teacher must create some condition in the classroom for the student to experience a sensation. The sensory has to jump out of the ordinary phenomenal flow of events to become a sensation that demands a response that arouses the idea that there is something desirable to explore, a problem to solve, a pleasure to be gained by traversing a particular terrain of experience. Hence the first aim of this teaching unit is to find ways to present the global population explosion as something that is more than just a blip on the student's sensory module but a felt problem that concerns the student as his or her own.

Once the student has entered the sensory dimension of the curriculum, the student does not leave it behind like some motivational gimmick used by a salesman, but rather develops this sensate experience by exploring it using reason and action. Dewey was very impressed by science because it demanded that reason always be subordinate to experience. He was appalled by the way the science of his day had become a compendium of facts that were learned by rote and believed in as if they constituted catechism. The sensate experience is not like the surface photography of empiricism where it is thought there is a one for one correspondence of

concept with empirical picture. Experience is multidimensional, creative and peculiarly human. Science does not have a different way of thinking from any other discipline, though it has its technical vocabulary, rather it shares with all disciplines of education the same basic processes of intelligent thought. Hence there is only interdisciplinary thought and to understand that is critical for an appreciation of Dewey. In essence, intelligent thought is experimentation whereby one becomes conscious of a problem, hypothesizes a solution, identifies a way of testing how that idea could be the answer, carrying out some action or using this model to see if it explains events and then a reflection to see if the model really did connect event with idea and the resolution of the problem posed by sensory awareness. Feeling, thinking and doing is thus part of a single act by which humans build up culture. If they are well integrated then culture is suitably adaptive. If not, we have a crisis in culture. In the classroom this translates into the need for students to have an opportunity to solve problems in such an intelligent manner. What passed for education, as Dewey found it in the classroom, was designed to lead culture in to crisis, not away from crisis into an adaptive response.

In this teaching unit, the first two lessons are to be designed with the above ideas shaping their pedagogy. (My lessons usually last one week). The first lends itself to stories, visuals, film and explorations of ideas and experiences that students already have about population explosion. The second lesson lends itself to experimentation with populations of bacteria, algae, insects or seedlings. (Since the unit is spread over a semester, there is time to follow plants and small animals through a life cycle etc). One can create small ecosystems and discover the inter-relationship of limiting factors on population size.

The second set of two lessons could follow on these but in application are best taught in the context of curriculum dealing with sexuality and reproduction. The most troubling part of discussing population explosion is finding a reference point by which to measure crisis, particularly crisis in culture. Just as there are seemingly endless points of view regarding the global warming 'greenhouse' effect, so there is in terms of identifying what in culture is actually in crisis as it affects population explosion. John Dewey's philosophy again, I think, offers a critical point of view. Moral problem solving that is needed to generate social policy solutions can be taught and thought through, rather as in any scientific problem. It is taught in classrooms in New Haven in life skills - a seven-step adaptation of Weinberg and Caplan's 'When you have a problem'.

Because the role of culture is survival of the species, Dewey can take this a step further. He provides a point of view by which to critique other analyses. It is not enough to have a point of view. The paradigm of thought must be justified as valid or desirable in terms of consequences for survival. Dewey provides a measure, a reference point from which to measure data about the population explosion. The best pedagogy for this lesson is for students to take particular aspects of the population problem and develop detailed plans for its solution using the method described below.

The fourth and final lesson that is proposed is one that addresses the 'meta' issues in culture and population explosion. Dewey not only proposed a model by which to teach in a classroom but also defended it by showing up the fallacies of opposing world views or fundamental a priori suppositions that exist in culture that perpetuate self-destructive behavior. He particularly attacked rationalism and empiricism. He did not endear himself to the scientific or philosophical community. The relevance of Dewey's radicalism, however, is that it is not enough merely to come up with an intelligent proposal. One needs to see how our cultural values and suppositions need to be changed. Given the degree to which our culture is out of synchronicity with survival in the environment, the challenge to students is to re-invent culture. 'Gaian' literature is suggestive of the dimensions of paradigm change. The myth of the great individual going out West to survive in the wilderness was appropriate once for U.S. culture, but now it contributes to crisis because it is we who must now be tamed, not nature. The American Dream is another powerful myth that at very least needs to be dreamed

anew if it is not to become a nightmare.

A suitable pedagogy for this lesson is presentation or debate about the population explosion from the point of view of justice, markets, nature, religion or humanism etc. The teacher's job is to assist students make judgements about the differing points of view in terms of the task of culture to align behavior with survival.

The outline of the teaching unit is as follows:

Introduction - a Deweyan approach in the classroom.

1. Experience and Meaning
2. Experimenting and Modeling
3. Data and Measuring
4. Conclusions and 'Meta-issues'

Lesson Plans

Resources and Annotated Bibliography

1. Experience and Meaning

When I lived in Hong Kong in the 1980's, I experienced the relationship of environment to population increase and crisis in culture very directly and immediately. At the time I went the Hong Kong harbor was 80% oxygenated. At the time of leaving it suddenly dropped to 20%. The water became not merely deadly for fish but toxic for humans. All the beaches were closed to the public for two years while the government put in temporary emergency sewerage treatment plants. Previously the tides had been able to carry the sewerage out into the ocean. The quantity of sewerage per day, however, had continuously increased year by year with increasing density of population until it reached a critical mass. Suddenly the whole tidal system for washing out the waste from the harbor collapsed. The government had been warned twenty years earlier of the probability of this happening. It saved money in the short term by ignoring the problem but suddenly was faced with a multi-billion dollar crisis and a social crisis. The half-million people per square mile in the industrial areas used these beaches to get away from the sweltering humid summer heat of the city streets. A single high-rise apartment building could be home to three thousand people. The government was paranoid about loss of social control at the best of times. Could the loss of beaches in this coastal city be the precipitating crisis of social breakdown and violence that was feared in the best of times? Fortunately the government had an unusually large surplus of money in its banks to finance both clean up and the construction of the technological machinery needed to solve the problem. Also the forces for social cohesion and the Chinese tradition of patience proved strong enough to carry the masses through the misery of loss of a significant outlet for 'pressure cooker' stress come from living in that over fast paced and over densely

populated city.

In the above story, catastrophe was avoided, but in another city with little financial surplus and a less motivated entrepreneurial population the outcome might well have been different. More fundamentally though, the problem of Hong Kong's harbor is but a metaphor for what the whole human population is faced with in the coming years. Populations in cities and countryside around the world are incrementally putting stresses and strains on the ability of the environment to support life (apart from bacteria). At what point will it give way and collapse?

We can create ecosystems in the classroom to model how these crises happen locally and more profoundly on a global scale. Using the 'Sim-earth' program one can simulate more complex feedback systems of inter-relationships. One can model the consequences of change in climate due to changes in temperature and humidity of the air that are consequences of loss of vegetation and loss of phytoplankton. These are predominantly cyanobacteria that produce 70% of the atmospheric oxygen and dimethyl sulphide that triggers cloud formation for holding moisture and reducing temperature. The same cyanobacteria are very sensitive to ultraviolet radiation. Loss of blue-green algae increases with loss of ozone coverage.

Simultaneously one could model what happens when there is a net decrease in forests and leaf coverage and a massive increase in levels of carbon dioxide and other gases due to burning fossil fuels. The net effect of these factors is to increase average temperature due to the 'greenhouse' effect. Furthermore one can factor in what happens when there is a significant reduction in stocks of available drinking water and loss of usable soil for farming. Topsoil is lost from cutting down trees for farming, cooking, the construction and paper industries. Another factor to model is the effect of toxic levels of animal waste that occurs with increased farming to support increased human population. On top of these factors, one must factor in the upsurge in size and number of cities that have the effect of removing a multiplicity of complex ecosystems that drives up the removal of animal and plant habitats essential to global food chains.

Like the sudden inability of tides to wash out the sewerage of Hong Kong's harbor, can one make predictions when incremental changes, working in tandem, and in parallel systems, will become sudden breakdowns or run-away catastrophes? How about speculating on unforeseeable events like production of new chemicals that are released into the environment without testing for their effects on non-human populations, such as progressive reduction in sperm count? Can one calculate risk factors to uncontrolled chemical production?

The particulars, the probabilities and how to attach significance to different factors can be debated but what cannot be debated is that we are playing dice with the future. The above intellectual activity is in one sense like a game, but like war games, the outcomes can be deadly. The objective of these exercises is to draw the students emotionally into the 'game' so that it is their deadly game, their future, their lives and the lives of billions of people that is at stake.

2. Experimenting and modeling

Hopefully the first lesson above taught us that though we can ignore population growth for a time, a day will come when ecosystems will precipitate a crisis that may have extraordinary impacts such that only extraordinary responses will save the day. We can pay attention now and live within the supporting limits of our local or global ecosystem or we can ignore it now and wait for devastation to hit us the ostrich response.

Once the problem is accepted as serious and real, we can do something about it. The next step, the purpose of this lesson, is not action but calming down and carefully describing the situation as it is. We will examine

the causes behind these effects, model these relationships and hypothesize consequences in demographics. We will assume that culture(s) will continue to operate as past history leads us to expect that they would.

There are many ways to describe the situation as it is. Tracking demographics of any city, region or country in the world over the last one hundred years when plotted on a graph and projected with existing trends into the next century will give ample food for thought. Local, regional and global history offers the causes behind the effects. Knowing this history may well suggest ways in which communities and nations will respond to the population growth in the future.

The most dramatic representation of the change in demographics is to look at a graph of total human population growth, plotting billions of humans against time. In 250 million years *Homo sapiens* expanded its population to 2 billion. Sixty years later i.e. today the population rose to 5 billion. At existing rates of population growth the population will double to 10 billion in 30 years from now.

To model this growth and look at basic causes one can study the population growth of bacteria, algae or insects in the class room. There are experiments in which one can readily plot growth in bacteria population to model these global changes in human population. After an initial lag, the population of bacteria grows exponentially. It reaches a climax at which point the population is stable and then suddenly the population crashes in the final death phase. A similar experiment can be carried out with fruit flies in a bottle with a suitable food source. One can begin with one male and one female fly and count the change in numbers, and the numbers of generations until the population reaches its maximum and collapses in a final death phase. Using 'fast' plant seeds, one can also record similar figures by counting the numbers of offspring for each generation as the same patch of ground is seeded again and again from the previous generation without replenishment in a closed environment.

The above experiments model the growth and collapse of populations where ecosystem resources are simple and the adaptability of the species minimal. In complex ecosystems and developed mammals such as humans, adaptability and social enemies are novel features. Also the global ecosystem is almost immeasurable for any variable. However it is basic to Gaia theory that the issue is one of systems breakdown, essentially non quantifiable but as in chaos theory, nonetheless having its laws and limits. The experiments are thus suggestive or analogical.

One could then go to the next level of observation in population explosion. What happens when one puts a variety of species together into a single ecosystem where there is competition for the same resources? Placing a variety of populations of protists in a small beaker and observing population changes with time will lead to similar consequences. Here population collapse will depend upon the relative ability of the differing species to survive under the changing abiotic conditions in the beaker.

The purpose of the above experiment is to model what happens in cultural competition for resources. History suggests that those cultures best adapted to survival in the environment continue and replace those cultures least well adapted. The critical factor tends to be technology and social organization but not necessarily. Students interested in independent study could usefully research such trends in particular periods in history. Immigration is a typical cause of war and cultural invasion.

An examination of existing trends in migration and survival (in terms of demographics) of differing cultures is suggestive of what is likely to happen in the future, making the assumption that humans continue to act as they typically have in history. One can describe the disappearance of Native American tribes and indigenous tribes globally. One can describe existing starvation and subsistence in impoverished cultures around the world

that lack advanced technology and dominance in economic markets. One can describe cultural responses to these crises in differing parts of the world, such as Islamic Fundamentalism as a response to extreme poverty in the Middle East. Equally one can see the cultural response of the rich and powerful cultures to immigrants, such as Christian Fundamentalism as a means to justify and protect dominance.

At the very least, the data will demonstrate that population growth is exponential and that in the competition for resources, the cultures best adapted technologically will become dominant with the poor cultures becoming poorer to the point of extinction. If history gives us precedents, as the scramble for resources intensifies, competing cultures are likely to war over survival issues like fishing rights, control over mineral and energy reserves and of course, drinkable water and land.

3. Data and Measuring

After students have described population increases and identified particular causes at a local, regional and global level in recent history and using the Malthusian biological models suggested above, they will be in a situation to go to the next lesson which is to propose practical ways to limit human population to a comfortable and sustainable level. The lesson is entitled 'Data and Measuring' because it has one overwhelming challenge to it. What exactly are we measuring and how is it to be measured?

How exactly are we to measure a sustainable level? How is this to be defined? What data is needed? How do we find it? Do we make calculations based on existing technology or on technology that seems to be in the pipe-line? Can we presume that nano technology (the ultimate in microtechnology), biochips, nuclear fusion, or biotechnology can bring about a revolution in availability of energy and renewable resources so that the basis for measuring sustainable levels is always a moving target? Are we to presume that the latest data on resistance by bacteria to antibiotics and pesticides means that we are at the limit of medical miracle cures and agricultural productivity? Will the promised miracle in vaccines to protect animals and humans in Africa from parasites be available any time soon? Will this do any more than give humans more time to find cultural adaptations to the ability of the environment to support existing population levels?

How do we define a comfortable level? An Australian or Texan definition is different from a Yankee or Hong Kong Chinese definition. Half the world's population at present lives under conditions that Western Europeans and Northern Americans would consider miserable. What is the misery index?

What are the limits of enforcement of policies? Can we place a limit on building roads so as to protect more encroachment on the wild? How do we enforce limits on human reproductive capacity once the definition of a limit has been defined by government? Do the last gorillas in Africa have greater value than the starving farmers that want more land for their farms? To what lengths can government go to enforce environmental rights? Should poachers be fired at? Are African babies as valuable as American babies are? Do we have one standard for the rich countries and another one for the poor?

For the purposes of this lesson, it is surely best to let students decide for themselves what the reference points should be for measuring and defining data as well as the parameters for enforcement. The teacher's role is essentially one of assisting students with accessing information, clarification of concepts and pointing out problems that students have not noticed.

The scoring rubric described below provides a structure for problem solving and a way for students to evaluate their own work and those of their classmates.

4. Conclusions and Meta-issues

When making evaluations, it is useful to have measurements and numbers. Hence in the previous class, the task was to determine criteria and data that could be measured so as to calculate effectiveness of policies. We were looking for empirical criteria as a way to measure containment of population within safe sustainable environmental constraints. Unfortunately all numbers are merely subjective nonsense unless what they signify is agreed upon as determining real or valid entities. What constitutes 'real' is a cultural construct and is non-empirical. The truth of cultural construction of reality becomes only obvious when one works in cross cultural contexts. There is no such thing as common sense only cultural perceptions of reality that judges sense as sensible or nonsense. Regardless of the reader's agreement as to this rejection of the foundations of British Empiricism, what will be presented here is an intentionally provocative approach to what is popularly known as 'meta issues', i.e. to those truths that cannot be settled by appeal to empirical data yet are critical in determining social policy as it relates to the environment.

Are African babies as valuable as American babies? The answer is obvious but its truth is rejected implicitly by most Americans. The value of a baby is secondary to individual responsibility. Since Americans believe there is such an entity as the nation state and individual responsibility, the African baby carries less value than the American baby in terms of empirical expenditure of national dollars. The existence of both nation state and individual responsibility are so important to Americans that they are expected to live and die for this truth. Freedom, God, self, community and life itself is presumed to be existent yet none are empirical and none believed in by even a majority of cultures. For some life is a soul that is attached to the body like static electricity or the life force of the cosmos. For others it is just the organization of chemicals based upon an evolving ordering and reordering of nucleotides.

What Deweyan philosophy demands, however, is that these meta-issues in culture must be in adaptive to survival in the environment and as such must be pragmatic. For the purposes of this lesson, the most all-encompassing paradigm that meets Dewey's criteria for validity is the concept of Gaia and as such will thus be used as a 'metaphysical' yardstick - the ultimate referent point by which to judge culture. It is only in this way that the empirical data that is needed in the evaluation of adaptability of culture will gain broad consensus. The following 'meta-issues' are examples that students need to critically use in constructing an overall strategy for cultural change to take culture from crisis to 'reality' i.e. to become responsive to the real world.

It is important to note that though the following are written propositionally, they are not at all meant to be dogmatic assertions or in any sense true. They are meant to be controversial and are perhaps nonsensical in contemporary culture. The propositions are intended to be rather like the Bill of Rights and to have the same effect as they did within feudal societies in the eighteenth century. The earliest democrats were drowned, burned alive or banished. Culture is always shaped by the past sense of what is real and possible. It does not easily adapt to a profound crisis under its nose because it may neither have the means to see the crisis as real nor recognize the solutions as real - hence the need for this unit. Unless the fundamental sense of 'common sense' is addressed in education, (the realm of the 'real' or meta-issues), then the needed change may well not occur, or occur too late or too slowly, to avoid social collapse. That is the contention here. These propositions may of course, be wrong by any definition but they are surely useful as propositions from which to start a debate.

Catchy debate titles are to be found in the resources and readings for each of the groups - see below. Students can make up their own titles. The following propositions are therefore to be read as provocative ideas for students to think about and react for or against in their group discussions along with their assigned

readings. They provide the ideas behind the debate. One photocopy of the source readings for the debates will be needed for each group participant. Alternatively, one student could present the main ideas/information from one of the books or articles assigned to the group to assist in discussion of questions and issues. Each group will need to have their discussions, presentations and work scheduled through the marking periods with the assistance of the teacher so that by the time of the debate, students will have had ample time to understand, explore and develop their own ideas on issues.

Debate Propositions

1. Gaia (the global homeostatic mechanism that enables life to exist) is the ultimate 'organism'. It is the ultimate cell or 'space ship' of life. Since Gaia is threatened by the population explosion, there can be no winners, only losers in the Gaia crisis. Only international global cooperation will enable us to stabilize the climate, stop global warming and bring about the energy conversion projects and minimal human impact need to maintain a healthy global ecosystem.
2. Preservation of the functioning of Gaia should be the highest priority of the earth, not humans. We need a Gaia centric culture, not an anthropocentric world. There needs to be a sacralization of the natural world in which animals and all organisms value independent of the utility to humans.
3. The world needs Gaia justice. Human economic interests should be secondary to the rights of planetary ecosystems. Humans have to merge back into nature as part of a cooperative community.
4. Family planning alone can bring human population under control and responsible to Gaia. Holy books, religious authorities, moralities and appeals to human rights must take Gaia into account. As such, the adoption of contraceptives have to be viewed as sacral duties, not as threats to religion or morality.
5. Gaia nurtures life and this nurturing needs to be a model for culture as it too supports the existence of individual humans. Such a value may be called the feminization of culture. As the central Gaian value of nurture diffuses into common sensical decision making, status, power and economy, women will find their natural status and position in society, and, especially, power over their bodies.
6. The major corporate powers must include environmental cost and social costs into their estimates of profitability. There needs to be a Gaia bill of rights that protects the environment from exploitative destruction.
7. From the point of view of Gaia, nations do not exist. There is only a global village. From this perspective, 80% of the world's population cannot be allowed to consume 20% of the world's resources. Gaia justice demands equity becoming a global village.
8. The index of economic health cannot be G.N.P. if this is calculated, as it currently is, independently of loss of nonrenewable resources, debased soils, polluted water, damaging climate, extinction of species, and so forth. Gaia underpins any economy and must be preserved before an economy can be said to be rational. Gaian economics demands an end to consumerism as an end in itself.
9. The necessity of war for purposes of national security is redundant. Security only comes from respect for Gaia now that populations have reached such massive proportions. From the point of view of Gaia, our current

political rationality behind arms spending is contradictory and currently a major cause of social and environmental crisis.

10. The concept of Gaia as the primary paradigm of common sense opens the closed world of national cultures to diverse, interdisciplinary, holistic approaches to religion, politics and science. It provides a framework from which to introduce values to technology that goes beyond compulsive consumption

LESSON PLANS

In the broad sweep of the four lesson plans, we will follow the above out-line. However in the particularities of their execution, we will follow a quite different tack, the Deweyan principle of democracy, or as is more popularly stated, a student centered methodology.

For Dewey, all institutions of a democratic society need to be 'democratic'. By this he means, all members of any group, particularly a school, must have the opportunity to actively participate in an essentially non-hierarchical manner, follow their perceived interests and have the right to assume a leadership role. So in the classroom, students should have a voice in what happens. The teacher exists to serve the perceived needs of the student rather than dictate what the students needs are.

The way we can achieve such participation in this unit will be by offering students the opportunity of working in one of 14 different possible groups, each responsible for different aspects of the curriculum. Each group specializes in a different skill as well as different content. These in turn lend themselves to the use of different learning styles, and as such are intentionally designed to appeal to different kinds of personalities. As will be noticed below, they require for the most part, different methods of processing information. Ideally it is intended that each group will not have more than two members since the curriculum and specialties needed are so broad. Also it is intended as far as possible to encourage students to stay with the same group since the level of skill needed or mastery of content is such that they will need the full semester to make an effective contribution to the class. From my experience, there is nearly always one student in a class that has one of the following interests as a preference. The groups are as follows:-

1. Evolution and Anthropology: included would be study in the behavior of chimpanzees, religion, the bible and traditional culture. The more philosophically or religiously inclined would presumably be interested in this topic.
2. Sexuality and human behavior: of special interest would be the attitudes, values and behavior of teenagers. It would include the history of changes in behaviors and values in sexuality.
3. Human Biology and health: those students particularly interested in medical or health related careers will want to look at the issues of abortion, infanticide, family planning and especially the physical and emotional well-being of women.
4. Ecology: The group would explore the biological dimension of controls in population of species in ecosystems, carrying capacity theory and experimentation. The group would have the special responsibility of understanding Gaia theory, the study of the earth as a single ecosystem.
5. Environment: The difference between this group's interests and the above would be its more practical and

earth/ physical science approach to the study of the impact of human population growth on the environment. It would be intended to appeal to the 'Green' activists and include such issues as development of a sustainable economy.

6. Biodiversity 1: Their responsibility will be in maintaining populations of small varieties of animals such as grasshoppers, frogs, fruit flies, fish, mice etc to be used in experiments as suggested above. In the debate on meta-issues their responsibility will be animal rights and the ethics of causing species to become extinct.

7. Biodiversity 2: Not a few students have green thumbs and love plants and so it is important to have a specialty group for them. Since every problem in biology can be looked at from a botanical point of view and plants are generally very manageable organisms in the classroom, a botanical group can always offer a useful perspective to the class. The group would supply a variety of different kinds of plants - mosses, ferns, fast plants and so forth. Their meta-issue would be the proposition relating to the consequences of disappearing rainforests and related business ethics.

8. Arts and Crafts: Every class I have taught has had a student or two that loves to draw, make visuals, construct three dimensional models and games that demonstrate concepts or model statistical relationships and so forth. Their modeling or illustrative (photographic?) services can be made available to students involved in projects. Since visualizing concepts is so important in motivational and understanding conceptual exercises, it is perhaps not necessary for them to have to research one of the debate topics.

9. Computer Services and demographics: A group is needed that can take the time to construct and understand the interpretation of graphs, especially necessary in tracking rates of change in population sizes. Increasingly finding such students is easy and their services essential in assisting in computing data. Mathematical types are needed in this group. In the debate, their contribution could be in the proposition relating to war. They could explore the relationship of wars in history to expanding populations and the option of war as a solution to the population explosion.

10. Media Biology: The use of magazines, popular journals and newspapers is increasingly encouraged in the classroom as a way of encouraging students to read. The topics in this unit are nearly always in the news on television and not infrequently are dealt with by movies (sexuality, abortion, environmental issues and so forth). In the meta-issues debate they can particularly find issues of justice as explosive population increases so directly affect children (needless starvation, early death, misery of overcrowding etc), around the world.

11. Bibliography, W.W.W. search and general research: There nearly always seems to be a student that does not like to work with anyone and only wants to have their nose in a textbook or an encyclopedia. They can be shy low academically achieving students who want to just work from a book and only do paper biology. I find it useful to have this group to fall back on when students join the class late in the semester or have to be away from school for an extended period of time (pregnancy, prison, illness etc). They can be given a particular research or textbook topic to report on.

12. Independent Study Project: Similarly to the general research and textbook group, independent study projects are loved by loners but unlike the above have special interests that are unique to them. For example, a student may want to read widely about Jane Goodall's research in Chimpanzee behavior and sexuality. For the student who wants to be different or has a special passion or ability, this group acts as an alternative option to conformity.

13. Microscopy: There is nearly always a student or two who loves the microscope and can offer the

development of this skill to the class as a whole. Included in its responsibilities would be growing populations of bacterial cultures and conducting related experiments. Growing populations of protists and general microorganisms come under their gambit too. Because of the sensitivity of microorganisms to changing abiotic factors such as acidity and light, they are most useful for conducting environmental and ecological experiments.

14. Laboratory Assistants: A few students are needed to assist in setting up general class activities and experiments. They need time to master the experimental technique so that they can assist small groups and the teacher when conducting whole class activities. I have found that they transform the viability and effectiveness of class activities. It particularly helps keep the more challenged students from becoming discouraged or socially destructive or disruptive.

Lesson One

At the outset of the semester or academic year, the task of most of the above groups is to start building up their stock of organisms, ecosystem or learning those skills needed in the group or project they intend to work on. In lesson one, which will last several weeks, the focus will be on the media biology group to find magazine or newspaper articles that sensationalize and make relevant the issue of population explosion to the class. The arts and crafts, can quickly put together graphic visuals of the meaning of overpopulation or explosive population growth around the world. The environmental group can provide information about alarming crises coming from overpopulation. The computer/demographics group can demonstrate the use of the 'Sim-earth' CD-ROM computer program.

Lesson Two

By the end of the first quarter, the populations of animals, plants and micro-organism should be built up enough so that some preliminary reports can be made from experiments on ecosystem overcrowding, if not population collapse as in the case of experiments with fruit flies. The ecology, environment, biodiversity and microbiology groups will have the main teaching role to play. These experiments can be repeated, refined and developed during the next quarter and used perhaps as entries to the Science Fair at the end of the semester. The arts and crafts group can assist in the visuals and models for purposes of presenting the experimental problem to the class.

Lesson Three

During the second quarter, the themes of evolution, genetics and sexuality are taught. Lesson three is intended to start the quarter off, especially using the groups studying evolution and anthropology, media biology and sexuality and health. They contribute throughout the marking period as the content of the course requires them. The ISP and General Research group participate as their special topic is needed or relevant. As described above, the idea of lesson three is to take a particular problem related to the population explosion and to explore a variety of solutions with projected scenarios. In the light of expected consequences of the three or so proposed solutions, the best is chosen. It is examined more carefully to examine more detailed costs and changes needed in life-styles and so forth. (The exercise is repeated separately from this unit, but using the same method for exploring ethical issues in genetics). The same students who have been involved in the sexuality and human health projects media biology and anthropology/religion/evolution will have a particularly useful contribution in the unit preceding lesson 4, when the biology of sexuality and human sexuality are taught.

Lesson 4

The lesson can be directed or introduced by the Ecology group who have as their main responsibility the understanding of the dynamics of ecosystems and the Gaia concept. All the groups (except the Arts and Crafts and the Lab Assistants) participate in the Meta-Issues debate. Some of the Gaia propositions naturally lend themselves for debate by particular groups (see readings, especially the class text). For assessment, it may be useful for students and teacher to use score sheets used by judges for debating teams. The script can be written up as an essay or paper and presented with the debate. Equally the actual script used in the debate could be evaluated according to standard criteria for essays or papers. For less academic students, the identification of issues and supported reasoning may be the key criteria for assessment. If students find debating too intimidating or difficult, then the activities for their group can be used an alternative way of presenting a debate on the issues, such as a trial or a game, for example, see group 7 below

Annotated Bibliography

READINGS WITH THEIR THEMES STATED AS A QUESTION

For group discussions, presentations, activities or debates.

Full bibliographical details follow.

Group 1. Evolution, Anthropology, Religion

	Readings:	Themes:
Demonic Males pp. 127-152	Genes control sex behavior?	
Oedipus in the Stone Age pp. 26-59	Culture controls sex?	
	Articles:	
Bonobo Sex and Society pp. 82-88	Females control sex?	
High Fertility in Sub-Saharan Africa 118-225	Many controls?	

Debate Text:

Bible, Genesis chapters 1, 2-4, 6-9	Is the Bible Green?	
Natural Grace pp. 15-26		Nature sacred?
Future Worlds pp. 44-48	New ideas/beliefs for a Gaia future?	

Activities:

Earth Matters pp. 149-159 Eco-ethics

Group 2. Sex and Human Behavior

Readings: Themes:
When children want children 70-75,124-129 Why so young?

Going all the way pp. 3-39 Do teenagers want babies?

Articles:

Sex and America's Teenagers p. 4-8, 41-47 Stats: ups/downs?

Fertility Decline pp. 60-67 What causes fertility rates to drop?

Debate and Textbook:

Teenage Sexuality, Debate from all sides on sex.

Gaia Future pp. 176-179 Future sex - business as usual?

Activities:

Earth Matters pp. 141-149 Population growth and values.

Group 3. Human Biology and Reproductive Health

Readings: Themes:

Abortion in America pp. 86-117 Abort to control family size?

Growing up in Egypt p. 1-27 Female circumcision for control?

Articles:

Abortion in American History 111-115 Abort for female health?

Family Planning, Amazon style 31-46 Less kids = Health for more?

Debate and Textbook:

Future Worlds p. 120-133 Personal impact with less population

Death without Weeping p. Overpopulation Now!?

Activities: Earth Matters pp. 149-158 The World's Women

Group 4. Ecology

Readings: Themes:

Atlas of Planet management: Earth a single ecosystem?

Article:

Population, poverty and ... environment p40-45 Connected?

Debate Text:

Future Worlds pp. 1-36, 50-57 Global ecosystem balanced?

Activities:

Earth Matters pp. 25-38 Climate Change and 'greenhouse'

Group 5. Environment

Readings: Themes:

Scarcity and Abundance: A debate on the environment

Article:

Our real China problem p96-114 End nature to end poverty?

Debate Text:

Future Worlds 134-156 Changed politics for changed planet?

Activities:

Earth Matters 49-60 Water Resources [also air, waste, energy]

Group 6. Biodiversity (1) animals

Readings: Themes:

The Diversity of Life 243-280 Global extinction, global crime?

Article:

Easter's End 63-69 Island's extinction: model of global doom?

Debate Text:

Future Worlds pp. 58-71 New Technology: chance or choice?

Activities:

Earth Matters pp. 107-114 Wildlife endangerment

Group 7. Biodiversity (2) plants

Readings: Themes:

The Third Revolution 73-87, 88-99 Forests today, us tomorrow?

Article:

Beyond numbers p.23-24 Seeing the population issue whole?

Debate Text: Future Worlds 109-118, 168-174 A new planetary economics?

Activities: Earth Matters p. 61-82 Act out a Trial. Play game with nature.

Group 9. Computers and Math

Readings:

Population Index- Web site- <http://popindex.princeton.edu/>

Themes:

All the data you need to know about population?

Debate Text:

Future Worlds 72-87 Atlas of Planet Management War no more?

Activities:

Earth Matters pp. 1-24 Computing population explosion

Group 10. Media and Biology

Readings: Themes:

Population Council- Web site- <http://www.popcouncil.org/>

Search the news and current issues about population

Debate Text:

Future Worlds pp 88-109 Justice in the Global Village?

Activities:

Earth Matters pp. 127-141 Rich and Poor (contrast budgets)

Group 13. Microscopy

Readings: Themes:

The Ends of the Earth : Why become a Global Village ?

Article:

World's women pp.7-16 A woman's global village?

Debate Text:

Future Worlds p.158-166 New Ideas and beliefs?

Activities:

Earth Matters p. 83-94 Food and Hunger - good/bad news

Groups 8, 11, 12 and 14 have readings/activities that

are individually arranged for them as described above.

Bibliography

Nayar Atiya Khul-khaal Growing up in Egypt, Syracuse Univ.1982

Dewey, John Democracy and Education NY, Macmillan 1916

Lidz and Lidz Oedipus in the Stone Age Madison, Ct. IUP 1989

Myers, Norman The Gaia Atlas of Future Worlds Doubleday Press, NY 1990

Myers N. and Simon J. Scarcity or Abundance? Doubleday, 1991

David Bender Ed. Teenage Sexuality Opposing View Points,

" " Environmental Crisis Opposing View Points

San Diego, Greenhaven Press, 1992

Cohen, Joel How many people can the earth support? Norton, 1996

Kaplan, R.D. The Ends of the Earth Vintage Press,1997

Paul Harrison The third revolution Penguin, 1992

Edwin Wilson Biodiversity Washington, DC Nat. Academy Press,1991

Leon Dash When Children want Children NY Penguin,1990

James Mohr Abortion in America NY, OAP, 1978

Nancy Scheper-Hughes Death without Weeping 1992

Sharon Thompson Going all the Way 1995

Journals

Atlantic Monthly

Kathy Pollitt Abortion in American History May 1997

Mark Hertzgaard Our Real China Problem Nov 1997

Discover

Jared Diamond Easter's End August 1995

Journal of Women's Health

Natural History

Warren Hern Family Planning, Amazon Style Dec 1992

Scientific American

John and Pat Caldwell High Fertility in Sub-Saharan Africa May 1990

Partha Dasgupta Population, Poverty and the Local Environment February 1995

Robey, Rutstein, Morris Fertility Decline in Developed Countries December 1993

Frans de Waal Bonobo Sex and Society March 1995

ANALYTICAL SCORING RUBRIC

for lesson 3

DIMENSION _____ SCORE

Problem

- Problem stated clearly. Underlying problems such as conflict of values, rights or interests are identified. 3
- Problem(s) identified adequately. 2
- Problem and/or underlying issues poorly stated. 1
- Problem not identified or its underlying issues missing. 0

Solutions

- Four or more solutions proposed. 3
- Two or three solutions proposed. 2
- Solutions are unclearly connected to the problem. 1
- Solutions do not address the problem or underlying issues. 0

Consequences

- Anticipated consequences or outcomes are identified as desirable or undesirable for 4 or more proposed solutions. 3
- Outcomes identified and evaluated for 2 or 3 solutions. 2
- Consequences unclear as to their desirability. 1

· Outcomes not connected to the proposed solution or missing. 0

Plan, Measures needed to make a Conclusion

· A clear outline plan made, listing any resources needed, to implement a solution. Measures are given by which outcomes can be measured and evaluated for purposes of making a conclusion about the adequacy of the solution to the problem. 3

· The plan and measurements are adequate for a solution. 2

· Significant information is missing from either the plan or method of measuring consequences, to make a conclusion. 1

· The plan or measures used are not connected or missing. 0

Excellent: 10-12 points Potential: 4-6 points

Proficient: 7-9 points

Unsatisfactory: 0-3 points

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